FINANCIAL LIBERALIZATION
AND
DYNAMICS OF FIRM-LEVEL FINANCING AND INVESTMENT DECISIONS IN THE SOUTHEAST ASIAN COUNTRIES

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Doctor of Philosophy

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Thesis Summary

This thesis examines the dynamics of firm-level financing and investment decisions for six Southeast Asian countries. The study provides empirical evidence on the impacts of changes in the firm-level financing decisions during the period of financial liberalization by considering the debt and equity financing decisions of a set of non-financial firms. The empirical results show that firms in Indonesia, Pakistan, and South Korea have relatively faster speed of adjustment than other Southeast Asian countries to attain optimal debt and equity ratios in response to banking sector and stock market liberalization. In addition, contrary to widely held belief that firms adjust their financial ratios to industry levels, the results indicate that industry factors do not significantly impact on the speed of capital structure adjustments. This study also shows that non-linear estimation methods are more appropriate than linear estimation methods for capturing changes in capital structure.

The empirical results also show that international stock market integration of these countries has significantly reduced the equity risk premium as well as the firm-level cost of equity capital. Thus stock market liberalization is associated with a decrease in the cost of equity capital of the firms. Developments in the securities markets infrastructure have also reduced the cost of equity capital. However, with increased integration there is possibility of capital outflows from the emerging markets, which might reverse the pattern of decrease in cost of capital in these markets.

The study also evaluates the economic impact of a decrease in the cost of equity capital on the firm-level capital allocation and investment strategies. The results show that the implementation of financial reforms such as: interest rate liberalization; reduction in policy credits; reduced reserve requirements and prudential regulations have significantly reduced financial constraints and improved the efficiency of investment allocation for these countries. The study also highlights episodes of over-investment in some countries suggesting possible weaknesses in the internal corporate governance mechanisms.

Key words: financial liberalization, capital structure, cost of equity capital, debt and equity adjustment speed, investment and investment efficiency, stock markets integration. Southeast Asian countries

To My Loving Friend Radiah

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List of Abbreviations

ADB	Asian Development Bank
ADR	American Depository Receipts
ARCH	Autoregressive Conditional Heteroscedasticity
ARIMA	Autoregressive Integrated Moving Average
BIBF	Bangkok International Banking Facilities
BLUE	Best, Linear, Unbiased and Efficient
BSE	Bombay Stock Exchange
CEO	Chief Executive Officer
CFO	Chief Financial Officer
DR	Depository Receipts
EWS	Early Warning System
FDI	Foreign Direct Investment
GARCH	Generalized Autoregressive Conditional Heteroscedasticity
GDP	Gross Domestic Product
GDR	Global Depository Receipts
GMM	Generalized Methods of Moments
ICICI	Industrial Credit and Investment Corporation India
IFC	International Finance Corporation
IFCI	International Finance Corporation Index
IMF	International Monetary Fund
IPO	Initial Public Offering
LOFSA	Labuan Off shore Financial Service Authority
LM-Test	Lagrange Multiplier Test
M2	Broad Money Supply
MENA	Middle East and North African
MSCI	Morgan Stanley Capital Index
NPV	Net Present Value
OLS	Ordinary Least Square
PSTR	Panel Smooth Transition Regression
RMSE	Root Mean Squared Error
SIC	Standard Industrial Code
SE	Stock Exchange
S.E.T.	Stock Exchange of Thailand
SOE	State-owned Enterprises
TARCH	Threshold Autoregressive Conditional Heteroscedasticity

CHAPTER 1

INTRODUCTION

This research examines the economic impact of financial liberalization on the firm-level capital structure, cost of equity capital, and investment in the Southeast Asian countries. The countries investigated adopted similar financial reforms during the past decade but they have differed in the sequence and implementation of these reforms. The economic rationale for financial liberalization in all of these countries has been to remove government interventions in the financial system and to allow market forces to determine the allocation of resources in the interests of increasing overall economic growth. This research study explores a number of related economic and financial issues concerning the liberalization era, including the speed of adjustment to optimal capital structure, stock market integration, cost of equity capital, and investment allocation and efficiency, by employing an overarching empirical methodology.

In the Southeast Asian countries, the pre-liberalization period was characterized by financial restraints and capital controls. Starting in the 1980s, most of these countries initiated financial liberalization programmes[1] which continued during the 1990s. The drive for financial liberalization was generally spurred by the belief that the existing financial structures were inadequate to promote and assist growth in the real economy (Schianteralli et al., 1994). During the last decade, domestic financial markets in most of these countries have become less segmented and more integrated with world markets due to financial liberalization (Kincaid, 1988). Whilst the current literature puts forward different arguments about the causes[2] and consequences of

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[1] Liberalization refers to the relaxation of price and quantity restrictions imposed on financial markets by the governments. It has been used to describe capital account and stock market liberalization in the current literature (Quinn, 2000; Bekaert and Harvey, 2000; Henry, 2000).

[2] Some argue that financial reforms fitted into the broader context of structural adjustment programmes supported by the IMF and the World Bank (Singh and Weisse, 1998) or were inspired by the work of McKinnon (1973) and Shaw (1973) who advocated that outcomes of financial liberalization are increased savings and greater efficiency in the allocation of capital.

financial liberalization[3], this is not a primary consideration for the thesis, which instead considers the financial and economic effects of financial liberalization.

At the macro level, existing empirical evidence seems to favour financial liberalization because it is associated with an increase in economic growth (King and Levine, 1993). However, the effect of financial liberalization on savings[4] and investment[5] has been less consistent across different studies. A political economy perspective has been suggested for the observed differences in the sequences of liberalization adopted by Southeast Asian countries. This political economy perspective illustrates that transition to new financial regimes has led to problematic effects, some of which are undesirable and uncontrollable.[6] At the micro-level empirical evidence of the financial liberalization has been related to the study of financing choices[7], cost of capital and investment. Such research advances have resulted in increased attention to the quantitative impact of liberalization at the firm-level rather than at the country-level[8].

Financial liberalization has often been considered as a one-off event in the current literature and its effects have been examined using event-study methodologies (see Vesperoni and Schmukler, 2001; Bekaert and Harvey, 2000; Henry, 2000; Laeven, 2003). The literature abounds with retrospective accounts of the economic benefits of this one-off financial liberalization, yet it has been argued that liberalization is a continuous process[9], which has a complex and non-linear influence on the choices of individual firms. The counter argument is made in this thesis that a

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[3] The implementation of financial liberalization in the 1970s and 1980s was followed by the financial crises in the developing countries during the early 1970s in Columbia, Uruguay, and Venezuela; the mid-1970s in Argentina, Brazil, Chile and Mexico; early 1980s in Turkey, Israel, Philippines, and Mexico and in the 1990s in Thailand, Malaysia, Indonesia, Philippines, South Korea and more recently crises in Russia, Mexico and Brazil.

[4] For example, some recent studies have found a reduction in savings after financial liberalization (Bandiera et al., 2001), whereas previous found a significant positive effect of the interest rate on savings (Fry, 1988).

[5] There are a number of studies that have examined the relationship between liberalization and financing and investment constraints (see Laeven, 2003).

[6] The political economy perspective has been examined in most of the studies for these countries (see Zhang, 2003, 2002; Li and Smith, 2002).

[7] The most recent empirical evidence relating financial liberalization to financing choices in the emerging markets for Latin America and Asia has been given in Schmukler and Vesperoni (2001).

[8] Eichengreen (2001) describes the lack of empirical clarity in the country level results as worrisome and asserts that the problem has been the macroeconomic foundation of the literature to date. What is required, he suggests, is more firm-level evidence based on a microeconomic foundation.

[9] See Stulz (1999), Bekaert and Harvey (1995), and Bandiera et al. (2001).

number of economic mechanisms through which economic activities were guided in the countries have been replaced or modernized during the course of liberalization, which varies across countries, and that these mechanisms have implications for the economic agents[10]. In the thesis, liberalization is described as multi-faceted; being considered for instance, as domestic banking sector liberalization and stock market liberalization, and it is reported as having multiple channels of heterogeneous effect. This thesis argues that liberalization, such as of the domestic banking sector, has preceded or lagged behind stock market liberalization and other reforms such as trade liberalization, but this real phenomenon has not been explored in the empirical work[11].

The goal of this research is to investigate the joint influence of the domestic banking sector and stock markets liberalization in six Southeast Asian countries, these being: India, Indonesia, Malaysia, Pakistan, South Korea and Thailand[12] and the empirical study specifically provides answers to the following questions:

1. Does the optimal debt/equity ratio of firms increase with financial liberalization?
2. Does the speed of adjustment of the debt ratio to target debt ratio and speed of adjustment of the equity ratio to target equity ratio increase with financial liberalization?
3. Does the cost of equity capital decrease with the stock market integration, market liberalization and institutional developments?
4. Does the firm-level investment and allocative efficiency of investment increase with financial liberalization?

The motivation for the selection of Southeast Asian region and the sample countries is described as follows: Southeast Asia is important because this region followed different strategies of

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[10] The economic mechanism such as stock market has now become a cornerstone of the financial systems of some Asian countries.

[11] According to Kaminsky and Schmukler (2001), between 63% and 80% of G-7 and European countries liberalized their stock markets and only 25% liberalized their banking sector. In contrast, between 57% and 77% of the Asian and South American emerging markets liberalized their banking sectors respectively. Within these latter countries, 43% of Asian countries compared with only 8% of South American countries, liberalized their stock markets. This is explained more in detail in Chapter 5.

[12] The country case studies are well documented in previous studies (see for reference, Caprio et al., 1994)

liberalization, with some countries opting for liberalization of banking sector first, and some others focusing on the stock market first. This contrasts sharply with the experience of South American region, countries in this region such as Brazil, Chile and Mexico overwhelmingly adopted liberalization of domestic banking sector first (Kaminsky and Schumkler, 2003). Another contrasting feature of the liberalization in the South American region was that most countries undertook liberalization simultaneously with stabilization programs. Another crucial difference is related to the difference in the timing of financial reforms across regions. For instance, liberalizations were implemented much earlier in Asia than in Africa but later than South America, therefore, potentially research findings may provide middle way benchmark to compare performance with early liberalizers (South America) and late liberalizers (Africa).

We selected only six countries –India, Indonesia, Malaysia, Pakistan, South Korea, and Thailand for analysis in this research. The choice of these countries stems from the fact that the extent of financial liberalization – interest rate regulations and greater competition in the banking markets, as well as liberalization of restrictions on cross-border capital flows has been considerably greater than in many other Southeast Asian countries. Furthermore, as a pre-requisite to financial liberalization, the inflationary environment in these countries was stable and the budget deficit has been under control on the eve of liberalization. For example, inflation rates in South Korea, Pakistan, Thailand and Malaysia were less than 5% compared to the liberalizing countries in Asia such as Sri Lanka and the Philippines where inflation rate was more than 20% on the eve of financial liberalization (Fuchs-Sch and Funk, 2003). Similarly, soon after liberalization in these countries, the prudential regulations were initiated to strengthen the banking supervision, whereas , in other Asian countries, such as Philippines and Taiwan the gap between implementation of interest rate liberalization and prudential regulations was more than 7 years as pointed by Laeven (2003).

The selection of these countries is also supported by some interesting findings reported about these countries in recent studies (Booth et al, 2001; Schmukler and Vesperoni, 2001) which have examined the capital structure of these countries. One such example is Booth et al (2001) who point out that there are differences between these countries due their firms' characteristics and diversity in financial and economic factors. Indeed, some studies (Deesomsak et al., 2004) have argued that there is not enough evidence on how capital structures of the firms in the Asian countries been influenced by financial liberalization, and Kaminsky and Schumkler (2003) add that focusing on just one factor such as liberalization of one market may result in biased picture and suggested that liberalization of banks, stock market, and capital account should be investigated in holistic way. Recent capital structure studies further provide empirical evidence to suggest that institutional framework is important when analyzing dynamics of the capital structure by studying adjustment process. Although Booth et al (2001) and Demirguc-Kunt and Maksimovic (2001) empirically study these issues with 10 different countries mostly during 1980s the initial phases of liberalization but there is no recent empirical evidence as most of these countries have moved from initial phases to complete liberalization.

In the light of above arguments, we are of the opinion that this research is timely as it focuses on the economic impact of financial liberalization and institutional developments on the firms' capital structure, cost of equity capital and investment in six selected countries. Furthermore, combination of these countries will lend importance to analysis because there is no study on the Southeast Asian countries analyzing the economic impact of different financial liberalization sequencing strategies. Indeed Falvey and Kim (1992) argue that timing and sequence matter for developing countries because inappropriate timing and sequence may raise doubts, as to sustainability of the reform and deter private sector from undertaking expected adjustments. Finally, availability of new dataset on these countries might provide new insights into the financing and investment decisions of firms.

The thesis employs a number of methodologically rigorous estimation methods to address specific issues about the impacts of financial liberalization.[13] The approach adopted in this thesis is

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[13] Chapters 4, 7, 8 and 9 have separate sections on the methodology.

substantially different from the previous ones, for example, non-linear specifications to investigate financing and investment decisions of the firms, have been used, unlike in previous studies that have mostly used linear specifications. In contrast to using aggregate country-level measures such as financial deepening to examine the economic impact of financial liberalization, this study has adapted old measurements of liberalization to develop new ones (see Chapter 3). These measures have helped the researcher to develop a macro-micro measurement of financial liberalization, and it is shown that the combined use of these methodologies provides an overarching approach to investigate the gradual and continuous influence of liberalization on a firm's financial structure.

The main contributions of the thesis rest in analyzing jointly the impact of the liberalization of stock markets, banking sector and institutional developments in an integrated fashion for the first time for Southeast Asian countries. In particular, we find that difference in the sequencing and timing of liberalization of banking sector and stock markets matter. More specifically, we found that banking sector liberalization sequencing strategy has a significant positive effect on the speed of adjustment of debt ratio for South Korea due to less spacing (shorter lags) in the implementation of reforms compared to other countries. We also find support for market timing hypothesis in the case of South Korea and Pakistan because firm-level equity issues increased when stock market valuations increased in both countries. More importantly, our results explain the time varying adjustment process of capital structures for the Southeast Asian firms for the first time and impact of firm-level characteristics on adjustment process.

Another important contribution has been the finding of time varying stock market integration for the sample countries. We find that there has been significant change in correlation of stock markets with world in the case of South Korea, Thailand, Indonesia and India. Most of the sample stock markets were more integrated globally rather than regionally in the early 1990s. Our findings might imply time varying stock market integration has been one of the factor underlying differences observed in the speed of adjustments of firm's capital structure.

Another main contribution of the research is that we find significant impact of stock market liberalization and institutional developments on the cost of equity capital using firm-level data for the first time. Most of the recent studies have used only a few stock market liberalization events and country-level stock returns data. Our stock market liberalization index not only captures the depth i.e., increases in the liquidity due to opening of stock markets, but also the breadth of the stock market i.e., increases in the number of listed firms after privatization. This finding was further extended to examine the effect on investment in the sample countries.

We find that financial liberalization has varying effects on firm-level investment across firms and across countries using new liberalization measures. And also we provide new evidence on the over (under) investment and investment allocative efficiency at firm-level for the Southeast Asian countries. We find evidence of over-investment in the case of South Korea that suggest that firms destroyed the shareholders' value when firms exceeded optimal level of the investment, which is corroborated by our finding of decrease in investment allocative efficiency index for South Korea. Our final contribution lies in using a Smooth Transition Regression model to explain investment dynamics for the sample countries. The results show that financing constraints faced by firms are specific to a country institutional environment and captured by country specific financing constraint variable, unlike previous studies which have used mostly relied on ad hoc proxy variables.

We derive several implications for policy makers in our sample countries from the results that can be useful for designing an appropriate framework to support the efficiently functioning stock markets. First, policy makers in these countries will have to believe in transparency in the financial markets and credibility of the institutions to implement the reforms in letter and spirit to achieve and maintain global investors' attention (investability). In particular, our results seem to imply that if firms adopt international auditing and accounting standards, then, there are great opportunities for such firms to attract foreign analysts and portfolio investors. Indeed, Mitton (2006) shows that firms with stocks that are open to foreign investors experience higher growth, greater investment, greater profitability, efficiency and lower leverage. It is important to point out to the policy makers in these countries that these changes or reforms might be costly investment for most firms in these countries because of the need to achieve change might require breaking into cultural domain of firms across countries. The international listings obligate the firms to comply with burdensome disclosure requirements. Family controlled and group connected firms have little tradition of disclosure. There is an urgent need for education and training of personnel within the businesses and the regulatory institutions. The investment in training and development of personnel will have higher pay offs in future for these countries.

A more detailed description of the remaining chapters is as follows:

Chapter 1 has introduced the research topic. Chapter 2 summarizes the knowledge to date on the research topic, aiming mainly to highlight deficiencies in previous studies and indicate how present knowledge can be improved or expanded through this research. Chapter 3 covers the dataset and preliminary non-econometric analysis. This chapter serves an important purpose of explaining the trend in main variables used in analysis. Chapter 4 is devoted to an investigation of capital structure dynamics and speed of adjustment. By comparing the sequence of liberalization of the banking sector and stock markets in these countries, the variations in the economic benefits of the increase in the speed of adjustment to the optimal capital structure are highlighted. The empirical analysis does not consider explicitly the new issue of debt (equity) or the repurchase of debt (equity) which is implied by adjustment in the capital structure. The estimation results from Chapter 4 have been used to calculate the actual speed of adjustment to target debt and equity ratios separately to investigate heterogeneous firm characteristics on these speeds of adjustment in Chapter 5. Chapter 5 evaluates the hypothesis of difference in speed of capital structure adjustment for different types of firms in the pre-post liberalization periods. Chapter 6 adopts a forecasting framework to test prediction of model and explores future outcomes of liberalization using a simulation framework. The simulation acts as a normative scoping exercise to gauge future imbalances in capital structure of firms.

Chapter 7 examines the integration of Southeast Asian stock markets because it was found that the speed of adjustment of equity ratio is different across these countries (see Chapter 5), which might be due to the lack of, or difference in the level of, integration of these markets with the world markets as well as among these markets. Prior studies do not explore time varying integration of stock markets with either world markets or regional markets (see Chapter 7) despite the fact that such variations have significant impacts on the speed of adjustment to various debt and equity ratios and cost of equity capital.

Chapter 8 investigates the decline in cost of equity capital after stock market integration, liberalization and institutional developments. A country's cost of equity capital has two components: the equity risk premium and the risk free rate. There are three reasons why stock market liberalization might cause a fall in the liberalizing country's cost of equity capital. First, stock market liberalization might increase net capital inflows and an increase in net capital inflows could reduce the risk free rate. Second, allowing foreigners to purchase domestic shares facilitates risk sharing between domestic and foreign investors. Increased risk sharing should reduce the equity risk premium, and finally increased liquidity will also reduce the equity premium.

The point is made that the quality of securities laws in these countries is less than adequate since such legislation does not give a clear indication about the quality of internal and external corporate governance in these environments. Of course, there are temporal differences in the establishment of regulatory bodies, implementation of electronic trading, and changes in the insolvency and disclosure laws in these countries, which have been ignored in previous studies. This chapter presents a new institutional development measurement for the countries and it is identified that besides stock market liberalization, securities market developments are also associated with decline in the firm-level cost of equity capital.

Chapter 9 examines whether liberalization leads to an increase in investment and allocative efficiency of investment. The chapter investigates that spacing of financial reforms measures and properly sequencing them, is important to encourage firm-level investment. Chapter 10 draws a number of conclusions from the empirical work and highlights the contributions, and policy implications.

A useful contribution of the research is that it will help managers and policy makers to understand the dynamic nature of liberalization in the emerging markets. The research findings have a number of economic policy implications. One such policy implication is that the timeliness of the liberalization is critical to derive economic benefits of financial liberalization in the short-run. In the long-run, coherence of the reform measures is indispensable to sustain the nexus of relationship between real sector growth and the financial sector in the emerging markets. The notion of coherence of reforms can be made operationally precise by specifying the exact nature and timing of all the relevant government interventions in the domestic financial markets, governance and institutions. This can be achieved by ranking the macroeconomic and societal objectives in terms of priorities achieved through transparency and evaluating the economic trade-offs of such policy endeavours and manoeuvrings.

CHAPTER 2

REVIEW OF RELATED LITERATURE

2.1 Introduction

The globalization of finance has attracted immense attention and it is hardly surprising that the relationship between financial liberalization and financial development has also been a focus for research interest in recent years. This chapter reviews the finance literature that is relevant to the main theme of financial liberalization, and does so in three sections. Section A describes how financial liberalization became associated with the economic development strategy of the Southeast Asian countries. It shows through characteristics of the financial sector, in particular the banking sector and stock markets, that financial repression was an outdated development agenda in the face of the globalization of finance. This section also describes the approach of six Southeast Asian countries to the financial liberalization process as evidenced by the empirical literature. The shifts in governments' attitude to allow freedom to financial sector participants (intermediaries and participants) is also discussed.

Besides investigating the significant country-level changes in financial sector operations, Section B explores theoretical arguments about and insights into, possible firm-level influences on the financing and investment decisions of firms. This section also ties together previous studies related to financing patterns in the countries being studied. Section C proposes a holistic framework to examine the relationship between financial liberalization and firms' capital structure, cost of equity capital and investment decisions. Thus, the literature review not only provides the context for this research by considering what research has already been conducted, but it also points out what evidence is lacking with reference to research questions. An important aspect is to evaluate the suitability or otherwise of the research methods in the sample of countries chosen for study.

Section A

2.2 Financial Markets Imperfections and Financial Liberalization

The Southeast Asian countries had a legacy of financial markets controls in one form or another, such as control on initial offering of new shares, subsidized and directed loans, interest rate and loan amount ceilings. During the last two decades, however, these controls have either been removed or reduced by the liberalization of financial sectors, thereby allowing financial markets to emulate the developed financial markets. In order to critically evaluate the influence of financial liberalization, there is a need to define the financial markets imperfections also known as financial repression, and, to examine the effects of financial repression on domestic financial sectors. This discussion will allow us to contrast the effects of financial liberalization with financial repression at the macro and micro level.

2.2.1 Financial Repression

The term 'financial repression' has often been used to describe the effects of policies rather than the policies themselves. Financial repression can be caused by a number of different policies, which typically include both price and quantity restrictions imposed on the domestic financial sector that distort financial intermediation, savings and investment (Giovannini and Melo, 1993). Government interventions in the pricing and allocation of credit decreased financial deepening mainly by depressing real interest rates. Restrictions are also imposed by governments on international capital flows because in the absence of such constraints, most of the regulations governing the domestic financial sector could be easily bypassed through offshore financial transactions. Stiglitz (1994, p.20) advocates government interventions in the financial markets in the developing countries, and suggests "there exists a form of government intervention that will not only make these market function better but will also improve the performance of economy". Stiglitz argues in favour of interest rate restrictions and against interest rates liberalization. He argues that financial liberalization increases competition between banks which erodes profitability of banks implying lower franchise values (i.e., the capitalized value of expected profits) and lower franchise values lower incentive for making good loans increasing the moral hazard problem. Without stronger prudential regulations, the interest rate liberalization will increase the pressure on the banks to take on risky loans. In addition, Stiglitz suggests that financial repression increases firm equity capital because it lowers the cost of equity capital. Thirdly, financial repression, if used in conjunction with export–promotion schemes, or preferential credit schemes, could encourage the flow of capital to sectors with beneficial technological spillovers. The main drawback of this argument forwarded by Stiglitz (1994) is that it does not indicate how it happens.

Likewise, there is a public finance argument for rationalizing financial repression. According to this perspective, governments repress financial systems in order to smooth out their fluctuations in the fiscal revenues (Denizer et al., 1988; Alm and Buckley, 1998)1. The high statutory reserve requirements imposed on the banks to hold government securities create an artificial demand for a government's own securities (Agenor and Montiel, 1996; Roubini and Sala-I-Martin, 1995). Thus, in the short-run, the high reserve requirements increase seignorage for the governments as well as reduce the credit supply in the economy. The governments do not emphasise the development of the stock markets because seignorage cannot be easily extracted from these markets (Fry, 1995). In the long-run, financial repression has the overall effect of transferring funds from the financial system to the public borrowers sector. Below, some stylized facets of the Stiglitz-idealized financial system in Southeast Asian countries are presented. Knowledge of the repressive policies in these countries has been concerned with the distortions in the banking sector and stock markets, which are namely - interest rate ceilings, high reserve requirements, policy directed or priority loans, and capital controls. The following sections review the effects of these distortions on the firms; financing and investment patterns.

2.2.1.1. Banking sector and Financial intermediation

A prominent feature of the financial sectors in the Southeast Asian countries is the dominance of government-owned commercial banks (Fry, 1995), which are the key institutions involved in the process of financial intermediation, and which are therefore, most affected by the financial

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[1] Giovannini and Melo (1993) estimated revenue from interest rates repression has been as high as 40% of government revenue in Mexico and 20% in India, and Pakistan.

repression. The classical literature suggests that government ownership of banks allowed government to develop certain strategic industries through direct ownership and control over finance and providing policy-directed and subsidized loans to certain sectors, for example, agriculture, heavy industries and small business sectors prior to liberalization seem to support this view. For example, in India, directed credit consisted of 30% of total private credit during 1980s, and increased to almost 43% prior to 1990. These subsidized lending were unusually below the market rate, and did not take into account the higher costs of priority sector lending and the higher rates of non-performance by recipients (Demetriades and Luintel, 1997).

An alternative view seems to suggest that governments own banks to provide employment and other benefits to supporters, who return the favour in the form of votes, political contributions and bribes (Schleifer and Vishny, 1994). For instance, in Indonesia, the government-owned banks served as a conduit for channeling state oil revenues to politically connected favoured industries. The benefits of subsidized credit went to the government-owned firms and large conglomerates, which was detrimental to quality in lending, public banks capitalization and profitability (Caprio et al., 1996). Chamley and Honohan (1993) argue that loan rate ceilings tend to deter bank spending on loan assessments, as seen in Indonesia prior to liberalization, the monetary policy was enforced by bank-by-bank credit ceilings, which contributed to the weakness of competitiveness forces and lack of management skills. Although there were also credit allocation restrictions in Malaysia but those were quite broad and not binding like in other Asian countries. For example, broad-based programmes like lending to native Malays, left credit decisions to individual banks.

The strategy of promoting large-scale heavy and chemical industry in South Korea resulted in the allocation of credit to specific firms in these industries, with the government providing the most successful exporters with a range of benefits including preferential access to loans at subsidized rates and tax incentives. In 1980, the government supported *Chaebols* to receive almost 95% of available policy loans, resulting in the neglect of the light manufacturing industries that were significant exporters as well as producers of daily necessities. Consequently, there were wider spreads between priority and non-priority lending rates, and over-investment occurred in the targeted industries, based on supply side considerations rather than realistic demand-side forecasts at the firm level. Although this government-business relationship contributed to the country's rapid industrialization, the national economy suffered from a fundamental distortion of the competitive market structure and misallocation of resources (Park, 1997). These contrasting cases of countries with similar repression caused by both price and quantity restrictions on the financial intermediation process indicate that some sectors of the economy might have been largely crowded out from the banking sector.

2.2.1.2. Banking sector size and competition

Most of the commercial banks in the countries being studied have been government-owned due to the restrictions on the entry of the foreign banks. This situation led to the monopolistic banking market, with government-owned banks controlling a higher percentage of banking assets (Pill and Pradhan, 1997). Thus, the number of foreign banks has been less in these countries. In a sample of 80 countries studies by Claessens at al. (2001, 896) report that average foreign bank presence varied from 0 in India to 0.35 in Indonesia for the 1988-1995 period. Moreover, the private domestic banks and non-banking financial institutions were non-existent in most of these countries except Malaysia (Sharma, 2000). The local commercial banks were originally set up by business groups and trading houses in Thailand to finance their operations and were majority family owned (Lauridsen, 1998).

Given the government regulation of the main source of commercial banks' income in Southeast Asian countries, there was no competition among the banks with respect, to interest rates on loans. And when the ceilings were imposed on lending rates, the banks were not able to charge market interest rates, with the result that the spread between lending and deposits rates decreased, and banks had to set low deposit rates, thus, reducing the supply of saving. This situation led to credit rationing as the demand for credit exceeded supply (World Bank, 1990). On the other hand, in order to speed up rapid growth in certain sectors, in particular agriculture, development financial institutions were established by the governments. These development financial institutions have been a source of subsidized credit, being able to borrow at competitive rates and having credit lines with foreign banks due to government support.

The empirical evidence relating to the effect of the above policies on financing and investment patterns seems to suggest that some firms have been subject to financial repression following government policies (Glen and Pinto, 1994; Ang et al., 1997), which saw politically-connected firms being been better off through being able to obtain low interest rate loans from the banks. For example, in India, working capital loans like term loans were common, and the firms were allowed a certain level of loans based on historical indicators rather than on expected sales and profit growth. Any increase in working capital limits, involved a time-consuming and laborious process. A consortium of banks was required for loans exceeding a certain upper limit. The conditions were similar in other Asian countries as a result the short-term borrowing ratio was higher – 40% in Indonesia, 55% in South Korea, and 45% in Pakistan (Glen and Pinto, 1995). The real interest rate and high public sector investments had a negative effect on private investment in these countries (Greene and Villanueva, 1990).

2.2.1.3. Capital controls and Capital markets

The intensity of capital controls has been regarded as one of the main reasons for the lack of development in the capital markets in these countries (Haque and Montiel, 1991). Most commonly, these controls included quantitative restrictions on the foreign direct and portfolio investment. The use of capital controls has often been justified on the grounds that: i) these controls help to manage the balance of payment crises; ii) these controls ensure that the domestic savings of developing countries are used to finance domestic investment rather than the acquisition of financial assets, and iii) these controls limits the foreign ownership of domestic factors of production (Mathieson and Rojas-Suarez, 1992). These controls had a severe impact on the capital mobility across countries. For example, the Indian economy was characterized as 'capital immobile'. The capital account was closed in South Korea, Thailand and Pakistan during the 1970s and early 1980s respectively (Glen and Pinto, 1995; Haque and Montiel, 1991). As a result, these countries had limited capital inflows except for foreign loans for the public sector. The governments relied on official debt to meet their fiscal deficits, and controlled offshore private corporate borrowings.

2.2.1.4. Unattractive Capital markets

The capital markets were closed for foreign portfolio investment in these countries, and the attractive feature of stock markets i.e., freedom to move investment in and out of the country at any time, was absent. The opening of capital markets using country funds was denied by governments thus preventing local market integration with global markets and opportunities for reduction in the cost of capital for local firms. In segmented capital market, risk premiums may be directly related to the volatility of equity returns in the particular market. Higher volatility implies higher cost of capital (Bekaert and Harvey, 1995). There was no provision by governments of local and foreign investor portfolio diversification and risk sharing opportunities, due to fears that capital would flow to the highest return markets offshore. Additionally, the attractiveness of capital markets was further debilitated due to the following reasons.

The family-owned firms were reluctant to go public and dilute their corporate ownership (Wai and Patrick, 1973). Most of the firms feared the dilution of firm ownership and intimidation by greater regulatory scrutiny. The government imposed constraints such as, setting the prices of initial share offerings; placing restrictions on price movements in the secondary markets; limiting the maturity of debt and selecting only the largest firms for stock market listing, thereby significantly affecting stock market liquidity and financing (Glen and Pinto, 1995; Hasnan, 2001). Such constraints on stock markets were prevalent in India and Indonesia, consequently limiting the role of their stock markets in providing long-term finance. The South Korean government introduced laws that only facilitated the access of selected firms to the stock market (Park, 1997). Under these laws, the government reviewed the financial performance of the firms, and recommended or ordered selected ones to go public. Such firms had to meet certain requirements in terms of size, years since establishment, and profitability to qualify for listing. Government limits were also imposed on corporate bond issuance.

In Thailand, the government passed a Public Company Act introducing a regulatory framework for all listed firms, but many firms considered this legislation too restrictive and a hindrance to growth. For instance, the law disallowed cumulative voting, which it was thought, could lead to a higher turnover in the board, thus proving to be disruptive to company management. A limit was also imposed on shareholding by the top shareholders. The law prohibited the largest shareholders, as a group, from holding more than 50% of total outstanding shares and other shareholders from holding more than 10% of outstanding shares individually.

Another factor affecting stock market financing was the relatively high personal tax rate. The attractive feature of securities i.e. the possibility of capital gain or the protection of savings against inflation, failed to attract investors in these countries due to higher personal taxes on dividends and capital gains. In India and South Korea, the high personal tax rates on capital gains compared to dividend income (Glen et al., 1995), had a negative effect on the attitude of investors and demand for new shares. Thus, personal tax structure might have created a bias in favour of debt over equity finance in these countries (see Fig.2.1) because if differential personal taxes on debt and equity are reflected in their cost to the firm, it should bring about an overall increase in leverage, since debt is relatively more attractive to the investors given high tax rates on the equity income (Miller, 1977).

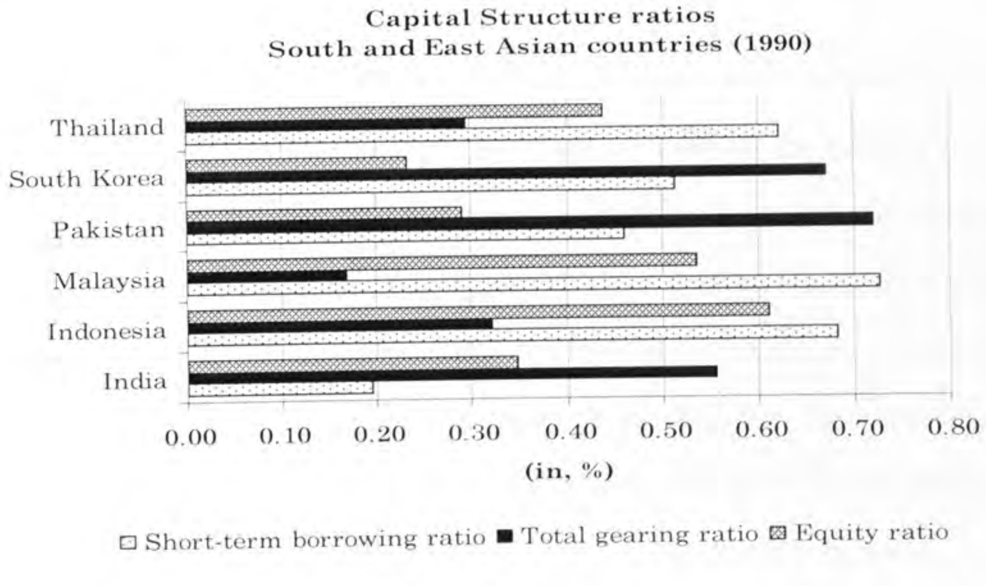

Fig 2.1 Capital market conditions and capital structure ratio in 1990
This figure shows the effect of capital market conditions on the capital structure of the firms prior to stock markets liberalization. Short-term borrowing is defined as the ratio of borrowing less than one year to total asset; Total gearing ratio is defined as the ratio of total debt to total debt plus market value of equity and Equity ratio is the ratio of total common equity to total assets. The ratios were calculated by the author using firm-level data from the *Datastream* and *Worldscope*.

The low level of equity finance in some countries suggested that debt had a 'Miller' tax advantage over equity as recently indicated by Booth et al. (2001) in the case of South Korea and Pakistan. On the other hand, the high level of short-term debt in Indonesia, Malaysia, and Thailand indicates that in the absence of developed equity markets and restricted access to long-term bank debt, most of the firms used short-term debt to finance both capital expenditure and working capital. The domestic shareholders had lack of interest in stock markets due to weak corporate governance such as lack of protection to minority shareholders and lax disclosure requirements. These factors cost many firms to face high capital costs (Errunza and Miller, 2000). The market for corporate control was not active and did not give managers strong incentives to perform efficiently. La Porta et al. (1997) have shown that lack of protection to creditors and shareholders leads to significantly smaller local debt markets. Thus, concentrated ownership, coupled with weak corporate governance, in some way led to a high level of information asymmetry among potential investors and entrepreneurs. Thus, stock markets in these countries remained small, opaque and less liquid due to the limited number of actively traded firms, high information asymmetry, and lack of enforcement of shareholders' rights. This situation was further complicated, as banks were an important source to finance government's budget deficit, whereas, the securities market presents only limited seignorage potential (Denizer et al. 1988). Thus, equity finance was effectively limited due to government efforts to limit their competition with banks.

From an empirical point of view, it is difficult to generalize the effects of financial repression on the financial sector in one country to another because the success of economic policies largely depends on the effectiveness of the institutions that implement them, and this clearly varies across national borders. Stiglitz's strategy of government-induced financial repression as a viable strategy for growth is often criticized in the literature. For example, Fry (1995) disputes the ability of a government to promote social welfare through repressionist policies. Firstly, lowering interest rates does not necessarily increase the average efficiency of investment because lower interest rates can encourage entrepreneurs with low yielding investment projects. Secondly, the approach may not lower the marginal cost of capital if rationing forces borrowers to the curb markets. Thirdly, using past performance as a criterion for allocating credit discriminates against new entrants and perpetuates monopoly power.

Finally, directed credit programmes have invariably raised delinquency and default rates, thereby increasing the fragility of the financial system by forcing institutions to increase their risk exposure with no compensating return. The overwhelming problem in implementing Stiglitz's idealized financial repression is the narrowness of real interest rates over which financial repression could be effective.

2.2.1.5. Financial Repression: Empirical evidence

Empirical evidence on the effects of financial repression on the firms' financing and investment decisions in these countries is very limited. The major limitation behind any sensible exploration of the effects of financial repression is severely curtailed by the choice of policy variables. For instance, Denizer et al. (1988) argue that financial repression relates to a specific set of policies, and the analysis of such policies, does not lend itself to systematic study. Firstly, financial restrictions may be implicit, imbedded in intricate tax codes or financial regulations. Secondly, there are also problems of coding such policies across countries in a way that makes them comparable, especially when the countries in question lack precedents or conventions needed for benchmarks against which variations in such policies could be measured. Finally, a financially-repressed economy may exhibit certain effects – low interest rates from financial transactions, distortions in savings and investment and low levels of financial intermediation, which may or may not be attributable to these policies. One solution to these identified problems above has been the use of actual data from some national accounts like, real interest rates, GDP growth rates, direct credits, and reserve requirements ratios to analyze a set of countries cross-sectionally. The World Bank (1989) study of a sample of 34 developing countries showed that on average, economic growth in countries with negative real deposit rates (lower than –10%) over the period 1974-1985, was substantially lower than growth in countries with positive real interest rates. And using a sample of 16 developing countries for the period 1970-1988, Fry (1997) show that financial distortions reduce investment ratios and export growth.

The available empirical evidence mostly focuses on the effect of financial repression on investment, growth and savings, and there is very limited evidence that seems to indicate the influence of financial repression on the domestic financial sector and capital controls on capital structure of firms. IFC (1991) findings seem to suggest that long-term debt was used by large manufacturing firms in these countries. More reliance on the external debt finance indicated a shortage of equity finance due to government and capital controls. The capital structure varied across countries over time reflecting the environment and investor preference in financial markets. Low levels of new equity issues were seen in Pakistan, India and South Korea because of the small size of the stock market and government controls (Glen and Pinto, 1994). So far, facets of financial repression and capital controls that affected the financial sectors in these countries prior to liberalization have been presented, and it is now appropriate to focus on the financial liberalization episode in these countries.

2.2.2. Financial Liberalization

McKinnon (1970) and Shaw (1970) argued that interest rate controls limit financial deepening and capital growth. The financial sector restraints such as the interest rate ceilings and high reserve requirements have a negative effect on financial intermediation and, consequently on innovative activity and economic growth. McKinnon and Shaw challenged government interventions and advocated the liberalization of interest rates to speed up savings and investments. Their financial liberalization argument was primarily concerned with supply side consequences of an increase in interest rates and the removal of quantitative restrictions from the financial markets. According to Shaw (1970), the interest rate liberalization implies that the interest rate responds more accurately to the opportunities that exist in relation to the substitution of investment for current consumption and the disinclination of consumer to wait. The financial deepening increases the real size of the monetary system and generates opportunities for profitable operations of institutions other than banks. On the other hand, McKinnon (1970) views monetary and financial policies as having impacts on capital markets; liberalization would, therefore, free capital markets from the distortions induced by government, thereby enhancing economic growth.

The development of financial intermediaries lies at the heart of this liberalization argument because financial intermediaries reduce the investment in liquid assets with low rates of return, and prevent the unnecessary liquidation of investment by entrepreneurs in order to satisfy liquidity needs (Bencivaenga and Smith, 1991). The financial intermediaries guide the investors in respect of opportunities for investments, which in turn lead to better resource allocation and economic growth. It seems that McKinnon and Shaw have immense faith in liberalization to remove shallowness in the financial system. In other words, financial liberalization is expansionary due to the interest rate stimulus to steady state capital. But some argue that the existence of the curb markets during liberalization will not deliver the expansionary effect.

The Neo-structuralists criticised McKinnon and Shaw positions. This school of thought is different from Neo-liberalists in that they point out market incapacity to regulate and produce higher possible social welfare. They emphasize the existence and importance of the informal curb markets in the financial system. This school of thought argues that it is not necessarily true that financial liberalization will increase the real supply of credit to firms. The curb markets can satisfy the residual demand by firms because these are not subject to reserve requirements like banks. Daniel and Kim (1996) contribute to this argument suggesting that in the presence of curb markets, financial liberalization is not expansionary and has very little effect on the output growth, being likely to have significant welfare effect only when curb markets are inoperative. Although the theoretical literature acknowledges the existence of the curb (informal) markets, no empirical research has investigated these markets. At the theoretical level, there are several arguments in favour and against the curb market efficiency. Schiantarelli et al. (1994) argue that informal lenders thrive in small segmented markets, their competitive advantage lying in their local knowledge that lowers information costs on certain types of loans compared with banks. But this local knowledge does not provide them with opportunities of exploiting economies of scale in risk pooling and information processing. In sum, they suggest that the true test of success of liberalization is found in the comparative efficiency of the banking sector and the informal sector in the process of intermediation.

2.2.3. Scope of Financial Liberalization

Financial reforms usually entail a variety of steps to ease portfolio and direct investment controls and directed credit, as well as to limit the government interventions in the determination of interest rates (Atiyas et al., 2000, p. 85). The financial liberalization proceeds along two basic lines: relaxation in prices (interest rates), and easing of limitations on certain types of financial activities (Kincaid, 1988). It involves reducing the barriers to competition in the financial sector such as entry of the new foreign banks, new licenses for the operation of new private banks/non-banking financial institutions, and the privatization of the government-owned banks. Additionally, it reduces the excessive reserve requirements on the banks, and provides freedom to enter into private contracts, such as through foreign direct investment in the domestic capital markets, cross border listings, and investment by local residents in a foreign country's assets. These measures look simple and straightforward but the appropriate sequence to financial liberalization has been a major source of concern for the policy-makers, a consideration which is discussed in the next section.

2.2.4. Sequencing of Financial Liberalization

The literature on the sequencing of financial liberalization suggests first to liberalize the trade and the exchange system for current account transactions, then liberalize the domestic financial system, and finally open up the capital account. Fiscal reforms and price stabilization should precede the domestic financial liberalization and privatization of state-owned enterprises. McKinnon (1991) argues that it is particularly important in the case of high government ownership of factors of production; the surpluses of state enterprises constitute tax revenue to the government. The pace at which these enterprises can be sold would depend on the constraints of the fiscal system. The argument to undertake the liberalization of the capital account as the last step is largely based on the potentially destabilizing effects of reversible capital flows (Abdelali et al, 1997). Focusing on the domestic financial sector liberalization, it should start with the interest rate liberalization, the introduction of market-based instruments of monetary policy such as government central bank securities and prudential regulations. Measures to enhance competition among banks, and the development of equity markets and non-banking financial services, are typically later steps in the reform process. However, while some countries have adopted a gradualist approach, starting with domestic financial market liberalization, others have followed a 'big bang' strategy of domestic financial market liberalization and capital account liberalization.

The earliest writers to address this sequencing issues, among them, Little et al (1970) recommend gradualist approach to reforms, this is to minimize adjustment costs and limit the distributional burdens on particular groups in the initial years, and also to ensure that reforms are allowed to proceed at a politically acceptable pace (Bhattacharya, 1997). On the other hand, Bruno (1992) has argued for a rapid pace of implementation. As Ahluwalia (1996) notes, under certain circumstances, a faster pace of reform may add to credibility if the results achieved in the short term are sufficiently favourable to vindicate the reforms and ensure against reversibility. Rodrik (1989) argued further that as long as scope of reform is kept narrow at each successive stage, there is little point in pursuing a gradualist approach. And Cho (1986) argued in favour of simultaneous liberalization of domestic financial sector and capital market. Cho (1986, p.192) propose that substantial development of an equity market is a necessary condition for complete financial liberalization. Recently, Karacadag et al. (2003) propose that domestic and external financial reforms should be sequenced in a manner that ensures that central banks and financial institutions as well as the infrastructure that supports them develop the capacity to manage risks associated with a wider range of permissible financial transactions, investible instruments and loan-able funds. The financial liberalization should revolve around the hierarchy and complementarily of markets and related institutions. The markets are ordered starting with money markets, followed by foreign exchange, treasury bills and bond markets, and ultimately, markets for corporate bonds and equity, and asset-backed securities and derivatives.

Blejer and Sagari (1988) argue that impact of sequencing of internal and external liberalization on firms' financing also varies according to the competitive structure of the banking sector in a country. If liberalization begins with the external sector through the freeing of international financial flows, but foreign banks are not allowed to enter the domestic markets at the initial stage, only a few (probably large) local borrowers are likely to gain access to the international loan market, and make transactions at international interest rates. Many of the borrowers will still be excluded from the foreign market because of costly or imperfect information.

On the other hand, if governments begin liberalization from the internal side, by allowing the entry of foreign banks, this step will weaken the monopolistic banking structure and domestic interest rates will be freely determined by market forces. In such a case, despite restrictions on external capital flows that would prevent the firms from benefiting from lower world interest rate, these firms would still benefit from internal liberalization. Once the restrictions on the operations in foreign capital markets have been removed, the volume of loans in the economy could increase, with some lending by local banks and the rest by foreign banks. The total welfare in the economy will increase resulting from the internal liberalization alone, partly because of the elimination of social losses from the earlier inefficient allocation of loans in the domestic market.

According to Atiyas et al. (2000, p. 86), financial reforms took place in relatively good economic times in the three East Asian countries of South Korea, Malaysia and Indonesia. For example, financial reforms were undertaken in South Korea and Indonesia in the context of overall economic liberalization. South Korea initiated exchange-rate devaluation and reduction of both the budget deficit and inflation before making any changes in the financial sector, and the Indonesian government gradually liberalized interest rates under continuing bank supervision. Indonesia had the shallowest financial system, in which the broad money indicator M2 to GDP constituted less than 17% but its budget deficit was 2.1% of GDP and the current account deficit was 0.8%. The Malaysian government also began financial reform in an exceptionally favourable macroeconomic environment, the ratio of M2 to GDP ratio being 37% and the average economic growth was 7% p.a.

These countries used different routes to financial liberalization. Indonesia and Malaysia liberalized their capital accounts prior to the domestic financial liberalization, whereas, India, Pakistan, Korea and Thailand implemented internal and external liberalization simultaneously. Zhang (2002, 2003) argues that the difference in liberalization approaches in

South Korea and Thailand can be attributed to fundamental differences in the organizational structures of the private sector, the bureaucracy, and the party system, which shaped the economic interests and political behaviour of social groups and state agencies in the policy-making. Variations in the paths to liberalization have impacted upon financial stability to differing degrees and generated varying abilities of the individual economies to withstand financial shocks. The recent literature on sequencing seems troubled with outcomes of liberalization often attributed to haphazard sequencing of the liberalization. For example, South Korea launched its policy of financial liberalization in the early 1990s by implementing a four-stage interest rate liberalization plan and encouraging competition among the financial institutions. However, the actual implementation of the financial liberalization deviated from the announced plan, because the authorities were unable to proceed with banking reforms due to a large non-performing loan problem. Instead, the authorities moved to a liberalization of the non-bank financial sector, thereby greatly increasing the proportion of financial intermediation within this sector at the expense of the banks in the system, but away from the curb market (Atiyas et al., 2000). The hastening of liberalization in the financial sector did not produce healthy competition between the banks and non-banking financial institutions. The liberalization of short-term financial instruments and control over long-term financial instruments forced firms into short-term borrowing. The maturity mismatch between liabilities and assets of banking and non-banking institutions, made the South Korean economy vulnerable to external shocks.

In 1992, as part of a broader financial liberalization package, the government of Thailand established The Bangkok International Banking Facility (BIBF) to attract more foreign funds to ensure greater competition in the banking sector and turn Thailand into regional financial centre. The main agenda of this centre was to take borrow in foreign currencies from abroad and lend the money both in Thailand and abroad. This strategy resulted in misallocation and mismatching of assets and liabilities in the early stages of liberalization in Thailand. There was mismanagement at the political and administrative levels (Lauridsen, 1998).

In the aftermath of the Asian financial crisis, most of the studies unanimously identified excess leverage of firms as a major source of financial crisis in Thailand (Krugman, 1999; Harvey and Ropper, 2002; Bris et al., 2004). Krugman (1999) states that high leverage financed through extensive foreign currency borrowing made these countries particularly susceptible to financial crisis. Asian firms bet on future growth opportunities by committing an increasing amount of short term foreign debt to their already heavily leveraged capital structure, but this did not materialize into gains. Once devaluation ensued, the amount of foreign borrowing increased substantially and interest payments became harder to meet. There was a significant increase in the debt-to-market value ratios after currency devaluation (in Thailand on 2 July 1997), and there has been a significant increase in the debt-to-market value ratio in Indonesia, South Korea and Thailand (See Fig.2.2).

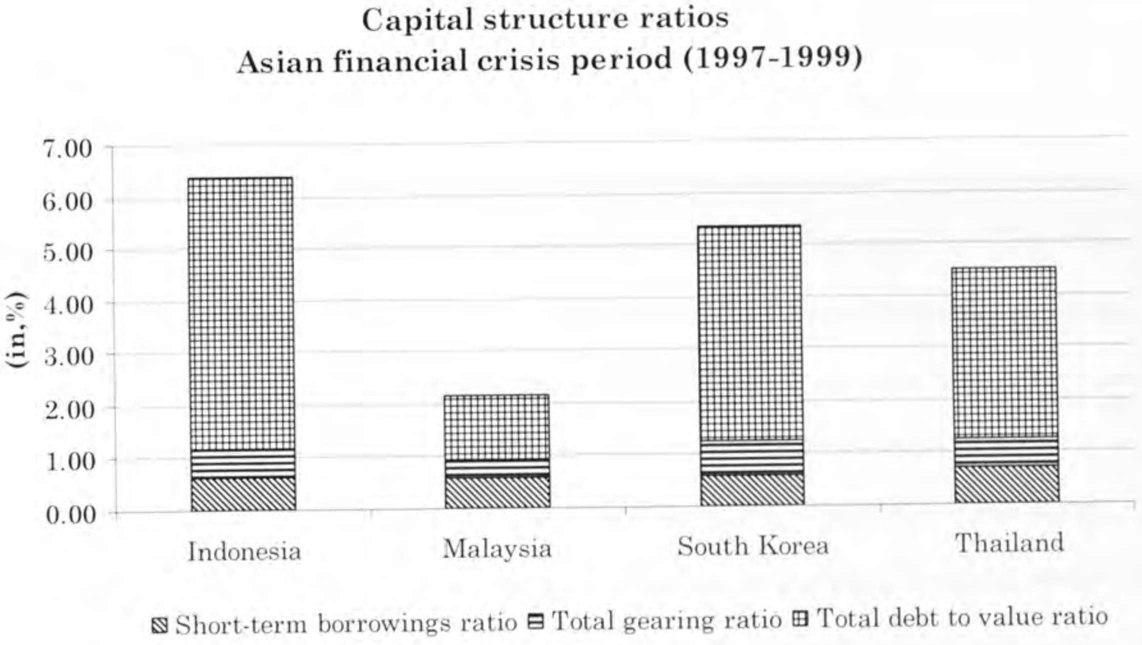

Fig 2.2 Effect of the Asian financial crisis on the firms' capital structure ratios
This figure shows the impact of the Asian financial crisis on the capital structure of the firms. Short-term borrowing is defined as the ratio of borrowing less than one year to total asset; Total gearing ratio is defined as the ratio of total debt to total debt plus market value of equity and Total debt to value ratio is defined as ratio of total debt to total market value. The ratios were calculated by the author using firm-level data from the *Datastream* and *Worldscope*.

Given the diversity and contextual differences across countries on the eve of financial reforms, arguably one of the most crucial areas of investigation has been the identification of the process of liberalization from repression. In what follows, a brief review of approaches used to measure the financial liberalization is presented.

2.2.5 Measurement of Financial liberalization

2.2.5.1 Quantitative measures

The first step in this direction was taken by Feldstein and Horioka (1980) who introduced a quantitative measure of financial openness to assess the extent of capital mobility. It was developed through a correlation between savings and investments to indicate impediments to capital movements. This measure has some heuristic appeal because saving matches investment in a country with repressed economy, while there need not be a link between savings and investment in a country with open economy. Despite its simplicity and ease of calculation, this measure has been criticized on theoretical grounds. Firstly, there can be a higher correlation between saving and investment despite high capital mobility depending upon the economic environment of a country (Obstfeld, 1986). Secondly, a tighter relationship between saving and investment in a country can be an outcome of a government effort to target the current account (Bayoumi, 1990).

Other quantitative measures to gauge a country's financial liberalization include onshore and offshore interest rate differentials and the deviations from covered interest rate parity used by Haque and Montiel (1991). Similarly, Edison and Warnock (2001) used the IFCI Investablility index to identify the openness of a country's stock market. This index is the ratio of the market capitalization of stocks that foreigners can legally hold to total market capitalization. A large jump in this index is evidence of an official stock market opening. Similarly, other studies (see Chanda, 2001; O'Donnell, 2001) used the ratio of the sum of the actual capital inflows and outflows to GDP and the ratio of the sum of portfolio and direct investment assets and liabilities to GDP. However, these quantitative measures have some shortcomings. For instance, the Edison and Warnock (2001) measure shows the relative openness of a country' stock markets and their evolution over time but it excludes liberalization of other sectors like banks. The use of actual capital flow measure (Chanda, 2001; O' Donnell, 2001) also has some limitations because it may fluctuate from year to year since capital flows are endogenous and there can be large valuation adjustments due to large swings in the equity values (Eichengreen, 2001).

King and Levine (1993) expanded the number of quantitative indicators to measure the deepening of the financial sector by including: size of the financial intermediaries defined as the ratio of liquid liabilities of the financial system to GDP; the ratio of bank credit divided by bank credit plus central bank domestic assets; the ratio of credit allocated to private enterprises to total domestic credit (excluding credit to banks), and the ratio of credit to private enterprises divided by GDP. The main assumption underlying latter two measures is that a financial sector that allocates more credit to the private sector provides risk management services, mobilizes savings and facilitates financial transactions, compared to a financial system that simply funnels credit to government or state-owned enterprises. But these measures also have shortcomings. For example, it is difficult to distinguish private banks from development banks and commercial banks from investment banks in Southeast Asian countries. Moreover, the definition of a bank and of a non-bank is not always consistent across these countries. In this thesis, it is argued that the ratio of credit allocated to private enterprises to total domestic credit includes a substantial proportion of policy or directed credit to certain sectors of the economy, which may over-estimate the credit expansion in the economy.

Levine and Zervos (1996) built on the work of Atje and Jovanovic (1993) and developed two measures of stock market development - the value traded ratio, is the ratio of the total value of shares traded to a country's GDP, which in turn measures trading relative to the size of economy. The second measure is the ratio of the total value of shares traded divided by market capitalization, which proxies for trading relative to the size of market. They claim that their measures seek to assess stock market liquidity on a macroeconomic scale. However, the latter measure has been criticized by Levine (1997), who disputes their claim it is a direct measure of trading costs. Another weakness in the use of stock market development indicators is the assumption that stock markets are the only mechanism for providing liquidity, when in fact; banks and bond markets may also provide this.

Moreover, Levine (1997) argued that technological, regulatory and tax differences across countries may imply that different financial structures arise to provide liquidity and risk diversification vehicles. For example, in one economy the costs of establishing an intermediary may be high, while the costs of conducting equity transactions may be low. In a second economy, however, the reverse may hold. The first economy may provide liquidity and risk diversification through equity markets, while the second does it through financial intermediaries. The first economy has an active stock exchange, so that existing empirical studies would classify it as providing substantial liquidity and risk diversification services. In contrast, the existing studies would classify the second economy as financially under-developed. The limitations identified in the above two quantitative approaches provided the reason for the development of qualitative financial liberalization indicators in this thesis to establish the actual impact of policy changes.

2.2.5.2 Qualitative (Rule) based measures

The qualitative (rule) based measures of financial liberalization have been developed using the event study approach, which involves using the *de facto* event dates indicating the changes in a country's financial sector policies. Bandiera et al. (2001) developed the first comprehensive measure of internal and external liberalization using the approach of Demetriades and Luintel (1997) for studying the effects of liberalization on savings. They suggest that the sum of reform indicators across years captures various dimensions of the deregulatory and the institution-building process. Recent work on the development of qualitative measures of stock markets liberalization has been done by Bekaert and Harvey (2000), Henry (2000), Kaminsky and Schmukler (2003) and Creane et al. (2003). The imprecision in dating the significant events such opening of stock markets have been overcome using both shorter and longer estimation windows in these studies.

The main contrasting feature of these qualitative measures lies in their scope and focus on any one or more than one facet of liberalization. For example, the scope and focus of the measure of liberalization is limited to the first date of stock market opening in Kim and Singal (2000), Bekaert and Harvey (2000), and Henry (2000). On the other hand, the liberalization index used by Bandiera et al. (2001) has a broader scope and focus as it concentrates on internal and external liberalization events. Nevertheless, there are some interpretation problems related to their measure. For instance, it counts every policy event equally regardless of the magnitude of its impact. Bandiera et al. (2001) used a series of 0-1 dummy variables and the first principal component of these variables is to construct a liberalization index to overcome this problem, but even with this alternative, the construction of the index involves the assumption that each measure of liberalization is equally weighted. This procedure captures the intensity of liberalization reforms only and ignores the liberalization event specific effect as indicated by Errunza and Miller (2000).

On the contrary, Williamson and Mahar (1998) and Laeven (2003) adopted different procedures from Bandiera et al. (2001) to measure financial liberalization. They used an aggregate measure, which is a sum of dummy variables denoting liberalization measures in a year for a country rather than the principal component of dummy variables. These researchers used sum of five liberalization measures as a cut-off point to distinguish a partially-liberalized country year from a fully-liberalized one. Using five or six measures of financial liberalization, Laeven (2003) show similarity with the years in which Williamson and Mahar (1998) considered a country's financial system to be largely liberalized and find similar progress in financial liberalization for the Southeast Asian countries.

2.2.5.3. Combination of Qualitative and Quantitative Measures

Demetriades and Luintel (1997) developed the first measure of financial repression using qualitative information about deposit and lending rate floor and ceiling, and quantitative information about policy-directed loans, bank branches, and liquidity ratio to investigate the direct costs of financial repression in India. Creane et al. (2003) argue in favour of such measure because the typical quantitative measures of financial development such as ratio of broad money, M2 to GDP and the ratio of private sector credit to total credit taken individually do not necessarily capture what is broadly meant by financial development. The financial structure of a country is composed of a variety of markets and financial products, and development encompasses not only monetary aggregates but also financial openness, regulation and supervision, and institutional capacity.

Creane et al. (2003) used 100 quantitative and qualitative statistics for 20 MENA countries to identify progress of reforms and what reforms are needed. This broad measure was organized under six themes, each of which reflects a different facet of financial sector development: (1) development of the monetary sector and monetary policy; (2) banking sector size, structure, and efficiency (including the role of the government in the sector); (3) quality of banking regulations and supervision; (4) development of the nonbank financial sector; (5) openness of the financial sector; and (6) institutional environment.

2.2.6. Financial liberalization Effects: Empirical evidence

2.2.6.1 Macroeconomic Effects

The section covers the empirical literature that shows, the economic impact of the liberalization has been quite dramatic despite the different liberalization strategies pursued by countries. To statistically test for the effects of financial liberalization at a macroeconomic level, prior studies have used cross-country time series data and quantitative and/or qualitative measures (see e.g., King and Levine, 1993; Bekaert et al., 2001; Barajas et al., 2000; Laeven, 2000; Ozatay and Sak, 2002). King and Levine (1993) provide the most extensive and comprehensive evidence on the relationship between aggregate growth rate and financial development. Bekaert et al. (2001) also show that financial liberalization has been associated with an increase in real economic growth after controlling for macroeconomic influences, banking sector and stock market developments. Kassimatis and Spyrou (2001) investigate the relationship between financial market developments and economic growth for a sample of five East Asian and South American emerging markets. They show that in financially repressed economies such as India, the equity market does not affect real sector growth. On the contrary, equity and credit markets both affect economic growth in South Korea.

Levine and Zervos (1998) find that capital account liberalization does not lead to a permanent increase in the growth rate of capital stock. Instead of investigating for a permanent effect, Henry (2000) shows the temporary effect of stock market liberalization on private investment, using real private investment data. He reports that the average growth rate of private investment was higher than the sample mean in the first two years after stock market liberalization but then began to decline. However, Henry (2000) ignores the impact of other reforms such domestic banking sector liberalization. The liberalization of banking sector has been one key component of financial reforms in most of the emerging markets (Laeven, 2003).

2.2.6.2. Microeconomic Effects

At a microeconomic level, a large number of studies have investigated the effects of financial liberalization on firms' financing patterns. Demirguc-Kunt and Maksimovic (1995, 1996) find significant positive relationship between bank development and leverage, and negative but insignificant relationship between stock market development and leverage. These findings show that stock market development is not an obstacle in the way of obtaining debt; on the contrary, it promotes an increased level of debt in the capital structure of the firms. Glen and Pinto (1995) are of the opinion that the liberal economic programmes adopted by the governments of many emerging economies have fostered the development of vibrant stock markets. In many cases, firms have used medium and even long-term domestic debts as well as foreign bond and equity capital to finance investment projects.

Domowitz et al. (2000) analyze the reliance on domestic versus foreign financing, and debt versus equity financing in developed and emerging countries. The results show that those countries with better accounting standards, high levels of investor protection and open stock markets tend to depend more on the domestic bond markets and foreign equity markets. Khasnobis and Bhaduri (2000) find that after financial liberalization the share of stock market finance in total sources of funds for Indian firms increased due to the abolition of controls over equity issues and pricing. The total net borrowing as a fraction of the total source of funds declined after liberalization. This finding implies that equity capital may have replaced other sources of capital, especially debt, in the firms' financing method following financial liberalization.

Schmukler and Vesperoni (2001) provide important empirical evidence on the influence of financial liberalization at firm-level. They have used useful measures that proxy for financial liberalization, such as stock market liberalization dates (see Bekaert and Harvey, 2000) and measures for the interaction of international bond and equity markets as sources of finance for firms. These researchers report a positive relationship between the long-term debt to equity ratio and financial liberalization in the East Asian countries. The variables of access to international bond and equity markets also have a significant positive effect on the long-term debt to equity ratio.

Agarwal and Mohtadi (2004) also examine the role of financial market development in the financing choices of firms using aggregate firm-level level data. Using separate indicators for banking sector and stock market development, and short-term and long–term borrowing, they show that equity market development favours the firm's equity financing, while banking sector development favours debt financing over equity financing. The banking sector development indicators are more significant than the stock market development indicators. However, these researchers do not consider implications of these developments in the financial markets such as the impact on speed of adjustment to optimal capital structure. These researchers only highlight the sources of finance such as FDI which they suggest has increased stock market development in developing countries. It is surprising that they show that the debt equity ratio has not decreased over the period. The firms stay away from the stock market due to limited demand for new shares, and stick to long-term debt financing to avoid speculative stock markets.

The empirical literature also includes the impact of stock market liberalization (often related to capital account liberalization) on the stock returns, volatility, and liquidity (Levine and Zervos, 1998; Chelley-Steeley and Steeley, 1999; Kim and Singal, 2000), and cost of equity capital (Bekaert and Harvey, 2000, Henry, 2000). Most of the studies have used event study methodology to examine the influence of various liberalizations on the cost of equity capital (Henry, 2000; Bekaert and Harvey, 2000, Errunza and Miller, 2000)[2]. Bekaert and Harvey

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[2] The length of estimation window varies from a high of ten years in the study by Kim and Singal (2000) to a low of six years as reported in Bekaert and Harvey (2000).

(2000) used dividend yield and show that stock market liberalizations tend to decrease aggregate dividend yields. They suggest that the economic impact of liberalization is decrease in the cost of equity capital by 90 basis points. Using monthly stock returns and dividend yield data for 12 emerging markets, Henry (2000) provides similar evidence in support of the decline in cost of equity capital. These studies claim decrease in cost of equity capital will be similar across countries which might not be the case, if some firms happen to be more responsive to the influence of the stock market liberalization than others. Furthermore, these researchers do not consider the effect of the institutional developments on the firm-level cost of equity capital might also vary across countries due to difference in the timing of implementation of major institutional reforms. The firm-level empirical evidence has been very limited and appears more wanting.

There are two strands of empirical literature about the effects of financial liberalization on the investment, the first of which examines private investment at the macro-level. Henry (2000) pursued the impact of stock market liberalization on the temporary increase in the growth rate of a country's capital stock, arguing that a temporary increase in the growth rate of capital stock implies a temporary increase in the growth rate of investment. Henry (2000) shows a significant increase in private investment after stock market liberalization in the Southeast Asian countries and the Latin American countries.

The second strand of the literature focuses on the investment and efficiency in investment allocation at firm-level, with most of the studies focussing on a single country using firm-level panel data and reporting mixed results. For instance, in their study, Harris et al. (1994) report that the sensitivity of investment to internal cash flows decreased for the smaller firms in Indonesia after the financial liberalization. Their evidence was that there has been a shift of resources from smaller firms to larger firms (Indonesian manufacturing companies), which are both more efficient and more profitable after liberalization.

Atiyas (1992) investigated the effect of financial reform on the investment of 180 Korean firms. He shows that investment is closely associated with debt, and that liquidity does not have a significant effect over the entire sample and time period. However, in terms of size of the firms, investment behaviour of smaller firms is affected by both liquidity and debt constraints, but the impact of both was reduced in the late 1980s, while for larger firms, the impact of financial variables was insignificant in the early 1980s, but the effect of both liquidity and leverage became significant in the late 1980s thereby suggesting that financial reforms actually decreased the access of this group to external finance. Koo and Maeng (2005) find that investment sensitivity to cash flow has decreased after liberalization for small and independent firms in the case of South Korea.

Athey and Resser (2000) find that internal finance is less important for small firms than large firms due to the existence of small-firm promotional programmes in India. Khasnobis and Bhaduri (2000) did not find any evidence of perceptible rise in the overall efficiency of investment in India. After the liberalization, Bhaduri (2005) show that small and young firms experienced significant increase in financial constraints in the post liberalization period, which were attributed to reduction in government's intervention in credit allocation. Lensink et al. (2003) find investment sensitivity has been lower for group affiliates using data of Indian firms.

In a pooled country-level study of 13 Asian and Latin American emerging markets, Laeven (2003) show that liberalization affected small and large firms differently. The smaller firms were financially constrained before the start of the liberalization process, but become less so afterwards, whereas the large firms were modestly constrained throughout the financial liberalization, in the sense that the investment of large firms was driven slightly by the cash flows. Driffield and Pal (2001) show that large firms became more financially constrained than smaller firms in Indonesia, South Korea and Thailand. However, these studies do not consider that even when similar reforms have been implemented across countries, the difference in results might be due to different external and internal shocks during the liberalization, consequently, gradual effect of liberalization have not been empirically estimated. Agarwal (2004) found that higher interest rates caused a greater availability of credit, which in turn, caused a higher investment rate in Indonesia, Malaysia, South Korea and Thailand. More specifically, higher interest rates up to 9 percent were associated with higher investment ratios, and the beyond this interest rate level, these countries experienced serious problems of accumulation of non-performing loans by banks leading to banking sector crisis.

Although the literature seems to suggest that financial liberalization would increase the supply of funds for investment through increased savings but the consequences of financial liberalization on savings and investment have been ambiguous. Bandiera et al. (2000) investigate the total effect of financial reforms on aggregate private savings in eight countries and find that those elements of financial reforms that seem to relax liquidity constraints of the financial sector may be associated with a fall, instead of a rise, in savings.

Theoretically speaking, financial reforms should provide equal opportunities to access the international capital markets and domestic sources of capital. But there are a number of externalities that might impede access. Firstly, the existing arrangements in financial systems and the development stage of the financial system will also affect firms' behaviour under liberalization. For a developing country, as the financial system grows, local banks, then, national financial institutions, and finally securities market and foreign banks, become sources of external funds (World Bank, 1990). Secondly, Schmukler and Vesperoni (2001) argue that the firms with more developed domestic financial systems are less sensitive to financial liberalization. This implies that domestic financial sectors that have become developed would provide similar financial instruments to those that are available in developed markets. Rajan and Zingales (1998) argues that the degree of financial sector development will disproportionately help firms that seek external finance.

2.3. Capital structure, Cost of Capital and Investment

Besides the considerations highlighted in Section A, there are theoretical antecedents that provide an explanation for the observed variation in corporate financing, cost of equity capital and investment. This section reviews capital structure theories and describes the move toward research that focuses on the relationship between financial liberalization and the financing choices of firms. The starting point of the capital structure debate has been the premise that under the assumptions of perfect capital markets with no transactions costs, and no corporate income taxes, the value of a firm is independent of its capital structure (Modigliani and Miller, 1958). This seminal contribution (Modigliani and Miller, 1958) upheld a strong belief in the idea that there is a tax advantage to debt but beyond a certain level, it is counterbalanced by costs associated with bankruptcy and financial distress.

The tax shield argument was defeated by Miller (1977) arguing that the tax advantage is zero. Under certain conditions the tax advantage of debt financing at the firm-level is exactly offset by the tax disadvantage of debt at the personal-level. In search of a more vivid explanation of the choice of debt over equity, a burgeoning theoretical literature has focused on the trade off between leverage-related costs and benefits. In their seminal work, Jensen and Meckling (1976) related capital structure choice as a means of balancing certain agency costs arising out of the relationship with various stakeholders, in particular, the shareholders and bondholders. The agency costs argument was later extended, and the difference in the capital structure of firms was related to the information asymmetry problems between managers and shareholders (Myers and Majluf, 1984).

Besides the agency and information asymmetry issues, changes in the industry demand and supply conditions have also been linked to the firms' financing decisions (Maksimovic and Zechner, 1991). This argument stresses that the business environment within industries and the characteristics of firms themselves, influence financial structure. Balakrishnan and Fox (1993) argue that the application of strategy may be most helpful in understanding intra-industry variations in capital structure. If competitive strategy guides the firm's investment decisions (Chandler, 1962), and the choice of investment influences the choice of financing (Williamson, 1988), then, we should expect that different capital structures best serve the needs of different strategies. This argument indicates that industry environment affects the capital structure (Brander and Lewis, 1986; and Chevalier, 1995). Although a vast amount of literature continues to emerge, the existence of an optimal capital structure that balances costs and benefits of leverage has remained an empirical issue. While theoretical analysis has suggested that taxes, the cost of financial distress, agency costs, and the firm's product and input market strategies all potentially affect the choice of capital structure, a complete characterization of this corporate decision has yet to be developed. In the remaining sub-sections a number of related issues are discussed as follows. Section 2.3.1 provides a discussion of the classical theories of capital structure; section 2.3.2 reviews the previous research; section 2.3.3 describes the relationship between cost of equity capital and institutional and firm specific factors, and section 2.3.4 reviews factors affecting firm investment in the liberalization context.

2.3.1 Capital Structure

The capital structure theory has been developing continuously since the seminal contributions of Modigliani and Miller (1958), and within the theoretical literature, three groups can be identified, these being: (i) theories that imply an optimal combination of debt and equity; (ii) theories that imply an optimal hierarchy in raising funds, and (iii) theories that imply neither of these approaches. The existing work draws heavily on these groups to extract definitive conclusions about the capital structure choice. Currently, there is still not a lot known about the capital structure choices of firms because of the variety of factors and economic conditions that can affect capital structure.

2.3.1.1 Balancing Theory of Capital Structure

During the 1970s, the general academic view, although not at a consensus level, was that the optimal capital structure involves balancing the tax advantage of debt against the present value of bankruptcy costs (Bradley et al., 1984). The optimal combination of debt and equity is based on the premise that a firm sets a target debt-equity ratio that maximizes its value by minimizing the costs of prevailing market imperfections, such as taxes, bankruptcy and agency costs. In the earlier version of this theory, the firm's capital structure choice can be seen as balancing only the tax benefit of debt and the cost disadvantage of bankruptcy (Kraus and Litzenberger, 1973). However, in the later versions of the theoretical debate, it was suggested that the actual debt ratio adjusts partially towards this target due to the existence of transaction costs.

Theoretically, a target debt ratio is an unobservable quantity, and transaction costs are time and firm specific. In order to overcome this problem from a methodological point of view, two approaches have been suggested in the finance literature. The first has been to estimate a target debt ratio, and adjustment speed to this target in a time-variant framework. According to this approach, the first step is to identify factors (variables) that explain the trade-off between debt-related costs and benefits associated with a target or optimal debt ratio. In second step, an adjustment speed parameter is estimated by a linear model of the firm and time-specific variables.

Bradley et al. (1984) argue that the three firm-specific factors (variables) that influence the firm's target debt ratio are: variability of firm value, the level of non-debt tax shields, and the magnitude of the costs of financial distress. However, the later empirical studies have included growth opportunities such as asset tangibility, firm size, profitability, and expected investment levels as the determinants of target debt ratio (Gilson, 1997; Miguel and Pindado, 2001; Heshmati, 2002). Likewise, the adjustment speed parameter has been defined as a function of some underlying set of variables. Jalilvand and Harris (1984) hypothesize that management's expectations about the future interest rates and stock prices will affect the speed of adjustment. The expectation of the interest rates and stock prices captures the macro-economic influences. Heshmati (2002) suggests that speed of adjustment depends on the firms' absolute difference between target and observed debt ratio, firm size, growth opportunities, and profitability.

In the second approach, either a historical average of debt ratio has been used as the target ratio or it has been exogenously specified. The adjustment speed is not separately specified. Marsh (1982) argued that since we have little information on what the target debt ratios might be, we are forced to use crude estimates such as the historical average debt ratio, the use of which is based on the argument that companies set their target debt levels according to past experiences. For this reason, empirical studies have employed industry debt ratios. Different versions of these two approaches have been used in the finance literature suggesting different opinions on target debt ratio and the speed of adjustment. For example, in earlier studies, Lev

(1969) postulated that firms use industry averages as targets and have similar speeds of adjustment to targets; Peles and Schneller (1989) argued that firm-specific unobservable targets vary over time and all firms have similar adjustment speeds. Davis and Peles (1993) suggested that there are different adjustment rates for different firms and the total adjustment speed should be divided into an industry-wide adjustment rate and management rate. Recent empirical studies (See Jalilvand and Harris, 1984; Gatward and Sharpe, 1996; Miguel and Pindado, 2000; Gaud et al, 2005) have adopted the assumptions of time-varying unobservable targets but with similar adjustment speeds across all the firms in a country.

Despite the simplicity of the second approach, it has been argued that the speed of adjustment that is observed is very sensitive to the way it is defined. For example, Shyam-Sunder and Myers (1999) show that magnitude and significance of the adjustment coefficient drops when the target is based on a three or five year rolling average of the book debt ratio. This drawback seems to make the first approach more favourable than the second. In the context of emerging markets, the adjustment hypothesis seems to provide a fairly good explanation of firms' financing behaviour because it seems to capture time-varying information asymmetry and agency cost, which is discussed below.

2.3.1.2 Pecking Order Theory

In contrast to balancing theory, pecking order theory outlines a hierarchy of funds rather than emphasizing an optimal capital structure (Myers and Majluf, 1984). According to this theory, a firm has no well-defined target capital structure, and the changes in the debt ratios are driven by the need for external funds, not by an attempt to reach an optimal capital structure. The need for external funds, referred to as financing deficit, arises due to the shortage of funds for investment and dividends. This theory stresses that the securities with the lowest information costs e.g., debt, would be issued first before the firm issues securities with highest information costs e.g., common equity (Frank and Goyal, 2003). Myers and Majluf (1984) argue that this pattern of financing overcomes the under-investment problem caused by information asymmetry. In the context of emerging markets, information asymmetry might be time-varying. Prior to the financial liberalization, there might not be an adverse selection and assets substitution problem because governments might have selected the projects and monitored the performance of the firms to provide subsidized credit for further export expansion. Prior to liberalization, large firms were provided with subsidized credits due to their historical performance, and thus, there might be a positive relationship between profit and debt ratio.

Theoretically, moral hazard and information asymmetry problems should be reduced after liberalization when commercial banks and institutional investors take over this role of allocating and monitoring. But it might not occur if there are weak institutions, and commercial banks lack the adequate research and monitoring skills to solve information asymmetry problems. Thus, in countries with weak regulations and lax accounting standards, liberalization might increase information asymmetry and aggravate adverse selection problems. As a result, firms might have more reliance on internal finance, and firms with future growth opportunities might have less external finance. Booth et al. (2001), and Schmukler and Vesperoni (2001) both report a negative relationship between growth and debt ratio. The profitable firms use less debt in Southeast Asian countries due to significant agency information asymmetry problems, and the undeveloped nature of their long-term debt.

In a strict theoretical context, Shyam-Sunder and Myers (1999) compared the trade-off and pecking order theories on time series data of US firms. They used an aggregation variable representing the various components of deficits. They claimed that the pecking order model has better explanatory power than the trade-off model, but Frank and Goyal (2003) have argued that the construction of the financing deficit variable is not justified aggregation because each component of financing deficit does not predict the dollar-for-dollar impact on debt. They show that the financing deficit variable under the pecking order model does not wipe out the effects of the variables such as profitability, size, growth and tangibility. Moreover, it has been argued that the pecking order theory is time and firm-size sensitive. The main reason for this time sensitivity has been the changing population of firms. Its applicability has been more obvious in the 1970s and 1980s, and in mature firms as considered by Shyam-Sunder and Myers (1999). However, in the 1990s, smaller firms began to trade publicly, and therefore, its applicability seems to have little empirical relevance.

2.3.1.3 Agency Cost Theory

Agency cost theory also explains external financing patterns without any emphasis on the hierarchy of financing choices or optimal structure. Agency cost theory (Jensen and Meckling, 1976; Myers, 1977) suggests that capital structure decisions are made in order to minimize the agency costs of debt and external equity. It argues that a decision to issue either a private/public debt or external equity is a resolution of agency conflicts between the managers and shareholders, shareholders and bondholders. According to Jensen (1986) manager and shareholder conflict occurs because managers engage in projects with negative NPV to pursue growth which results in wastage of free cash flows. Jensen (1986) defines free cash flow as the cash flow in excess of the cash flows required for the projects with positive NPV. Since the managers are partial owners, they have incentives to cause their firm to grow beyond the optimal size and to accept projects with a negative NPV. Jensen (1986) and Stulz (1990) show that issuance of debt can limit the managerial discretion and reduce agency costs. The management is monitored by creditors who want to make sure that they will be repaid, and they will have the firm declared bankrupt if a firm cannot pay the interest or fails to repay debt. Thus, free cash flow theory predicts a positive relationship between free cash flow and debt ratio.

However, Zwiebel (1996) argues that the use of debt to discipline managers is limited due to the managers' entrenchment. Berger et al. (1997) define entrenchment as the extent to which the managers fail to experience discipline from the full range of corporate governance and control mechanisms, including monitoring by the board, the threat of dismissal or takeover and stock or compensation-based performance incentives. The entrenched managers by definition have discretion over their firm's capital structure choices. The managers may prefer less debt than is optimal because of a desire to reduce firm risk to protect their under-diversified human capital (Fama, 1980) or their dislike of performance pressure associated with commitments to disgorge large amounts of cash.

Conversely, Harris and Raviv (1988) and Stulz (1990) argue that entrenchment motives may motivate managers to increase debt beyond the optimal level in order to reduce the possibility of takeover attempts. Novaes and Zingales (1995) further add that the choice of debt generally differs from the entrenchment choice. That is, debt may be optimal for managers whose objective is to maximize their job tenure. When the disciplinary mechanism has higher cost, the managers choose a lower debt ratio, and when the disciplinary mechanism has lower cost, managers choose a higher debt to block takeover.

In the context of emerging markets, with an absence of corporate control due to weak institutions and legal protections available to shareholders, the main prediction of this free cash flow theory and associated agency cost of managerial discretion theory might be that if a firm has less growth opportunities and higher free cash flows, the managers can easily avoid the debt and issue equity due to the threat of bankruptcy and vice versa. The testable hypotheses of the agency theoretical framework included in previous studies (Titman and Wessels, 1988; Rajan and Zingales, 1995; Berger et al., 1997, Booth et al., 2001) have been concerned with the relationship between leverage and growth opportunities, free cash flows and asset tangibility.

2.3.1.4 Institutional Theory

Besides the trade-off, pecking order and agency theories, the political economy literature suggests that the institutional and political environment affects firms' capital structure choice. The institutional framework consists of the quality of accounting standards; the rights of shareholders and creditors; law enforcement; and the bankruptcy procedures. It has been argued that difference in the bankruptcy codes, the rights of the shareholders and creditors affect the supply of the external finance across countries. Generally speaking, most of the Asian countries have inherited their legal systems either due to conquest or colonization, and the variations in their legislative arrangements might lead to different creditor rights in the event of bankruptcy. For instance, in the case of bankruptcy, the claims of secured creditors have priority over the employees and tax authorities in South Korea, Malaysia, Pakistan, and Thailand, whereas, employees have priority over other claimants in India (Stomberg, 2000; and Thorburn, 2000).

These disparities can explain why the creditors in some countries feel less risk in corporate lending than in other countries. In some of the countries, firms do not see any incentive to enter into formal bankruptcy proceedings due to lack of rehabilitation procedures. For instance, formal bankruptcy is avoided throughout court settlements in Common Law countries such as Malaysia and Pakistan (Modigliani and Perotti, 2000). These legal and regulatory facts pertaining to the Southeast Asian countries cause a high likelihood of out-of-court settlements, and high moral hazard among managers to forestall bankruptcy. This moral hazard could be worse if the sound corporate governance practices are absent.

In the empirical literature concerned with the political economy argument, there has been a tendency to use variables that usually represent a subjective assessment of a country's legal and regulatory system. Most of the studies have used variables to indicate the existence or otherwise of shareholders' and creditors' rights. In this regard, La Porta et al. (1997) have provided the most influential work relating the legal systems with the finance and growth of firms. According to La Porta et al. (2000), an ability to distinguish countries by the efficiency of their legal system in supporting financial transactions is more useful than distinguishing countries by financial system to understand financial sector developments.

There are some sceptics of the legal origin argument. Firstly, the legal origin hypothesis does not clearly indicate the channels through which legal origin affects financial markets (Markesinis, 2003). Secondly, considering legal origin as exogenous is problematic because legal developments have occurred in many countries to accommodate financial reforms. Therefore, a stricter and a neat classification of countries into either Common-law or Civil-law will not always be tenable. Thirdly, some argue that legal origin may not be as important as religion, culture, geography and history in explaining capital structure differences across nations (Beck et al., 2003).

2.3.1.5 Market Timing

In a slightly different vein, some studies on the capital structure of the US firms (in particular) gives the impression that a firm's history and market timing are more important determinant of capital structure than are firm characteristics that proxy for the costs and benefits of debt versus equity financing (Kayhan and Titman, 2006; Hovakimian et al., 2004; Welch, 2004; Baker and Wurgler, 2002). Kayhan and Titman (2006) argue that firm history has significant impact on the capital structure decisions. Using data on US firms they confirms that history does in fact have a major influence on observed debt ratios, and that these effects at least partially persist for at least ten years. However, there is a stronger evidence that a portion of these history effects are subsequently reversed, and that debt ratios tend to move towards target ratios based on traditional trade-off variables.

The market timing view has been latest perspective on the capital structure studies (Hovakimian, 2006; Hovakimian et al., 2004; Welch, 2004; Baker and Wurgler, 2002 Hovakimian, 2006). Unlike the pecking order and trade off hypotheses, this market timing hypothesis asserts that managers routinely exploit information asymmetries to benefit current shareholders. The main assumption of this 'market timing' view is that cost of equity financing is inversely related to the market-to-book ratio; as a result, firms fund their financial deficit with equity rather than debt if their market-to-book ratio is sufficiently high. Kayhan and Titman (2006) concur that it is plausible because firms with high market-to-book ratios are more willing to issue equity because they are subject to fewer asymmetric information problems. Second, firms with higher market-to-book ratios could be more willing to be exposed to the increased scrutiny that occurs when their shares are issued on public markets. Third, since firms with higher market-to-book ratios are likely to have higher growth opportunities, they might wish to finance their current financial deficit with equity because they want to reserve their borrowing capacity for the future.

Baker and Wurgler (2002) renewed the focus on the 'market timing' debate by suggesting that managers "time the equity markets" i.e., firms tend to reduce their leverage ratios by raising substantial amounts of capital when the equity market is perceived to be more favourable, i.e., when market-to-book ratios are higher. Baker and Wurgler (2002) report that historical market-to-book ratios, averaged using a weighting scheme where market-to-book ratios in years with higher external financing receive higher weights, have a statistically and economically significant impact on current capital structure. The authors argue that neither the trade-off nor the pecking order theory is consistent with the negative effect of long past market-to-book ratios on firm leverage. Instead, they contend that firms time their net equity issues to equity market conditions, and that the changes in capital structure induced by these issues persist because firms do not care to adjust their debt ratios toward the target in subsequent years. As a result, observed capital structures reflect the cumulative outcome of timing the equity market. Indeed Welch (2004) also agree that over reasonably long time frames, the stock price effects are considerably more important in explaining debt-equity ratios than previously identified proxies" (p. 107).

Hovakimian et al. (2004) find evidence of market timing and conclude that firms tend to issue equity following increases in their stock prices and tend to repurchase shares following stock price declines, which is the opposite of what one might expect if firms tended to rebalance their capital structures towards a static target. High market-to-book firms have low target debt ratios and, therefore, are more likely to issue equity and are less likely to issue debt. Holding market-to-book ratio constant, the most recent increases in share price are associated with a higher probability of equity issuance even though these recent increases are not associated with a lower target debt ratio.

Instead of equity market timing, Henderson et al. (2006) examine debt market timing both in the U.S. and at international level. More specifically, they analyze that whether firms' propensity to issue debt in a low interest rate environment allows them to time the market and raise more long-term debt prior to increases in interest rates. They examined the relation between debt and interest rate at the aggregate level rather at the firm level and found that in most countries market timing consideration seem to uphold the long-term debt issuance. Baker et al. (2003) address a similar issue in the U.S.; however, their paper focuses on the timing considerations in the choice of debt maturity, whereas Henderson et al. (2006) focus on aggregate levels of long-term debt.

The robustness of 'market timing' view has been less consistent across a number of recent studies. Elliot et al. (2007) find that overvaluation in the 1990s led to equity being increasingly preferred over debt for a broad set of firms, and market timing explains a significant portion of the variation in the type of security used to fund the financing deficit. On the other hand, Flannery and Rangan (2006) attempted to distinguish and test three main competing hypotheses (trade-off, market timing and pecking order) and conclude that market timing and pecking order hypotheses are not valid as firm leverage indicate that firms do have target capital structure implied by trade off model. Hovakimian (2006) find that historical market average market-to-book ratios have significant effects on current financing and investment decisions, thus, rejecting Baker and Wurgler (2002) findings. Similarly, Gaud et al. (2006) examined these hypotheses for a sample of European firms and find that profitable firms do not seek outside equity financing opposite to the finding of Hovakimian et al. (2004). Kayhan and Titman (2007) computed two variables based on the market-to-book ratio: a long term measure based on the average market to book interacted with the long run average of the firms' financing deficit, and short term measure defined as the covariance between market-to-book and the financing deficit to test market timing view. They find that first measure accounts for the negative relationship between market-to-book and leverage, while the short term measure provides only weak evidence of market timing. The following sections critically evaluate the empirical evidence on the validity of these theories and the ability to generalize from them.

2.3.2 Capital structure in Southeast Asia: Empirical evidence

There are two types of studies that have investigated financing patterns of Southeast Asian firms. Firstly, there are studies on external and internal financing of firms based on aggregate firm-level data (IFC, 1991; Glen and Pinto, 1994; Singh and Hamid, 1992). For example, Singh and Hamid (1992) examined the financing pattern of the top listed manufacturing firms in the 1980s, and the top 100 firms during 1980-1990, concluding that the firms in Asian countries depend on new share issues to finance their growth of net assets. Secondly, there are studies on the determinants of the capital structures of listed non-financial firms.

Similarly, there are country-specific case studies that have investigated the capital structures of listed non-financial firms in the Southeast Asian countries (see Table 2.1). The time period and the number of the firms covered in these studies vary and the difference in the results of these studies might also be due to these factors. Some studies have tried to test the application of a particular theory. For example, Ang and Jung (1993) studied a sample of large Korean firms to test the pecking order theory, their results indicating that regardless of the existence of asymmetric information, the Korean firms prefer bank loans to internal funds, which is inconsistent with the pecking order theory. Similarly, Ang et al. (1997) collected primary data to investigate the capital structure policy of publicly-traded Indonesian firms, finding that firms rank banks to be the most important source, followed closely by retained earnings, suppliers and foreign sources. This finding again contradicts pecking order theory.

Table 2.1
Capital Structure Studies

This table shows the list of previous capital structure studies on the Southeast Asian countries. Column-I shows the Author(s) name, followed by time period covered in the study, name of the Southeast Asian countries only and the sample size of listed non-financial firms is shown in the parenthesis.

Authors	Time period	Sample Southeast Asian Countries
Kim et al (2006)	1985-2002	South Korea#
Fraser et al. (2005)	1990-1999	Malaysia (257)
Agarwal and Mohtadi (2004)	1980-1997	India (36), Indonesia (66), Malaysia (52), Pakistan (52), Thailand(17), South Korea (37), Philippines (22)
Deesomak et al. (2004)	1993-2001	Malaysia (669), Thailand(294)
Shirai (2004)	1992-2001	India #
Bris et al. (2004)	1997	Indonesia, Malaysia, South Korea, Thailand#
Suto (2003)	1995-1999	Malaysia (375)
Bhaduri (2002)	1989-1995	India (363)
Schmukler and Vesperoni (2001)	1980-1998	Indonesia (185), Malaysia(561), Thailand(278), South Korea (410)
Booth et al (2001)	1980-1990	India (99),Malaysia(96),Pakistan(96),Thailand(64),South Korea (93)
Bhaduri and Khasnobis (2000)	1989-1998	India (620)
Cobham and Subramaniam (1998)	1980-1992	India (620)
Singh and Hamid (1992)	1980-1988	India (50)
Ang et al. (1997)	1993	Indonesia (48)
Ang and Jung (1993)	1990s	South Korea #
Krishnan and Moyer (1997)	1990s	Malaysia (21), South Korea (27)
Wiwattanakantang (1999)	1996	Thailand (270)
Glen and Pinto (1994)	1980-1992	India, Indonesia, Malaysia, Pakistan, South Korea and Thailand**
IFC (1991)	1980-1988	India, , Malaysia, Pakistan, Thailand, South Korea***

no information on sample size, ** largest 100 listed firms , ***50 largest listed firms.

According to Ang et al. (1997), retained earnings are less preferred than short-term loans. The firms' preferred short-term financial instruments are trade credits and bank loans of less than a year, while at the longer maturity range the preferences are new stock issue, 5-10 year bank loans, straight and convertible bonds, and preference shares.

Some of the studies have examined whether the determinants of capital structure in developed and developing countries are similar (Deesomak et al., 2004; Booth et al, 2001; Wiwattanakantang; 1999). For example, Deesomak et al. (2004) investigated the determinants of capital structure operating in the Asia Pacific region with different legal, financial and institutional environments using the legal development indicator of La Porta et al. (1997). Booth et al. (2001) used the explanatory variables indicated in Rajan and Zingales (1995) for investigating the determinants of capital structure in Southeast Asian countries. Booth et al. (2001) show that the more profitable the firm, the lower the debt ratio, regardless of how the debt ratio is defined. There are systematic differences in the ways debt ratios can be affected due to country-specific factors such as GDP growth, inflation rate and development of capital markets. However, Booth et al. (2001) find the impact of these variables is not completely uniform across the countries attributing this phenomenon to different institutional structures and/or accounting practices. They concluded that "everything is institutional and capital structure difference between countries can be explained by knowing the nationality of the company" (Booth et al. 2001, p.117).

2.3.3 Cost of Capital

There are firm-specific and institutional factors that also affect the firms' cost of equity capital. The quality of enforcement of laws and regulations also impact on the cost of capital. The corporate disclosure and corporate governance affects the cost of equity capital. The effect of corporate disclosure on the cost of equity capital has been modelled on the premise that corporate disclosure reveals useful information. The lack of disclosure generates information risk, which is captured both by the extent of private information and by the precision of both public and private information (see Easley and O Hara, 2004; Leuz and Verrecchia, 2000). The information risk is not diversifiable and increases the required rate of return.

On the contrary, Domowitz et al. (2000) argue that some countries have significant trading costs, which are related to asymmetric information. In such a scenario, the quality of disclosure might have a stronger marginal effect in reducing information asymmetry and the cost of equity capital. Likewise, the entry of the foreign investors into newly-opened stock markets might result in the improvement of disclosure requirements and protection of the shareholders' rights in the domestic stock market.

It has been suggested that better corporate governance lowers the cost of equity capital by reducing the cost of external monitoring by outside investors and by limiting opportunistic trading by insiders (Bhattacharya and Daouk, 2002; Hung and Trezevant, 2003). In this respect, Johnson et al. (2000) argue that expropriations by insiders are related to market conditions. Specifically, the insiders are expected to expropriate more when the market is bad and less when the market is good. Thus, a negative relationship between expropriation and market condition can magnify the firm's systematic risk, which in turn might be depicted by a higher cost of capital. For example, Chen et al. (2004) show that disclosure is not associated with cost of equity capital after controlling for firm-specific factors. On the other hand, corporate governance has a significant negative effect on the cost of equity capital. Hail and Leuz (2003) show an association between the effectiveness of a country's legal institutions and cost of equity capital. Using four different models of estimating firms' implied cost of capital, they find that firms in countries with extensive securities regulations and strong enforcement mechanisms, exhibit lower cost of capital than firms in countries with weak legal institutions, even after controlling for various risk and country factors.

Although the empirical results meet the theoretical expectations, the results can be driven by the choice of model used for estimating the cost of equity capital. It is very difficult to measure changes in the cost of equity capital for a market undergoing liberalization because liberalizations occur over long periods of time (Stulz, 1997). Studies that examine the effect of disclosure, corporate governance legal and institutional variables on the cost of equity capital have used *ex ante* measures (Botosan, 1997; Botosan and Plumlee, 2005), which might not be used by managers in reality to determine the cost of equity capital.

From the practical point of view, it would be ideal to ask financial managers about their choice of variables in estimating the firm's cost of equity capital. For example, in a survey of CFOs and CEOs in the Asia Pacific region, Kester et al. (1999) report that choice of estimation of cost of equity capital varied from CAPM, dividend yield plus growth rate method to risk premium methods.

2.3.4 Investment

In the absence of market imperfections, a firm's investment decision is explained by market indicators of expected future profitability or shadow cost of capital. The firm perceives the opportunity cost of internal funds to be market interest rates, and it can borrow and lend in the capital market. All else being equal, an improvement in investment opportunity increases the desired capital stock and investment. This story assumes that no information asymmetry exists, as decision makers in the firm and external suppliers of capital to firms have the same information about the firm choice and use of inputs, investment opportunities, risk of project and profit (Hubbard, 1998).

These assumptions are not realistic as market imperfections reminiscent to closed economics create information asymmetry between the borrowers and lenders which lead to a gap in cost of external and internal finance. In such circumstance, a firm in a closed economy faces high cost of external finance due to information asymmetry and have more reliance on internal finance for investment. This argument has led to the accepted view that firm-level investment is not only determined by expected future profitability but also by the firm's net worth. All else being equal, an increase in net worth leads to greater investment and while a decrease in net worth leads to lower investment.

The models of investment stress the cross-sectional differences in investment due to information asymmetry and capital market imperfections, and therefore, suggest discrimination between the investment decisions at any point in time of 'constrained' and 'unconstrained' firms (Hubbard, 1998). However, the effect of financial liberalization on firm investment based on these arbitrary classifications of 'constrained' and 'unconstrained' firms have produced dissimilar results (see Laeven, 2003; Love, 2003 for review of studies).

In summary, there has been general agreement on the positive effect of liberalization such as increase in economic growth and financial development using country-level data. However, there is still lack of empirical evidence about the economic impact of the financial liberalization at firm-level that might lead to disagreement with country-level findings. In particular, the empirical literature appears to be unspoken on the issue of sequence of financial liberalization and its impact on firm-level dynamics. Therefore, this thesis aims to contribute to literature along this dimension.

Section C Development of Empirical Framework

Sections A and B have provided a review of theoretical and empirical literature germane to the financial liberalization and corporate finance themes. This section formalizes the empirical framework that will be pursued in the subsequent empirical chapters. The economic perspectives examined here are: the economic benefits of the financial system openness at firm-level in the Southeast Asian countries rather than country-level. The economic perspective of the cost and benefit of liberalization at firm-level is investigated by examining capital structure adjustment, cost of capital and the efficiency of investment allocation, which possibly have broader economic impact.

2.4 Empirical Framework

The empirical framework pursued in this study has two aims. The first aim is to examine the direct influence of financial liberalization on the financing choices, i.e., economic impacts of liberalization on the capital structure adjustment. The second aim is to investigate the interaction between liberalization and cost of equity capital, and its effect on the firm-level investment, which is lacking in the previous studies. To achieve these aims, the study proposes comprehensive measures of financial liberalization and securities market development. The liberalization measure developed in this research include factors omitted in McKinnon and

Shaw framework, and securities market development measure captures institutional aspects of financial markets ignored in the literature.

2.4.1. Proposed Measurement of Financial Liberalization

Our proposed measure of financial liberalization adapts the event study approach used in previous studies. This measurement focuses on two policies which are banking sector and stock markets liberalization in Southeast Asian countries. These two policies have been associated with specific measures in recent empirical studies (see Laeven, 2003, Henry, 2000). Using these two policies, two indicators have been developed for firm-level analysis for this research. These indicators are explained in detail in Chapter 3.

2.4.2. Proposed Measurement of Institutional Development

We propose a new measure of the securities market institutional development for the Southeast Asian countries. This measure takes into account three facets - securities market regulation, trading technology and disclosure laws. We argue that this measure is different from the previous studies that have predominantly focused on corporate governance variables (see e.g., La Porta et al, 1997). This measure is developed and explained in detail in Chapter 3. These new measures of banking and stock market liberalization introduced in this research are replacements and additions to the existing ones used in Kaminsky and Schmukler (2003), Laeven (2003), Henry (2000) and Bekaert and Harvey (2000). For example, Laeven's (2003) index of financial liberalization consists of 6 measures (i) liberalization of interest rates (ii) removal of entry barriers (iii) lowering of reserve requirements (iv) removal of credit controls (v) privatization of state owned banks and (vi) implementation of prudential regulations (until 1998). Leaven (2003) suggest that reserve requirements in Pakistan have been higher during the 1988 to 1998, and therefore treated Pakistan as not liberalized until 1997 but according to information provided by State bank of Pakistan, reserve requirements were reduced in 1993. Therefore, using this information, status of liberalization in Pakistan is re-assessed in this research. We add a new variable to Laeven (2003) measures i.e., scope of banking services. This additional measure allows us for evaluating the separate impacts associated with an increase in scope of banking services and financial intermediation associated with foreign bank entry and privatization. The changes in scope of banking services across countries provide much deeper interpretation of variety of domestic banking sector reforms. One such example of increase in scope of banking services is establishment of offshore banking centres in Thailand (BIBF) and Malaysia (LOFSA) in 1995 and 1996 respectively. These offshore banking centres provided foreign currency loans to domestic and international firms. This would have ultimately increased the scope of banking services in these countries relative to other countries. This impact will be different from the entry of foreign banks and privatization.

Bekaert and Harvey (2000) measurement of stock market liberalization consists of 3 chronological events (i) first country fund (ii) first depository receipt and (iii) increase in the US dollar equity capital flows. The stock market liberalization measure developed in this research is more comprehensive than Bekaert and Harvey (2000) because it includes (i) incentive given to foreign investors such as regulations on the repatriation of capital and repatriation of interest and dividends, and (ii) privatization of state-owned enterprises. The economic benefits of privatization that motivate governments include the reduction of interference in the decision making, the development of domestic capital markets, improved access to foreign capital, and raising the proceeds for government treasury (Jone et al. 1999). One such example of government initiative was massive privatization in Pakistan which started in the early 1990s, and South Korean government incentives for firms to seek alternative to bank finance by listing on the stock markets. As a result, the total number of listed firms increased remarkably in both countries.

2.5 Conclusion

This chapter has provided a comprehensive review of literature that forms the foundation of this research, as it clarifies the relationship between the study and previous work. The chapter proposes an empirical framework grounded in the review in two sections that will be useful in examining the influences of financial liberalization in six Southeast Asian countries. In subsequent chapters, this empirical framework has been implemented in a systematic manner to answer the research questions.

Chapter 3

FINANCIAL LIBERALIZATION AND CAPITAL STRUCTURE: PRELIMINARY STATISTICAL ANALYSIS

3.1 Introduction

The aim of this chapter is to describe the dataset that has been selected to study the impact of financial liberalization on capital structure of firms, from which it can be seen that there is a substantial breadth and coverage of firms. In addition, this chapter presents univariate and bivariate tests that serve as a precursor to the econometric analysis that follows in Chapter 4. The chapter is laid out as follows. Section 3.2 describes measurement of banking sector and stock market liberalization. Section 3.3 describes the sample coverage. Section 3.4 reports on the univariate tests, and discusses the results of parametric and non-parametric tests on the firm-specific characteristics to draw preliminary inferences about the effect of banking and stock market liberalization on the capital structure. Section 3.5 discusses bivariate correlations between firm-specific variables and debt and equity ratio in the pre-post liberalization period to draw a preliminary inference about the direction of the relationship between firm-specific variables and capital structure. Section 3.6 concludes.

3.2 Measurement of Banking sector and Stock market Liberalization

We develop two measures of liberalization using information on the implementation of financial reforms. Table 3.1 describes these policy measures in column-I, for each country *j* (where *j*=India, Indonesia, Malaysia, Pakistan, South Korea and Thailand) at time *t* i.e. calendar year. These policies are identified with banking sector liberalization (column I, Item 1-7) and stock market liberalization (Item 8-14). Lastly, institutional developments are identified with, changes or innovations in financial markets laws, infrastructure and technology (Item 15-20).

Table 3.1

Using the yearly information, three indexes were constructed as follows. As a first step, for each item in the first column of Table 3.1, a dummy variable was created which takes a value of 1 to denote the implementation in a country *j* at time *t* and 0 otherwise. In the second step, these dummy variables for items 1-7 for the banking sector liberalization policy and 8-14 for the stock market liberalization policy, and 15-20 for institutional development were summed, A sum of dummy variables ranging from 0 to 7 was obtained respectively (see Table 3.2 Panel A and B). In Panels A, B, C, values > 5 are used to identify a country-year with a high degree of liberalization of banking sector, stock markets and institutional development as in Laeven (2003) whilst values below 5 are used to identify a country-year with a lower degree of banking sector, stock market liberalization and institutional development. The cut off point of >5 is an objective measure for pre-post liberalization because when the index takes value >5 in sample countries, the differential between real interest and nominal interest volatility became smaller. As Lynn (1996, p.15) suggest that market oriented financial system should exhibit smaller differential between nominal and real interest rates (lending) volatility (see Table 3.2).

Table 3.2

Banking sector Liberalization, Stock market Liberalization and Institutional Development Index

This table presents banking sector, stock market liberalization and institutional development index by year and country. For each country, the index in a particular year is defined as the sum of the banking sector, stock market liberalization and institutional development measures described in Table 3.1 that have been implemented in that country up to that year. Thus, the index denotes changes in the degree of financial liberalization and institutional development within a country, and ranges from 0 to 7, with 7 indicating the highest level of banking sectors stock markets liberalization and 6 indicating the highest level of institutional development in Panel A, B and C respectively, the indices are constructed as of year end status. In Panels A, B, C, values > 5 are used to identify a country-year with a high degree of liberalization of banking sector, stock markets and institutional development whilst values below 5 are used to identify a country-year with a lower degree of banking sector, stock market liberalization and institutional development. Nominal less Real volatility is the difference between standard deviation of nominal and real lending rates obtained from World Bank.

Panel A. Banking Sector Liberalization Index

Country	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	Nominal less Real volatility 1981-1991* (*BLIB*<5)	Nominal less Real volatility 1991-1995** (*BLIB*>5)
India	1	1	4	5	5	7	7	7	7	7	7	7	7	7	-2.12	-0.75
Indonesia	5	5	6	6	6	6	7	7	7	7	7	7	7	7	-0.80	-0.06
Malaysia	3	3	3	5	5	6	6	6	6	6	6	6	6	6	-1.70	-0.03
Pakistan	1	1	3	4	6	7	7	7	7	7	7	7	7	7	-1.89	-0.95
South Korea	4	4	5	5	5	7	7	7	7	7	7	7	7	7	-1.00	-0.85
Thailand	1	4	4	4	6	6	7	7	7	7	7	7	7	7	-1.60	-0.44

Panel B. Stock Market Liberalization Index

Country	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
India	2	5	6	6	6	6	6	6	7	7	7	7	7	7
Indonesia	4	4	5	6	6	6	6	6	6	6	6	6	6	6
Malaysia	2	5	5	6	6	6	6	6	6	6	6	6	6	6
Pakistan	3	3	4	4	4	5	6	6	6	6	6	6	6	6
South Korea	2	4	5	6	6	6	6	6	6	6	6	6	6	6
Thailand	4	6	6	6	6	6	6	6	6	6	6	6	6	6

Panel C. Institutional Development Index

Country	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
India	3	4	4	4	5	6	6	6	6	6	6	6	6	6
Indonesia	0	0	3	3	4	4	4	5	5	6	6	6	6	6
Malaysia	1	2	4	4	4	4	4	4	6	6	6	6	6	6
Pakistan	0	0	0	1	1	1	4	4	5	6	6	6	6	6
South Korea	1	2	3	3	4	4	4	4	5	5	5	6	6	6
Thailand	1	3	5	5	5	5	5	6	6	6	6	6	6	6

*Source: Lynn (1996) except India and Pakistan,** The standard deviation of nominal and real lending rates are calculated for each country until the year in which *BLIB* =6.

Thus, this cut off approach is objective to investigate that reaction of a particular company to different types of liberalization e.g., bank versus equity measures. Hence, using 5 as cut off point, (0/1) dummy variables denoted by, *BLIB*, *SLIB* and *INST* were created that takes on a value of 1 for values > 5, and 0 otherwise. This approach to measure liberalization period is in line with Kaminsky and Schmukler (2003). They used the sum of the (0/1) dummy variables and regimes fully liberalized regime denoted by 1, partially liberalized by 2 and fully repressed by 3. Using this approach, they show that banking sector in South Korea was partially liberalized until 1993 and became fully liberalized after 1996; the same conclusion is reached in this research using out cut off point of > 5 for banking sector liberalization. In Thailand, stock market was partially liberalized until 1990 and became completely liberalized in 1992 as shown in this research (see Panel B).

It is important to highlight here that construction of indexes assumes that each new innovation in liberalization is equally important, which may not be a valid assumption if some measures should be weighted differently. However, alternative approach such as assigning a higher weight to important measure also suffers from the subjectivity bias. Laeven (2003) suggested that the sum of 5 or 6 as a cut-off point is a reliable indicator of country's liberalization status. Indeed Bandiera et al (2000, p.243) suggest that " measures such as the developments of markets as proxy –an approach leading to ambiguity in interpretation and endogeneity problems-it seems impossible at present to find useful measures". Thus, they recommend "index of reforms developed from explicit policy changes, though not wholly independent of wider economic conditions, should be less subject to endogeneity problems".

3.3 Data and Description of the Sample

3.3.1 Data Source

The sample consists of listed non-financial firms in six Southeast Asian countries: India, Indonesia, Malaysia, Pakistan, South Korea and Thailand. The firm-level accounting data is downloaded from *Datastream* and *Worldscope*. Table 3.3 presents the ratio of average market capitalization of firms in the sample to total market capitalization of non-financial firms (in %) to show the representativeness of sample firms in each country.

Table 3.3

Representativeness of Sample Firms

This table shows the sample firms' market capitalization to total stock market capitalization of a country in percentage over the time period of 1991-2004. The data on the market value of the firms in the sample were collected from Datastream and Worldscope databases. The data on the total market capitalization of a country's stock market has been taken from World Bank. The percentages for the US and the UK are calculated using the firms listed on the New York Stock Exchange and London Stock Exchange in the following industry sectors: from different sources. Agriculture and Forestry (SIC 1-9); Mining and Construction (SIC 10-14, SIC15-17); Food (SIC20), Chemical (SIC28), and Non-metal sector include, Tobacco (SIC21), Textile/Apparel (SIC22-23), Lumber (SIC24), Paper (SIC26), Furniture (SIC25), Petroleum and Coal products (SIC 29), Rubber (SIC30), Metals includes primary metal industries (SIC33-34), Electrical and Instruments (SIC 36, 38), Machinery (SIC35), Transport (SIC37, SIC 44-45), Communications (SIC 48) and Misc. such wholesale and retail trade (SIC 50-59). The last two rows present *t-tests* the difference between mean capitalization ratio of each sample country compared to mean market capitalization in the UK and the US denoted by *t-test(UK) and t-test (US)* respectively..

	Country							
Year	India	Indonesia	Malaysia	Pakistan	South Korea	Thailand	UK	US
1991	6.80	25.45	14.97	7.33	26.03	11.24	23.09	41.98
1992	20.13	28.30	10.15	21.32	35.51	20.22	27.61	40.82
1993	20.48	27.94	22.56	24.44	36.93	24.66	36.79	39.89
1994	29.09	49.50	40.21	33.57	39.30	22.94	36.48	40.87
1995	38.13	64.80	40.15	37.32	44.43	30.47	35.90	41.26
1996	39.65	51.72	34.01	67.35	41.89	27.27	34.36	40.10
1997	37.84	96.57	83.76	68.40	69.65	45.43	37.22	40.24
1998	48.25	44.76	33.47	67.97	32.70	24.02	35.35	40.92
1999	26.29	38.52	35.31	65.06	32.69	30.61	36.40	39.19
2000	35.34	51.18	44.96	78.32	45.38	35.00	50.81	39.19
2001	24.85	54.30	38.44	73.48	40.14	45.25	50.66	46.26
2002	21.46	52.11	39.28	50.88	36.40	45.70	48.48	47.09
2003	30.87	56.35	40.67	41.71	52.88	43.90	36.88	46.26
2004	45.31	55.26	43.92	48.60	50.67	44.01	36.55	45.32
Mean	30.32	49.76	37.27	48.98	41.75	32.19	37.61	42.09
Max.	48.25	96.57	83.76	78.32	69.65	45.70	50.81	47.09
Min.	6.80	25.45	10.15	7.33	26.03	11.24	23.09	39.19
t-test(UK)	0.0440	0.0182	0.9362	0.0312	0.2081	0.0237	-	
t-test (US)	0.0026	0.1316	0.3125	0.2694	0.9082	0.0022	0.0466	

Table 3.4
Distribution of Firms by Market Values, 1991-2004

This table shows the number of firms moving across percentiles of market values from the start of the sample period to the end of sample period (Panel C). The market value is obtained by multiplying the total number of common share outstanding by year end market price. The data on market values were calculated using data obtained from DataStream and Worldscope over the sample period of 1991-2004.

India	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
smallest	0	5	14	6	4	4	13	16	17	19	20	15	15	17
20	0	7	7	8	9	15	17	17	17	10	18	15	18	12
30	1	2	12	10	10	18	11	12	12	18	17	14	11	17
40	2	5	7	7	14	11	17	15	15	14	11	16	16	15
50	0	2	12	10	15	13	19	16	19	12	8	11	16	19
60	2	6	4	11	14	17	17	13	12	15	11	13	10	12
70	2	6	7	11	26	21	9	14	12	9	13	5	15	12
80	1	3	5	11	23	14	15	15	10	14	6	12	18	15
90	1	8	7	11	13	16	11	8	12	15	11	9	8	11
largest	0	1	2	12	13	13	13	16	16	15	7	9	15	9
	9	45	77	97	141	142	142	142	142	141	122	119	142	139

Indonesia	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
smallest	4	3	0	8	14	11	17	20	5	6	13	11	15	16
20	2	4	1	11	14	14	13	16	8	8	8	10	12	11
30	5	2	5	9	12	8	14	12	6	1	10	7	13	12
40	3	3	8	9	11	10	12	15	10	12	7	10	12	13
50	3	8	2	12	10	7	16	12	8	16	13	13	11	15
60	2	3	4	6	11	18	7	12	14	9	18	18	15	11
70	3	4	5	9	13	13	11	8	13	11	11	15	14	13
80	0	0	5	11	9	11	8	10	21	14	13	10	10	10
90	1	2	4	8	9	13	10	3	16	17	10	7	8	14
largest	0	1	4	7	14	14	12	11	18	10	16	9	10	5
	23	30	38	90	117	119	120	119	119	104	119	110	120	120

Table 3.4 (continued...)

Malaysia	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
smallest	3	9	3	2	1	1	9	14	9	10	21	23	17	15
20	5	4	8	6	9	1	12	15	11	18	9	11	13	19
30	5	9	4	3	8	9	7	15	14	9	17	11	11	10
40	2	4	6	4	8	11	9	12	18	12	10	11	15	12
50	5	9	5	11	12	9	14	10	8	11	11	10	5	8
60	4	2	9	11	11	14	8	16	9	12	5	8	11	10
70	5	6	7	13	13	15	12	9	11	8	7	5	7	6
80	3	2	10	14	18	16	13	5	10	9	9	7	6	7
90	1	0	7	13	15	18	13	5	12	9	10	9	9	10
largest	1	1	5	10	12	16	13	9	8	12	9	13	12	13
	34	46	64	87	107	110	110	110	110	110	108	108	106	110

Pakistan	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
smallest	1	2	3	1	2	8	7	9	9	7	7	8	10	7
20	1	3	2	3	8	4	5	6	5	6	8	7	9	9
30	2	1	1	5	1	2	3	5	6	5	6	4	8	2
40	2	5	6	0	4	4	3	7	5	8	6	8	7	5
50	1	3	2	3	3	2	6	9	7	6	4	6	4	6
60	1	1	3	3	3	7	8	4	6	2	5	8	2	4
70	2	3	5	5	4	4	5	3	1	4	9	7	5	7
80	1	2	5	5	3	1	2	2	6	7	4	4	3	5
90	0	2	3	3	4	4	4	3	2	7	5	2	5	4
largest	0	0	1	4	3	3	5	4	6	5	3	3	3	6
	11	22	31	32	35	39	48	52	53	57	57	57	56	55

Table 3.4 (continued...)

South Korea	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
smallest	0	19	11	7	12	8	27	31	23	30	28	30	10	25
20	0	24	15	10	17	12	26	18	13	29	24	13	11	20
30	1	19	20	11	13	18	28	21	18	23	22	14	21	17
40	3	19	16	9	11	15	23	16	23	25	20	13	23	15
50	1	15	21	21	21	27	18	16	21	14	14	18	25	18
60	2	16	22	25	25	25	19	18	18	15	12	11	15	19
70	3	15	23	22	27	27	16	19	11	12	19	17	17	18
80	4	18	15	33	23	31	17	19	20	10	11	5	23	17
90	3	9	23	28	22	15	7	18	21	21	13	12	22	20
largest	8	9	11	18	15	12	9	13	23	12	11	15	20	17
	25	163	177	184	186	190	190	189	191	191	174	148	187	186

Thailand	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
smallest	2	2	3	6	4	7	18	21	16	16	9	11	13	9
20	6	5	3	5	7	13	19	17	11	10	13	13	17	7
30	2	4	5	9	12	15	13	9	12	13	9	9	10	12
40	8	3	6	11	16	12	8	8	13	10	8	11	4	13
50	6	4	16	15	11	8	7	7	17	18	10	8	6	14
60	1	14	15	15	16	7	5	6	10	15	15	4	8	18
70	9	5	13	13	7	9	10	8	5	7	12	11	12	20
80	4	15	12	9	12	10	6	5	10	10	13	14	17	10
90	3	3	12	9	7	9	9	13	10	6	10	14	11	9
largest	5	7	13	9	9	11	5	6	11	10	10	10	11	1
	46	62	98	101	101	101	100	100	115	115	109	105	109	113

Table 3.4(concluded)

This ratio varies across countries and time periods due to the following reasons. First, there has been increase in the total number of listed firms in some years for some countries[1] and the decrease in the ratio for some years has been outcome of movement of firms from higher percentile to lower percentile of market capitalization as shows in Table 3.4. The last two columns of the table show the ratios over time for two developed markets, the US and the UK. The percentages vary for these countries as well over the years but are similar to those reported by Fan et al. (2002). Thus, obviously our non-random sample appears to be capturing relatively similar market capitalization as two developed countries, as shown by *t-test* results (see last two rows of Table 3.3).

It is possible that the increase (decrease) in the number of firms for each country could cause selection and survivorship bias in our data. However, it is important to highlight that the coverage of firms for each country by databases also introduces selection bias i.e., these databases might be biased towards the inclusion of the only largest listed firms in each country as pointed out by Fan et al (2000). On the other hand, a survivorship bias might also occur when if firms meeting certain criteria are more likely to survive. As in our case, the number of selected firms are further reduced after imposing the restrictions that firm-level observations must be available consecutively for at least nine years, thus, introducing a selection bias. Lastly, the analysis make extensive use of ratios to calculate variables for subsequent analysis, which sometimes results in extreme outliers, to alleviate this problem, we had to remove such firm-level observations based on outlier selection criteria i.e., we discard values of variables used in analysis that are three standard deviation away from the average value for that country further reducing number of firms. Though, at first, it seems that this is a weakness of sample selection criteria (9 consecutive years) and this will result in a bunching of firms (i.e., a proportionally higher number of firms during the middle of sample period), as shown in Table 3.4. Therefore, our results might be influenced by this bunching of firms in the middle of sample. We conjecture that in some of the countries, this bunching of the firms might have been outcome of policy endogeneity. As Henry (2000) point out that policy makers have incentive to liberalize the stock market when it is doing well. We think that

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[1] New listed non-financial were - 44 in India, 30 Indonesia, 22 Malaysia, 5 Pakistan, 3 South Korea and 19 Thailand during the period of 1994-1996.

policy makers had expectation of boost in performance of local stock markets, and the firms might have seen incentives to list or raise new equity capital at low cost. As a result, listing of the new firms increased in our sample causing bunching of the firms in the middle of sample period. For instance, in the case of Pakistan, the increase in the new listing was exceptional, as listed firms increased to 628 in 1992 (i.e., year of stock market opening see Table 3.1) from 542 in 1991. Therefore, suspected policy endogeneity of the stock market liberalization decision requires cautious interpretation of the estimation effects on the debt/equity ratios and cost of equity capital in the subsequent chapters.

Another sample selection bias is that, we ignore the financial firms. Non-financial firms are crucial to the current investigation because liberalization might have different effects on the capital structure of financial firms. Capital structure decision of banks may differ from these of non-financial firms. First, deposits seem to play a role in both the real and financial decision of banks, because deposits are not only inputs into banks production function but also components of debt in their capital structure. Second, the regulatory forces influence the capital structure of banks. The banks are obliged under prudential regulations to keep a minimum of 8% capital asset ratio, and previous studies have shown that capital requirements influence the capital structure of financial firms. Some studies have shown that determinants of capital structure of banks are different from the non-financial firms. One example is of Ogler and Taggart (1983) who show that personal and corporate taxes, reserve requirements and economies of scale influence financial firms' capital structure. Buser et al. (1981) show how the combination of capital regulation and flat rate deposit insurance jointly influence bank leverage.

Recent studies on the banking sector in the South East Asian countries seem to suggest that capital structure decisions of the banks were significantly influenced by government's policies. The bank restructuring process led to substantial changes in the bank governance across Southeast Asia region. Benaccosi and Hardy (2005) show that there was increase in equity to total asset ratio in Pakistan as regulation were tightened in particular public sector banks which received the periodic injection of equity from the government. Thus, above arguments and empirical evidence strengthen the case for the exclusion of financial firms from our analysis. The analysis is based on non-financial firms in all the subsequent chapters: Chapter 4, 5, 6, 7, 8 and 9.

3.3.2 Description of the Sample

This section describes the distribution of firms for each country with reference to firm ownership and industry sector classification. Booth et al. (2001) suggest that knowing the industrial composition of the sample in developing countries would be very useful in understanding their capital structure. It has been argued that the ownership of a firm also affects its capital structure (Hoshi et al, 1991). Previous studies have found that ownership structure of Asian firms is similar to some of those in the developed countries[2]. Claessens et al. (2000) report a high level of family control for most East Asian firms[3], and Capulong et al. (1999) show that the top five shareholders concentration ratio is the highest among East Asian firms[4]. Likewise, foreign ownership also varies across countries due to respective governments' strategies for the protection of local industries (Thompson, 1998).

To proxy for the level of ownership, the study used an ownership of share capital of 50%, as a cut-off point to denote substantial foreign shareholding in a firm. Because the information on ownership is not always available from the stock exchange of the representative countries, other sources of information were used. For Thailand, *'Thai Business Groups: A Unique Guide to Who owns what'*, 5th Edition, was used. For Malaysia, Kuala Lumpur Stock Exchange Annual Companies Hand Book Vol. 25, Book 4, while the ICICI online research was used for India. In the case of South Korea, the study used the Top 30 *Chaebols* and for Indonesia, the Jakarta Stock Exchange website. In some cases, where there was no available information at

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[2] Ownership of firms is less widely dispersed in France, Canada and Germany than in the US or UK. The ownership of firms in France, Germany and Canada is characterized by different types of owners; in France by non-financial corporations and the government; in Germany by non-financial corporations and banks (Jenkinson and Mayer, 1992) and in Canada by a single shareholder or families (Khemani, 1988).

[3] Family ownership constitutes 68% in Indonesia; 67% in South Korea; 57% in Malaysia and 56% in Thailand. Government ownership is also significant in Indonesia at 10%; Malaysia 18%, and Thailand 7.5% respectively. The number of widely-held corporations is as low as 5% in South Korea to relative high of 21% in Thailand. The number of widely-held corporations is more than 10% in Malaysia and Indonesia respectively. Local private family-based firms constitute 59%, semi government 12%, and multinational 15% of the top 40 companies in Pakistan (Bari and Cheema, 2003).

[4] The top five shareholders concentration ratio in Indonesia is 67%; Malaysia 58%; South Korea 38%; Thailand 56% and Pakistan 37% respectively.

all, the researcher observed the similarity of a firm's names to infer family ownership. The information from all these sources was then used to indicate the structure of firm-level ownership, as shown in Table 3.5.

Table 3.5
Structure of Firm-level Ownership (in %)

This table presents the average percentage ownership at firm-level for each country over the sample period 1991-2004. The information about ownership of firms was obtained from different source. The firm ownership is classified into mutually exclusive categories of foreign, and local. The local firms are further divided into those groups owned and non-group owned. Foreign ownership is defined as ownership of 50% of the share capital in a firm; Group denotes percentage of firms connected with a business group. Non-group denotes stand-alone companies in the sample. *N* shows the total number of firms in the sample from 1991-2004.

	Country					
Ownership	India	Indonesia	Malaysia	Pakistan	South Korea	Thailand
Foreign	26.65	22.12	9.20	30.26	5.43	41.92
Local	72.35	77.88	90.80	69.74	94.57	58.08
Local firms						
Group	54.56	30.46	20.98	9.94	65.98	24.37
Non-group	45.44	69.54	79.02	90.06	34.02	75.63
N	141	121	110	57	191	115

Table 3.5 shows that the level of foreign ownership varies from a low of 5.43% in South Korea to a high of 41.92% in Thailand on average. This low level of foreign firm presence in South Korea can be attributed to restrictions on foreign firms, several of which remain today (Thompson, 1998). The percentage of foreign firms seems to be higher in Thailand as entry barriers have been gradually dismantled during 1990s. The percentage of firms associated with business groups also varies from a low of 20.98% in Malaysia to a high level of 65.98% in South Korea. Table 3.6 presents the distribution of sample firm across industrial sectors.

Table 3.6
Description of Sample by Industry Sector

The table shows the number of firms in each country classified by two digits SIC industry sector codes. The sample covers the period from 1991 to 2004. The information about each firm's main core operations was obtained from Stock Exchanges, WorldScope database and complemented with information from the Webster Online SIC Codes. Agriculture and Forestry (SIC 1-9); Mining and Construction (SIC 10-14, SIC15-17); Food (SIC20), Chemical (SIC28), and Non-metal sector include, Tobacco (SIC21), Textile/Apparel (SIC22-23), Lumber (SIC24), Paper (SIC26), Furniture (SIC25), Petroleum and Coal products (SIC 29), Rubber (SIC30), Metals includes primary metal industries (SIC33-34), Electrical and Instruments (SIC 36, 38), Machinery (SIC35), Transport (SIC37, SIC 44-45), Communications (SIC 48) and Misc. such wholesale and retail trade (SIC 50-59). *N* shows the number of firms.

Industry sectors	India	Indonesia	Malaysia	Pakistan	South Korea	Thailand	Total
Agriculture, forestry	0	2	0	0	0	5	7
Mining & Construction	3	11	29	4	11	8	66
Food, Chemical, Non-Metal	81	51	38	35	80	47	332
Metals, Electronic, Machinery	44	35	27	12	75	35	228
Transport, Communications	11	6	11	6	14	12	60
Wholesale, Retail	2	16	5	0	11	8	42
N	141	121	110	57	191	115	735

It is apparent that sample is heavily weighted in favor of firms belonging to SIC 20-29 and SIC 30-39 sectors across the countries. These firms account for 45% and 31% respectively in the total sample of firms. Outside these sectors, firms in other industrial sectors are not observed in significant number, such as the marginal presence of firms in agricultural and wholesale, Retail sectors shown in the table above.

3.3.3. Description of Variables

The set of explanatory variables used in this chapter explain variations in debt ratio and equity ratio of the sample firms consists of those that have been used frequently in the previous capital structure studies. A brief explanation of their impact positive (negative) is described as under:

Non-debt tax shield (NDTS)

Theoretically, in the presence of taxes, debt financing provides a substantial advantage over equity financing because interest on debt is paid prior to payment of corporate income taxes. Therefore, reduction in taxable income due to interest payment should make external debt finance a more preferred choice over equity. In other words, there is a positive relationship between the non-debt tax shield and leverage. On the other hand, DeAnglo and Masulis (1980) argue that if non-debt tax shield exist, then firms have a lower incentive to use debt from a tax shield point of view and thus may use less debt. Non-debt tax shields, such as depreciation allowances and investment tax credits, are substitutes for interest expense because of their capacity to reduce the firm's effective marginal tax rate. In other words, there is a negative relationship between the non-debt tax shield and leverage. Previous studies such as Booth et al. (2001) found no positive relationship between taxes and total debt ratio for Southeast Asian countries. Fan et al. (2003) also found the tax variable to be negatively related to leverage. On the other hand, Wiwattanakantang (1999) found a negative relationship between non-debt tax shields and firm's average debt ratio in Thailand as predicted. In this study, instead of using tax as a determinant of target debt ratio, non-debt tax shield has been used for two reasons. First, lack of data regarding taxes would reduce substantially the size of our sample and secondly choosing the appropriate marginal tax rate of firms is crucial in determining the tax shield (Graham, 1996).

Profitability (PROFIT)

The signaling and pecking order theories make predictions about relationships between a firm's financial debt ratio and its profitability. Signalling theory implies a positive relationship, in which firms with a higher cash flow signal their performance with a higher debt ratio. In contrast, pecking order theory suggests a negative relationship between a firm's debt ratio and its profitability, in which firms with higher internally-generated cash flow require less debt.

Tangibility (TANG)

The tangible assets are those assets of firms which are easy to collateralize. These assets provide a safety cushion to recoup loan in the event of failure of a firm to repay outstanding loans. The intangible or knowledge-based assets do not possess such physical attributes and do not lend themselves to be easily collateralized. As a result, firms with more tangible assets will have higher debt ratios and vice versa. The value of a firm is increased by using collateralized debt when the current creditors do not have such guarantee. Hence firms have an incentive to do so, and we should expect a positive relationship between importance of tangible assets and the degree of leverage (Gaud et al, 2005).

Growth opportunities (GROWTH)

According to agency costs models, firms with growth opportunities are more likely to incur a higher cost of debt due to perceived asset substitution and information asymmetry. The agency theory predicts a negative relationship between growth opportunities and debt ratio. On the contrary, according to resource-based theory, sometimes financial intermediaries are willing to lend to firms with fewer growth opportunities because such firms have high value collateral assets on their balance sheets. There is also a relationship between growth and tangible assets on a firm's balance sheet. Therefore, there is a positive relationship between growth opportunities and debt ratio.

Financial distress costs (FDC)

It has been argued in the literature that when the debt ratio increases, a firm becomes more prone to financial distress because its interest-paying ability decreases and chances of bankruptcy increase. This debt overhang might even force firms to pass up profitable growth opportunities, and in extreme cases, the under-investment problem might force them out of the market, and the financial distress costs may push them far away from their optimal debt ratio. In addition, firms with high financial distress costs are even turned down by the banks, and are forced to pay a higher risk premium on debt. In such a situation, firms are more likely to issue equity and retire debt, thereby suggesting an increasing concern over bankruptcy risks. Thus, we expect a negative relationship between financial distress and debt ratio. Miller and Rock (1985) suggest that an equity offer in such a situation is interpreted by investors as indicating that a firm has less liquidity problems, and the managers have revised their forecast of the firm's earning downward. Therefore, we should expect a positive relationship between *FDC* and equity ratio.

Free cash flow (FCF)

Jensen (1986) argues that debt enhances a firm's value by forcing managers to pay out free cash flows that they might otherwise waste on bad investments. The free cash flow theory predicts a positive relationship between free cash flow and debt ratio. When shareholders of a firm worry about the over-investment problem, manager think that issuance of debt might be one possible solution. The pressure to issue debt should sometimes require disciplinary mechanisms e.g., board of directors. In the absence of any discipline to restrain managerial opportunism, there will be a positive relationship between free cash flow and equity ratio (Zweibel, 1990) because managers retain free cash flows and issue new equity to invest in those projects that increase managerial benefits. On the contrary, if the managers are loyal to shareholders they will avoid such investment and use free cash flows for investment. Thus, there will be a negative relationship between free cash flows and the equity ratio.

Investment (INV)

Theoretical models that examine the investment-financing decisions linkage have assumed a static relationship, i.e. investment and financing decisions are made at a single point in time and are irreversible. Similarly, some studies have assumed a dynamic relationship, i.e., a firm has flexibility to dynamically manage both decisions over time (Mauer and Triantis, 1994). If the investment-financing decision linkage is static, there should be a positive relationship between investment and financing decisions and vice versa. According to managerial theory, a significant portion of the managers' human capital may be firm-specific and hence contingent on future existence of the firms'. The self-interested managers over-diversify the firm's assets (Jensen and Meckling, 1986). If shareholders are susceptible to such managerial behaviour, they will refuse to finance new investments. Therefore, we should expect a negative relationship between investment and equity ratio. On the contrary, if shareholders and managers have a common objective, the investors will respond positively to new issues of the firm. Thus, the investment of a firm will be positively related to new debt (equity) issue. In the light of the above findings, the relationship between debt (equity) ratio and *INV* is ambiguous.

Business risk (BRISK)

The business risk also influences capital structure decisions and as noted by Healy and Palepu (1990), managers decide to issue equity and reduce debt ratio when they foresee an unexpected increase in their firms' business risk. Firms with a high business risk, and hence more volatile profits, are likely to borrow less because additional borrowing increases financial distress costs more than the expected benefits. Thus, we expect a negative relationship between *BRISK* and debt ratio. On the other hand, Chemmanur and Fulghieri (1997) argue that when insiders have private information about the underlying risk as well as the expected value of their firm's future cash flows, different types of equity classes are issued. Thus, the expected relationship between *BRISK* and equity ratio will be positive. Table 3.7 provides definition of the variables used in this study as well as used in the previous studies (shown in the last column).

Table 3.7
Description of Firm-level Explanatory Variables

This table describes the firm-level explanatory variables used in the empirical analysis in this chapter and also refers to the studies, which have used these variables in the last column of the table.

Variable	Description	Previous studies
TDR	Total debt ratio is defined as the ratio of total debt to total assets.	Booth et al. (2001)
TER	Total equity ratio is defined as the ratio of total common equity to total assets.	Jalilvand and Harris (1984)
NDTS	Non-debt tax shield is measured as the ratio of depreciation expense to total assets.	Titman and Wessels (1988)
PROFIT	Profit is measured as the ratio of earnings before interest, taxes and depreciation divided by total assets.	Miguel and Pindado (2001) Guad et al.(2005)
TANG	Assets tangibility is measured as the ratio of total net fixed asset divided by total assets.	Rajan and Zingales (1995), Wiwattanakantang (1999), Schmukler and Vesperoni

		(2001)
GROWTH	Growth opportunity is measured as the ratio of the sum of market value of equity and total debt to total assets.	
FDC	Current ratio is the ratio of total current assets to total current liabilities.	Deesomsak et al. (2004)
FCF	Free cash flow is the *PROFIT* multiplied by the reciprocal of *GROWTH i.e. PROFIT (1/GROWTH)*	Miguel and Pindado (2001)
INV	*INV* is equal to the total capital expenditure on the property, plant and equipment.	Love (2003)
BRISK	Business risk is measured as the change in absolute value of *ROA* for a year firm from year *t* and *t-1*.	Booth et al. (2001)
SIZE	Size is measured as a logarithm of total assets.	Fraser et al. (2005), Bhaduri (2002) , Deesomsak et al. (2004).
ROE	Return on shareholder equity is defined as the ratio of earnings after taxes to total common shareholders equity	

In the following sections, the univariate and bivariate analyses for some of these variables are reported. In discussing the univariate analysis, the next sections begins with an examination of the frequency distribution of debt ratio and proceeds to provide descriptive statistics of the explanatory variables shown in Table 3.7. These descriptive statistics are offered to gain some idea about the properties of these variables that might be useful for the selection of suitable estimation methods for the later multivariate analysis in Chapter 4.

3.4 Univariate Analysis

3.4.1 Distribution of Debt Ratios

This section explores the distribution of debt ratios to relate the impact of the beginning of the financial reforms and subsequent financial liberalization measures on the financing pattern of firms. Table 3.8 reports the distribution of the firm debt ratios over three sub-periods: 1991-1995, 1996-2000, and 2001-2004, for each country respectively. We report a Chi-Square test statistic under the null hypothesis that proportions of firms have been uniform across three sub-periods in each country. Chi-Square test statistics reported in Table 3.8 reject the null hypothesis for all the countries except Malaysia. An overall view of the distribution patterns of debt ratios for the countries where significant chi-square values were found seems to indicate that more recent debt ratios data series (2001-2004) are more positively skewed as well as less likely to follow a normal distribution than older data (1996-2000). In particular, in the case of South Korea, the distribution of debt ratios during the sub-period 1996-2000 show larger concentration of firm under categories 40%-49% and 50%-50%, and in the case of Thailand, 5 firms even reached the maximum level of debt ratios. As a result of this analysis, it would appear that assumptions of normality for debt ratios would not be tenable. Although normality can be achieved by transforming the data but there are no robust guidelines that would be appropriate for across countries.

Table 3.8

Frequency Distribution and Chi Square Test on Firms' Debt ratio

The data on the total debt of non-financial firms were downloaded from *Datastream* and *Worldscope* from 1991 to 2004. The debt ratio is defined as to total debt to total assets at the end of year. Chi-Square test values are reported under the null hypothesis of no change in the proportion of firms over the three periods: 1991-1995, 1996-2000, and 2001-2004.

	India			Indonesia		
	1991-1995	1996-2000	2001-2004	1991-1995	1996-2000	2001-2004
0-9%	7	15	37	16	7	45
10-19%	18	18	17	22	11	10
20-29%	24	25	24	26	11	9
30-39%	32	27	31	17	20	19
40-49%	35	35	12	28	16	14
50-59%	21	17	8	8	20	9
60-69%	4	2	5	2	19	3
70-79%	0	1	0	1	9	1
80-89%	1	0	3	0	3	4
90-99%	0	0	1	0	3	1
>100%	0	1	0	0	0	5
	142	141	138	120	119	120
Chi-square Test			*60.20*^{a}	*Chi-square Test*		*117.25*^{a}

	Malaysia			Pakistan		
	1991-1995	1996-2000	2001-2004	1991-1995	1996-2000	2001-2004
0-9%	32	24	16	27	16	27
10-19%	23	25	24	6	12	6
20-29%	19	24	20	2	8	2
30-39%	10	15	19	7	5	7
40-49%	9	16	17	6	10	6
50-59%	4	5	8	3	5	3
60-69%	1	1	4	1	1	1
70-79%	1	0	0	1	0	1
80-89%	1	0	0	1	0	0
90-99%	0	0	1	1	0	1
>100%	0	0	1	0	0	0
	100	110	110	55	57	54
Chi-square Test			*20.45*	*Chi-square Test*		*18.73*^{b}

	South Korea			Thailand		
	1991-1995	1996-2000	2001-2004	1991-1995	1996-2000	2001-2004
0-9%	4	5	33	11	17	36
10-19%	12	8	36	12	9	20
20-29%	20	29	29	15	16	13
30-39%	42	31	31	25	9	10
40-49%	47	56	11	21	10	11
50-59%	40	42	3	20	23	10
60-69%	20	12	1	5	10	3
70-79%	5	4	2	0	5	3
80-89%	1	1	1	2	6	2
90-99%	0	2	2	0	2	1
>100%	0	1	0	0	5	3
	191	191	149	111	112	112
Chi-square Test			*159.64*^{a}	*Chi-square Test*		*61.55*^{a}

^{a}, ^{b}, and ^{c} respectively denote statistical significance at a 1-, 5-, and 10-percent level

Persistence of Debt ratios

It would be interesting to know the percentage of companies that do not change deciles over time during these time periods. The transition of firms from lower to higher or status quo would provide much clearer picture of adjustment in the capital structure. This section reports on the changes, from one period to another, in the average debt ratios of the firms for each country in the sample period. We first calculate the average debt ratio of firms in each country over three periods: 1991-1995, 1996-2000, and 2001-2004. Then, the firm is placed into one of 11 categories. Table 3.9 shows the number of firms moving from category *i* to category *j*. Elements in the diagonal in the table (shaded cells) reflect persistence of the debt ratios. The transition matrix for the periods 1991-1995 to 1996-2000 is presented in Panel A, Panel B reports the period 1996-2000 whilst Panel C reports the changes in the debt ratio in the 1991-1995 periods and the period 2001-2004. We notice that most of the entries are concentrated in the upper left quadrants of the table. Thus, most of the firms have debt ratios at 50% or lower. In a world of bankruptcy costs this behaviour is expected.

The transition matrix shows that 40% of the sample firms in India, 27% in Pakistan, 37% and 22% in South Korea and Thailand respectively moved from higher debt ratio categories to lower debt ratio categories. A roughly comparable percentage of firms seem to have maintained their debt ratios across countries17% (India), 15% (Indonesia), 18% (Malaysia), and 19% (Pakistan) respectively. The table also shows that 14% firms in Thailand, 8% in Indonesia and 4% in South Korea moved towards higher debt ratio categories (see Panel A and B). These firms seem to have been near bankruptcy. Indeed, some of the firms in our sample for Indonesia, South Korea, and Thailand were reported to have undergone restructuring in 1998 and 1999.

Table 3.9

Persistence of Debt ratios

This table presents the percentage of firms moving across percentiles of average debt ratio from period 1991-1995 to 1996-2000 (Panel A), period 1996-2000 to 2001-2004 (Panel B), and from the start of the sample period to the end of sample period (Panel C). The debt ratio is defined as the ratio of total debt to total assets. The firm-level debt ratios were calculated using accounting data downloaded from *Datastream* and *Worldscope* over the sample period of 1991-2004.

India

Panel

1996-2000

A	(in%)	0-9	10_19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	>100	Total
1991-1995	0-9	2.84	2.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.97
	10_19	6.38	4.96	1.42	0.71	0.00	0.00	0.00	0.00	0.00	0.00	0.71	14.18
	20-29	2.13	3.55	7.09	4.26	1.42	0.00	0.00	0.00	0.00	0.00	0.00	18.45
	30-39	0.71	1.42	5.67	9.93	4.96	0.71	0.71	0.00	0.00	0.00	0.00	24.11
	40-49	0.71	0.00	2.84	5.67	6.38	7.80	0.00	0.00	0.00	0.00	0.00	23.40
	50-59	0.00	0.00	0.71	1.42	6.38	2.13	1.42	0.00	0.00	0.00	0.00	12.06
	60-69	0.00	0.00	0.00	0.71	0.71	0.71	0.00	0.00	0.00	0.00	0.00	2.13
	70-79	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	80-89	0.00	0.00	0.00	0.00	0.00	0.71	0.00	0.00	0.00	0.00	0.00	0.71
	90-99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	>100	0.00	0.00	0.00	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	12.77	12.06	17.73	22.7	19.85	12.06	2.13	0	0	0	0.71	100.00

2001-2004

B	(in%)	0-9	10_19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	>100	Total
1996-2000	0-9	10.95	1.46	0.00	0.73	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.14
	10_19	8.76	1.46	0.73	1.46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.41
	20-29	5.11	5.84	1.46	2.92	0.00	0.73	0.00	0.00	0.73	0.00	0.00	16.79
	30-39	0.73	4.38	8.03	7.30	1.46	0.00	0.73	0.00	0.00	0.00	0.00	22.63
	40-49	1.46	0.00	6.57	5.84	4.38	1.46	0.00	0.00	0.00	0.00	0.00	19.71
	50-59	0.73	0.00	1.46	3.65	2.92	2.19	1.46	0.00	0.00	0.00	0.00	12.41
	60-69	0.00	0.00	0.00	0.00	0.00	0.00	0.73	0.00	1.46	0.00	0.00	0.00
	70-79	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	80-89	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00	0.00
	90-99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.19
	>100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.73	0.00	0.00	0.73
	Total	27.74	13.14	18.25	21.90	8.76	4.38	2.92	0.00	2.92	0.00	0.00	100.00

2001-2004

C	(in%)	0-9	10_19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	>100	Total
1991-1995	0-9	2.90	1.45	0.00	0.72	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.07
	10_19	8.70	1.45	0.72	2.17	0.00	0.00	0.00	0.00	1.45	0.00	0.00	14.49
	20-29	7.97	3.62	2.90	3.62	0.00	0.00	0.72	0.00	0.00	0.00	0.00	18.84
	30-39	4.35	3.62	6.52	5.80	2.90	0.00	0.72	0.00	0.00	0.00	0.00	23.91
	40-49	1.45	2.17	5.07	6.52	3.62	2.90	1.45	0.00	0.00	0.00	0.00	23.19
	50-59	1.45	0.72	2.17	2.17	2.17	0.72	0.00	0.00	1.45	0.00	0.00	10.87
	60-69	0.00	0.00	0.72	0.72	0.72	0.72	0.00	0.00	0.00	0.00	0.00	2.90
	70-79	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	80-89	0.72	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.72
	90-99	0.00	0.00%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	>100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	27.54	13.04	18.12	21.74	9.42	4.35	2.90	0.00	2.90	0.00	0.00	100.00

Table 3.9 (continued...)

Indonesia

Panel

1996-2000

A	(in%)	0-9	10_19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	>100	Total
1991-1995	0-9	4.24	1.69	0.85	5.93	0.00	0.00	0.00	0.85	0.00	0.00	0.00	13.56
	10_19	1.69	2.54	2.54	4.24	5.93	0.85	1.69	0.00	0.00	0.00	0.00	19.45
	20-29	0.85	3.39	0.85	3.39	5.08	5.93	1.69	1.69	0.00	0.00	0.00	22.88
	30-39	0.85	0.85	3.39	3.39	0.00	1.69	4.24	0.85	0.00	0.00	0.00	15.25
	40-49	0.00	0.85	0.85	0.00	1.69	4.24	5.08	3.39	1.69	1.69	0.00	19.49
	50-59	0.00	0.00	0.00	0.00	0.85	2.54	2.54	0.00	0.85	0.00	0.00	6.78
	60-69	0.00	0.00	0.00	0.00	0.00	1.69	0.00	0.00	0.00	0.00	0.00	1.69
	70-79	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.85	0.00	0.00	0.00	0.85
	80-89	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	90-99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	>100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	7.63	9.32	8.47	16.95	13.56	16.95	15.25	7.63	2.54	1.69	0.00	100.00

2001-2004

B	(in%)	0-9	10_19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	>100	Total
1996-2000	0-9	6.78	0.00	0.00	0.85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.63
	10_19	5.93	0.85	1.69	0.00	0.85	0.00	0.00	0.00	0.00	0.00	0.00	9.32
	20-29	5.08	0.85	0.00	1.69	1.69	0.00	0.00	0.00	0.00	0.00	0.00	9.32
	30-39	6.78	3.39	1.69	2.54	1.69	0.85	0.00	0.00	0.00	0.00	0.00	16.90
	40-49	5.08	1.69	0.85	1.69	0.85	0.00	0.00	0.85	0.00	0.00	1.69	12.71
	50-59	6.78	0.85	0.85	2.54	1.69	2.54	0.00	0.00	0.85	0.00	0.85	16.95
	60-69	1.69	0.00	2.54	1.69	5.08	1.69	0.00	0.85	0.85	0.00	0.85	15.25
	70-79	0.85	0.00	0.00	5.08	0.00	0.00	1.69	0.00	0.00	0.00	0.00	7.63
	80-89	0.00	0.00	0.00	0.00	0.00	0.00	0.85	0.00	1.69	0.00	0.00	2.54
	90-99	0.00	0.00	0.00	0.85	0.00	0.00	0.00	0.00	0.00	0.00	0.85	1.69
	>100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	38.98	7.63	7.63	16.95	11.86	5.08	2.54	1.69	3.39	0.00	4.24	100.00

2001-2004

C	(in%)	0-9	10_19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	>100	Total
1991-1995	0-9	5.88	0.84	1.68	3.36	0.84	0.00	0.84	0.00	0.00	0.00	0.00	13.45
	10_19	5.88	2.52	1.68	1.68	4.20	1.68	0.00	0.84	0.00	0.00	0.84	19.33
	20-29	10.92	3.36	1.68	2.52	1.68	0.84	0.00	0.00	0.00	0.00	1.68	22.69
	30-39	7.56	0.84	0.84	2.52	1.68	0.00	0.00	0.84	0.00	0.00	0.84	15.13
	40-49	4.20	0.00	1.68	5.88	2.52	2.52	1.68	0.00	1.68	0.00	0.84	21.01
	50-59	2.52	0.00	0.84	0.00	0.84	0.00	0.00	0.00	1.68	0.00	0.00	5.88
	60-69	0.84	0.00	0.00	0.00	0.84	0.00	0.00	0.00	0.00	0.00	0.00	1.68
	70-79	0.00	0.00	0.00	0.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.84
	80-89	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	90-99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	>100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	37.82	7.56	8.40	16.81	12.61	5.04	2.52	1.68	3.36	0.00	4.20	100.00

Table 3.9 (continued...)

Malaysia

Panel

1996-2000

A	(in%)	0-9	10_19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	>100	Total
1991-1995	0-9	17.00	9.00	5.00	1.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	34.00
	10_19	0.00	7.00	9.00	4.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	21.00
	20-29	2.00	3.00	6.00	4.00	4.00	0.00	1.00	0.00	0.00	0.00	0.00	20.00
	30-39	0.00	3.00	1.00	0.00	3.00	3.00	0.00	0.00	0.00	0.00	0.00	10.00
	40-49	0.00	0.00	1.00	3.00	4.00	0.00	0.00	0.00	0.00	0.00	0.0%	8.00
	50-59	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	4.00
	60-69	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
	70-79	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
	80-89	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
	90-99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	>100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	21.00	23.00	23.00	12.00	16.00	4.00	1.00	0.00	0.00	0.00	0.00	100.00

2001-2004

B	(in%)	0-9	10_19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	>100	Total
1996-2000	0-9	10.91	6.36	1.82	1.82	0.91	0.00	0.00	0.00	0.00	0.00	0.91	22.73
	10_19	2.73	10.00	5.45	5.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	23.64
	20-29	1.82	8.18	4.55	2.73	2.73	0.00	0.91	0.00	0.00	0.00	0.00	20.91
	30-39	0.91	0.00	0.91	3.64	4.55	2.73	0.00	0.00	0.00	0.00	0.00	12.73
	40-49	0.91	0.00	0.91	2.73	6.36	2.73	1.82	0.00	0.00	0.00	0.00	15.45
	50-59	0.00	0.00	0.91	0.00	0.91	0.91	0.91	0.00	0.00	0.00	0.00	3.64
	60-69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.91	0.00	0.91
	70-79	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	80-89	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	90-99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	>100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	17.27	24.55	14.55	16.36	15.45	6.36	3.64	0.00	0.00	0.91	0.91	100.00

2001-2004

C	(in%)	0-9	10_19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	>100	Total
1991-1995	0-9	9.00	9.00	5.00	6.00	3.00	0.00	1.00	0.00	0.00	0.00	1.00	34.00
	10_19	4.00	6.00	2.00	4.00	3.00	1.00	1.00	0.00	0.00	0.00	0.00	21.00
	20-29	2.00	5.00	1.00	3.00	6.00	2.00	0.00	0.00	0.00	1.00	0.00	20.00
	30-39	1.00	2.00	2.00	0.00	1.00	2.00	2.00	0.00	0.00	0.00	0.00	10.00
	40-49	0.00	0.00	1.00	3.00	2.00	2.00	0.00	0.00	0.00	0.00	0.00	8.00
	50-59	0.00	1.00	2.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00
	60-69	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
	70-79	0.00	1.00	0.00	0.00	0.00	0.0	0.00	0.00	0.00	0.00	0.00	1.00
	80-89	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
	90-99	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00
	>100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	16.00	24.00	14.00	17.00	16.00	7.00	4.00	0.00	0.00	1.00	1.00	100.00

Table 3.9 (continued...)

Pakistan

Panel		1996-2000											
A	(in%)	0-9	10_19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	>100	Total
1991-1995	0-9	4.44	6.67	6.67	0.00	0.00	2.22	2.22	0.00	0.00	0.00	0.00	22.22
	10_19	0.00	6.67	4.44	2.22	2.22	0.00	0.00	0.00	0.00	0.00	0.00	15.56
	20-29	2.22	2.22	2.22	0.00	2.22	0.00	0.00	0.00	0.00	0.00	0.00	8.89
	30-39	2.22	0.00	6.67	6.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.56
	40-49	2.22	0.00	0.00	6.67	6.67	4.44	6.67	0.00	0.00	0.00	0.00	26.67
	50-59	0.00	0.00	0.00	0.00	0.00	2.22	4.44	0.00	0.00	0.00	0.00	6.67
	60-69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	70-79	0.00	0.00	0.00	0.00	0.00	2.22	0.00	0.00	0.00	0.00	0.00	2.22
	80-89	0.00	0.00	0.00	0.00	2.22	0.00	0.00	0.00	0.00	0.00	0.00	2.22
	90-99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	>100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	11.11	15.56	20.00	15.56	13.33	11.11	13.33	0.00	0.00	0.00	0.00	100.00

		2001-2004											
B	(in%)	0-9	10_19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	>100	Total
1996-2000	0-9	7.69	3.85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.54
	10_19	13.46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.46
	20-29	7.69	5.77	0.00	1.92	0.00	0.00	5.77	0.00	0.00	0.00	0.00	21.15
	30-39	1.92	7.69	1.92	3.85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.38
	40-49	0.00	0.00	3.85	0.00	7.69	1.92	0.00	0.00	0.00	0.00	0.00	13.46
	50-59	1.92	0.00	1.92	1.92	1.92	5.77	0.00	0.00	0.00	0.00	1.92	15.38
	60-69	0.00	1.92	0.00	0.00	3.85	0.00	0.00	1.92	1.92	0.00	0.00	9.62
	70-79	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	80-89	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	90-99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	>100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	32.69	19.23	7.69	7.69	13.46	7.69	5.77	1.92	1.92	0.00	1.92	100.00

		2001-2004											
C	(in%)	0-9	10_19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	>100	Total
1991-1995	0-9	4.76	0.00	0.00	2.38	0.00	2.38	4.76	0.00	2.38	0.00	0.00	16.67
	10_19	16.67	0.00	0.00	0.00	2.38	0.00	0.00	0.00	0.00	0.00	0.00	19.05
	20-29	7.14	0.00	2.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.52
	30-39	0.00	11.90	0.00	2.38	0.00	0.00	2.38	0.00	0.00	0.00	0.00	16.67
	40-49	0.00	7.14	4.76	4.76	7.14	0.00	0.00	2.38	0.00	0.00	2.38	28.57
	50-59	0.00	0.00	0.00	0.00	2.38	2.38	0.00	0.00	0.00	0.00	0.00	4.76
	60-69	2.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.38
	70-79	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	80-89	0.00	0.00	0.00	0.00	0.00	2.38	0.00	0.00	0.00	0.00	0.00	2.38
	90-99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	>100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	30.95	19.05	7.14	9.52	11.90	7.14	7.14	2.38	2.38	0.00	2.38	100.00

Table 3.9 (continued...)

South Korea

Panel		1996-2000												
A	(in%)	0-9	10_19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	>100	Total
1991-1995	0-9	0.53	1.58	0.00	0.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.63
	10_19	1.58	1.58	3.16	0.53	0.53	0.00	0.00	0.00	0.00	0.00	0.00	7.37
	20-29	0.53	2.11	3.68	2.63	1.58	0.53	0.00	0.00	0.00	0.00	0.00	11.05
	30-39	0.53	0.00	4.74	4.21	7.89	2.63	0.00	0.00	0.00	0.53	0.00	20.53
	40-49	0.00	0.00	2.11	6.32	11.05	4.74	2.11	0.00	0.00	0.00	0.53	26.84
	50-59	0.00	0.00	2.11	0.00	7.89	5.79	2.11	0.00	0.00	0.53	0.00	18.42
	60-69	0.00	0.00	0.00	0.53	1.05	4.21	1.58	2.11	0.53	0.00	0.00	10.00
	70-79	0.00	0.00	0.53	1.05	0.53	1.05	0.00	0.00	0.00	0.00	0.00	3.16
	80-89	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	90-99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	>100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	3.16	5.26	16.32	15.79	30.50	18.95	5.79	2.11	0.53	1.05	0.53	100.00

		2001-2004											
B	(in%)	0-9	10_19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	>100	Total
1996-2000	0-9	2.70	0.68	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.38
	10_19	1.35	0.68	2.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.05
	20-29	4.73	5.41	4.05	1.35	0.68	0.00	0.00	0.00	0.00	0.00	0.00	16.22
	30-39	6.08	4.73	4.05	2.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	17.57
	40-49	4.05	8.11	6.76	8.11	2.03	0.68	0.00	0.00	0.00	0.68	0.00	30.41
	50-59	3.38	3.38	4.05	6.76	0.68	0.68	0.00	0.00	0.00	0.00	0.00	18.92
	60-69	1.35	0.00	0.00	0.68	0.68	0.00	1.35	0.68	0.68	0.00	0.00	5.41
	70-79	0.00	0.68	0.00	0.68	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.35
	80-89	0.00	0.00	0.68	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.68
	90-99	0.00	0.00	0.00	0.00	0.68	0.68	0.00	0.00	0.00	0.00	0.00	1.35
	>100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.68	0.00	0.68
	Total	23.65	23.65	21.62	20.27	4.73	2.03	1.35	0.68	0.68	1.35	0.00	100.00

		2001-2004											
C	(in%)	0-9	10_19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	>100	Total
1991-1995	0-9	0.67	1.34	1.34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.36
	10_19	4.70	1.34	2.01	0.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.72
	20-29	2.01	0.67	3.36	1.34	0.00	0.00	0.00	0.00	0.00	0.67	0.00	8.05
	30-39	4.70	5.37	2.01	4.70	2.68	0.67	0.00	0.00	0.00	0.00	0.00	20.13
	40-49	5.37	9.40	5.37	5.37	0.00	0.67	0.67	0.00	0.67	0.67	0.00	28.19
	50-59	1.34	3.36	5.37	5.37	2.01	0.00	0.00	0.67	0.00	0.00	0.00	18.12
	60-69	2.01	1.34	2.01	3.36	0.00	0.67	0.67	0.00	0.00	0.00	0.00	10.07
	70-79	2.68	0.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.36
	80-89	0.00	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	90-99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	>100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	23.49	23.49	21.48	20.81	4.70	2.01	1.34	0.67	0.67	1.34	0.00	100.00

Table 3.9 (continued...)

Thailand

Panel

1996-2000

A	(in %)	0-9	10_19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	>100	Total
1991-1995	0-9	9.91	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.91
	10_19	0.90	2.70	4.50	0.90	0.00	1.80	0.00	0.00	0.00	0.00	0.00	10.81
	20-29	4.50	1.80	5.41	0.90	2.70	1.80	0.90	0.00	0.00	0.00	0.90	18.92
	30-39	0.00	0.90	3.60	1.80	3.60	3.60	0.90	0.90	0.90	0.00	0.90	17.12
	40-49	0.00	1.80	0.00	3.60	2.70	6.31	5.41	0.00	2.70	0.00	0.90	23.42
	50-59	0.00	0.00	0.90	0.00	1.80	5.41	2.70	0.90	0.00	0.90	0.90	13.51
	60-69	0.00	0.00	0.00	0.00	0.00	0.90	0.90	0.90	0.90	0.00	0.90	4.50
	70-79	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	80-89	0.00	0.00	0.00	0.90	0.00	0.00	0.00	0.00	0.00	0.90	0.00	1.80
	90-99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	>100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	15.30	7.21	14.41	8.11	10.81	19.82	10.81	2.70	4.50	1.80	4.50	100.00

2001-2004

B	(in%)	0-9	10_19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	>100	Total
1996-2000	0-9	12.50	2.68	0.00	0.00	0.89	0.00	0.00	0.00	0.00	0.00	0.00	16.07
	10_19	3.57	2.68	0.89	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.14
	20-29	8.93	2.68	0.89	1.79	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14.29
	30-39	2.68	3.57	0.89	0.89	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.04
	40-49	3.57	0.89	2.68	0.89	1.79	0.00	0.89	0.00	0.00	0.00	0.00	10.71
	50-59	1.79	0.89	3.57	5.36	2.68	2.68	0.89	1.79	0.00	0.00	0.00	19.64
	60-69	0.89	0.00	1.79	0.00	3.57	2.68	0.00	0.00	0.00	0.89	0.89	10.71
	70-79	0.00	0.89	0.89	0.89	0.00	0.00	0.00	0.00	0.0	0.00	0.00	2.68
	80-89	0.00	0.00	0.00	0.00	0.89	0.89	0.89	0.00	0.00	0.00	1.79	4.46
	90-99	0.00	0.00	0.00	0.00	0.00	0.00	0.89	0.00	0.89	0.00	0.00	1.79
	>100	0.00	1.79	0.00	0.00	0.89	0.89	0.00	0.00	0.89	0.00	0.00	4.46
	Total	33.93	16.07	11.61	9.82	10.71	7.14	3.57	1.79	1.79	0.89	2.68	100.00

2001-2004

C	(in%)	0-9	10_19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	>100	Total
1991-1995	0-9	8.11	1.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.91
	10_19	5.41	2.70	0.90	0.90	0.00	0.00	0.00	0.90	0.00	0.00	0.00	10.81
	20-29	9.01	1.80	3.60	1.80	1.80	0.00	0.00	0.90	0.00	0.00	0.00	18.92
	30-39	3.60	5.41	1.80	1.80	0.90	0.90	2.70	0.00	0.00	0.00	0.00	17.12
	40-49	6.31	3.60	1.80	1.80	3.60	2.70	0.00	0.00	0.90	0.00	2.70	23.42
	50-59	0.90	0.90	2.70	1.80	3.60	2.70	0.90	0.00	0.00	0.00	0.00	13.51
	60-69	0.00	0.00	0.90	0.90	0.90	0.90	0.00	0.00	0.00	0.90	0.00	4.50
	70-79	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	80-89	0.00	0.00	0.00	0.90	0.00	0.00	0.00	0.00	0.90	0.00	0.00	1.80
	90-99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	>100	0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00	0.00	0.00	0.00	0.00
	Total	33.33	16.22	11.71	9.91	10.81	7.21	3.60	1.80	1.80	0.90	2.70	100.00

Table 3.9 (concluded)

Table 3.10 summarizes the overall impact of liberalization measures and the Asian financial crisis on the movements of the firms across percentiles. By comparing the movements of firms from *lower* to *higher* percentiles, interesting findings about adjustment (no adjustment) in debt ratios of firms can be ascertained.

Table 3.10
Transition of Debt Ratios in Sample Countries, 1991-2004

This table shows the percentage of firms that have shown persistence, movement towards lower regime and higher regime of average debt ratio over three time periods 1991-1995, 1996- 2000 and 2001-2004. The movement to a lower and higher regime is defined as a firm's movement from lower percentile towards higher percentile of average debt ratio and *vice versa* in three time periods. The total debt ratio is defined as total debt to total asset ratio. The debt ratios were calculated using data obtained from DataStream and Worldscope over the sample period of 1991-2004.

	Persistence		Lower Regime		Higher Regime	
Country	(P1xP2)	(P2xP3)	(P1xP2)	(P2xP3)	(P1xP2)	(P2xP3)
India	33	29	40	56	26	15
Indonesia	16	15	15	68	69	17
Malaysia	35	35	19	23	46	42
Pakistan	29	25	27	56	44	19
South Korea	30	21	35	78	35	7
Thailand	29	21	22	65	49	14

Note:
(P1xP2) compare movements from period 1991-1995 to 1996-2000;
(P2xP3) compare movements from period 1996-2000 to 2001-2004;
Where: P1 denotes period from 1991-1995
P2 denotes period from 1996-2000
P3 denotes period from 2001-2004

Looking at the table 3.10, it appears that except India, South Korea and Thailand, there have been tendency towards maintenance of debt ratio in other countries. Interestingly except Malaysia, there has been greater persistence towards reducing debt ratio in other countries. Comparing the percentage of firms moving between periods (P1xP2) with (P2xP3) in table, it can be seen that there has been increase of 2 times (Pakistan and South Korea) to 4 times (Indonesia) in the percentage of firms moving towards low debt ratio regime. Recall from Section 3.2, that the sum of banking sector liberalization was either 5 (India, Malaysia and South Korea) or 6 (Indonesia, Pakistan, Thailand) by the end of 1995. It can be conjectured that these measures have produced changes in average debt ratio of firms, i.e., percentage of firms which are impacted by these measures varies from a high of 70% in

Indonesia, Pakistan, South Korea and Thailand to relatively low of 65% in India and Malaysia from 1991-1995 to 1996-2000. The latter result is corroborated by the fact a relatively a higher percentage of firms 33% and 35% in India and Malaysia have shown persistence in their average debt ratio.

There are several reasons for the clustering found in the case of debt ratios. First, firms seems to have timed equity issues as suggested by recent market timing literature (see Section 2.3.1.5, Chapter 2). Second, firms might be under regulatory pressure to have a certain fixed ratio of debt-to-equity as in the case of Pakistan. Third, firms might have grown larger in size due to increase in economic growth followed by liberalization (Mitton, 2006; Bekaert et al., 2003, 2001), and as a result, most firms suddenly increase their borrowing. More importantly has been the impact of the Asian financial crisis on the balance sheet of the firms. For instance, a change in stock exchange regulations required companies to record all foreign exchange loses rather than amortize them over a five year period as previously allowed results in major loses and negative equity in the balance sheet of the firms in Thailand. This preliminary analysis seems to indicate that firms might made adjustments (upwards) in the debt and equity ratios in the three periods, with major changes clustered in the sub-period 1996-2000. Thus, the results support the argument of this section that, relative proportion of firms for different capital structure ratios have changed over the sample period.

This section focuses on the descriptive statistics of explanatory variables assumed to have relationship with debt ratio and equity ratio. The univariate analysis provides us with assessment of central tendency, dispersion and underlying distribution for these variables. In order to prepare data for multivariate analysis, we evaluate whether these variables to be used in estimation exhibit normality. In this regard, we examine the skewness and kurtosis of each variable, and use appropriate parametric / non-parametric test to see whether capital structure ratios exhibit changes in the pre-post liberalization periods.

3.4.2 Descriptive Statistics

The descriptive statistics are shown in Table 3.10. We report three measures of leverage – *LEV*, *STB* and *LTD*. The first measure of leverage is stock measure of leverage, and is related to agency costs associated with debt. It shows how the firms in each country have been financed in the past, and also relative claims on firms' value held by outside equity and debt holders (Rajan and Zingales, 1995). The second and third measure of leverage indicates the maturity structure of firm's debt in the balance sheet at the end of financial year. The last two measure of leverage has been most commonly used in recent studies.

The mean values in Table 3.9 shows that *LEV* varies from a low of 28% in Malaysia to a high of 59% in South Korea. The higher leverage ratio in South Korea might be due to existence of relationship-based banking system as suggested in previous studies. Indeed Rajan and Zingales (1998) show that relationship-based systems ensures a return to the financier by granting her some form of power over the firm being financed. The simplest form of power is when the financier has (implicit or explicit) ownership of the firms. Booth et al. (2001) have also reported a high debt ratio of 73% for South Korea over the period of 1980-1990. *STB* is relatively higher in Indonesia, Malaysia, South Korea and Thailand. The higher level of short-term borrowing compared to long-term borrowing in these countries is not surprising for many reasons. First, it may be due to the absence of well functioning long-term corporate bond markets in these countries as suggested in ADB report. Second, short-term financing appeared to have lower default risk compared to long-term financing. Indeed Schmukler and Vesperoni (2001) have shown that financial liberalization was associated with a shorter debt maturity in East Asian countries, which recent empirical evidence suggest played a crucial role in the Asian financial crisis. *STB* was 0.716 during 1980-90 in these East Asian countries.

The table 3.10 shows descriptive statistics of explanatory variables over the entire sample period which is standard in capital structure research. The definitions of these variables are given in Table 3.8. Here, in passing, we report only the descriptive statistics of these variables. Except for the firms in Pakistan and Thailand, *NDTS* seem to be similar. It is interesting to find that firms in India and Pakistan have high *PROFIT* and *ROE,* a proxy for shareholder returns, compared to the firms in other sample countries, for instance, Malaysia and South Korea, which have *PROFIT* and *ROE* less than 10%. Thus, with reference to profitability of firms, it seems that countries fall into a high profitable group consisting of India, Pakistan; moderately profitable group Indonesia and Thailand and less profitable group consisting of Malaysia and Korea. The table also shows that *PROFIT*, *ROE* and *FCF* measures exhibit significant negative skewness in most of the countries. The negative skewness measure for *PROFIT* and *ROE* is typically larger in the case of Indonesia, Malaysia, South Korea and Thailand, suggesting that there are substantial negative returns for firms[5] which might be attributed to deterioration in the firms' performance near the financial crisis.

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[5] Our sample shows that percentage of firms with negative values of *ROE* 13% in 1996 and 28% in 1997 in Thailand were; South Korea, 20% in 1996 and 30% in 1997; Malaysia, 10% in 1996 and 1997; and Indonesia 1% in 1996 and 35% in 1997.

Table 3.11
Summary Descriptive Statistics

The firm-level data were downloaded from *Datastream* and *Worldscope* and consists of key items in the balance sheet, income statement and cash flow statements in each country from 1991 to 2004. The table shows the descriptive statistics of the variables using the cleaned data without outliers. We discarded all values that are at least three standard deviation from the average value for the country following Booth et al. (2001) to make our sample comparable to their dataset. *LEV* is ratio of total debt to total debt plus market value of equity; *STB* is ratio of total borrowing less than one year to total debt; *LTD* is ratio of long-term debt to total debt; *NDTS* is the ratio of total depreciation expenses to total assets; *FDC* is ratio of total current assets divided by current liabilities; *PROFIT* is ratio of earning before interest taxes and depreciation to total assets; *ROE* is ratio of earnings after tax to total common shareholders equity; *BRISK* is defined as absolute value of the difference between return on asset in year *t* and *t-1*; *TANG* is ratio of net fixed assets to total assets; *GROWTH* is ratio of sum of market value of equity and total debt to total assets; *FCF* is profitability multiplied by reciprocal of *q*-ratio (market to book ratio obtained from Datastream); *INV* is total investment in plant, property and equipment (obtained from cash flow statements form Worldscope). *SIZE* is measured as natural log of total assets. All variables are nominal. For each variable, S.D. is the standard deviation, Max is maximum values and Min is minimum value. Jarque-Bera test was used to test the significance of the Kurtosis value of a variable.

Country	*LEV*	*STB*	*LTD*	*NDTS*	*FDC*	*PROFIT*	*ROE*	*BRISK*	*TANG*	*GROWTH*	*FCF*	*INV*	*SIZE*
India													
Mean	0.4000	0.3798	0.3847	0.0331	1.4705	0.1272	0.1053	0.0366	0.4104	1.2146	0.1181	0.1629	11.9148
S.D	0.2929	0.2640	0.2987	0.0161	0.5080	0.0794	0.1503	0.0478	0.1810	0.8915	0.0851	0.1801	1.3250
Max	1.0090	0.5817	1.4889	0.1004	3.2563	0.4146	0.9906	0.5817	0.9501	4.6530	0.4672	1.0180	8.1288
Min	0.0000	0.0000	0.0000	0.0000	0.0000	-0.4177	-0.8005	0.0000	0.0000	0.0555	-0.4614	0.0000	1.3250
Skewness	0.3032	3.7563	0.9381	0.8707	0.6407	0.2157	0.2390	3.7564	0.2606	1.6169	-0.1134	1.9283	0.0905
Kurtosis	1.9088 ^{a}	2.8164 ^{a}	3.7925^{a}	3.9506 ^{a}	3.8944 ^{a}	5.8909 ^{a}	8.7611 ^{a}	26.5860 ^{a}	2.5135 ^{a}	5.1980 ^{a}	8.6907 ^{a}		2.8204
Indonesia													
Mean	0.4589	0.6003	0.3728	0.0338	1.7203	0.0820	0.1329	0.0891	0.3841	0.9298	0.0841	0.1299	11.5544
S.D	0.3122	0.3537	0.2437	0.0234	1.2572	0.1282	0.3306	0.0905	0.2141	0.4547	0.1417	0.1733	1.5170
Max	1.0000	1.0000	1.4987	0.1392	6.9660	0.5297	1.3286	0.5090	0.9451	2.5587	0.5994	0.8202	16.1207
Min	0.0000	0.0000	0.0000	0.0000	0.0495	-1.0944	-1.2980	0.0000	0.0000	0.0642	-0.4776	0.0002	3.6668
Skewness	0.0728	-0.2485	2.8187	1.4377	1.4984	-0.9936	-0.7477	1.6812	0.4491	1.1383	-0.0386	2.2253	-0.0498
Kurtosis	1.7377 ^{a}	1.5434 ^{a}	2.8187^{a}	5.5207 ^{a}	5.3685 ^{a}	11.7886 ^{a}	6.5222 ^{a}	6.2540 ^{a}	2.2760 ^{a}	4.2342 ^{a}	5.1962 ^{a}		4.4418 ^{a}
Malaysia													
Mean	0.2818	0.6095	0.2464	0.0261	1.6151	0.0587	0.0876	0.0426	0.3951	1.1782	0.0521	0.1158	12.4689
S.D	0.2719	0.3312	0.2887	0.0197	1.0483	0.0867	0.1875	0.0467	0.2309	0.7787	0.0746	0.1624	1.3930
Max	1.0000	1.0013	1.4706	0.1267	5.8160	0.4002	0.8040	0.2507	0.9875	4.2150	0.3471	0.7552	16.5741
Min	0.0000	0.0000	0.0000	0.0000	0.0000	-0.3970	-0.8585	0.0000	0.0000	0.1044	-0.3534	0.0000	8.5665
Skewness	0.8154	-0.3579	1.6301	1.1523	1.3904	-0.7662	-0.8227	1.7568	0.1696	1.4551	-0.7344	2.4817	0.1536
Kurtosis	2.5129^{a}	1.7837 ^{a}	5.5596^{a}	4.7029 ^{a}	2.1801 ^{a}	7.9257 ^{a}	7.9990 ^{a}	6.1960 ^{a}	2.1855a	4.9163 ^{a}	7.4907 ^{a}		3.0210 ^{b}
Pakistan													
Mean	0.4357	0.5707	0.1976	0.0429	1.1613	0.1299	0.2383	0.0842	0.4541	0.7897	0.1809	0.1092	11.1301
S.D	0.3253	0.3073	0.1980	0.0202	0.4106	0.1055	0.2636	0.0716	0.0584	0.4505	0.1572	0.1474	1.3241
Max	1.0000	1.0000	1.2066	0.1179	2.5362	0.5276	0.9868	0.2677	1.7871	2.2023	0.7967	0.9961	14.8830
Min	0.0000	0.0000	0.0000	0.0012	0.1060	-0.2747	-1.4442	0.0000	0.0584	0.0325	-0.3998	0.0012	7.8774
Skewness	0.2581	-0.0485	1.6892	0.6000	0.6619	0.1801	-1.3164	0.8135	0.7272	1.0451	0.7398	2.9363	0.3361
Kurtosis	1.7551	1.7205	7.1043^{a}	3.2438 ^{a}	3.8622 ^{a}	4.9833 ^{a}	10.1153 ^{a}	2.6276 ^{a}	4.8118 ^{a}	4.1492 ^{a}	5.2841 ^{a}		2.8398 ^{a}

Table 3.11(continued...)

Country	*LEV*	*STB*	*LTD*	*NDTS*	*FDC*	*PROFIT*	*ROE*	*BRISK*	*TANG*	*GROWTH*	*FCF*	*INV*	*SIZE*
South Korea													
Mean	0.5972	0.5778	0.3710	0.0353	1.2230	0.0572	0.0695	0.0334	0.3765	0.6853	0.0869	0.1245	12.6608
S.D	0.2514	0.2280	0.3015	0.0243	0.5805	0.0543	0.1459	0.0356	0.1734	0.2545	0.0877	0.1591	1.5609
Max	1.0000	1.0000	1.4888	0.1367	3.6041	0.2462	0.5571	0.1746	0.9136	1.5890	0.4293	0.9993	17.8737
Min	0.0000	0.0000	0.0000	0.0000	0.0938	-0.2561	-0.5516	0.0000	0.0001	0.0291	-0.3790	0.0000	8.7937
Skewness	-0.4502	-0.2115	1.2310	1.3386	1.3056	-0.9339	-0.8022	1.6575	0.2707	0.4096	-0.2471	2.4364	0.6592
Kurtosis	2.3745 ^{a}	2.7409 ^{a}	4.4201^{a}	5.1288 ^{a}	4.9775 ^{a}	7.2927 ^{a}	6.6775 ^{a}	5.4175 ^{a}	2.6189 ^{a}	3.6323 ^{a}	6.3091 ^{a}		3.2877 ^{a}
Thailand													
Mean	0.4425	0.6415	0.2737	0.0447	1.2077	0.0797	0.1223	0.0631	0.4219	1.0419	0.0806	0.1163	11.3406
S.D	0.3142	0.2233	0.3069	0.0260	0.6948	0.1033	0.2797	0.0636	0.2160	0.5419	0.1147	0.1662	1.4167
Max	1.0000	1.9670	1.4920	0.1605	3.3961	0.4986	1.1443	0.3125	0.9569	3.0256	0.5055	0.9974	15.5376
Min	0.0000	0.0000	0.0000	0.0000	0.0381	-0.4797	-1.1078	0.0000	0.0049	0.1266	-0.5055	0.0011	7.7645
Skewness	0.1849	1.9786	1.3841	1.0215	0.9005	-0.4110	-0.8186	1.5800	0.1813	1.1533	-0.5023	2.3671	0.6864
Kurtosis	1.7762 ^{a}	11.3777 ^{a}	4.5384^{a}	4.6395 ^{a}	3.6054	6.9277 ^{a}	7.2315 ^{a}	5.1926 ^{a}	2.4232	4.1567 ^{a}	6.7757 ^{a}		2.8952 ^{a}

^{a}, ^{b}, and ^{c} respectively denote statistical significance at a 1-, 5-, and 10-percent level

Normative theory would suggest that the firms would make capital structure adjustments at different speeds in their capital structure, growth rates and investment in the post-liberalization compared with those observed in the pre-liberalization period. Therefore, it is hypothesized that that the *LEV*, *LTD*, *STB*, and financial characteristics of the firms *INV*, *GROWTH*, and *BRISK* will vary due to variation in the economic and social conditions over the two periods. To test this hypothesis, paired-wise tests were conducted across the sub-periods for each country. Due to evidence of significant non-normality of financial variables reported in Table 3.10 even after removing the outliers, non-parametric statistics such as those generated by the Wilcoxon signed rank test, are important here, as inferences based upon them are not affected by the presence of non-normality. The Wilcoxon T^+ signed rank sum test is the non-parametric version of a paired samples t-test. In what follows, the analysis is based on parametric and non-parametric tests.

3.4.3 Parametric and Non-parametric tests for the Liberalization Effect

The results in Table 3.12 show that the financial liberalization has different effects within the countries. For example, there has been a significant increase in *TDR* of the firms in the case Indonesia from 0.22 to 0.45 (*p-value* < 0.01), while there has been a significant increase in *TER* of firms in the case India, Pakistan and South Korea (*p-value* < 0.01). Thailand appears to be an exception because there is no significant increase in *TER* in the post-liberalization period. *STB* has increased significantly for Indonesia and South Korea and decreased for Malaysia (*p-value* < 0.01). *INV*, *GROWTH*, and *BRISK* of the firms have also changed significantly over the two periods. There has been significant decrease in *INV* for India, Pakistan, Malaysia and Thailand (*p-value* < 0.01). The mean rank for *INV* was higher in the pre-liberalization period in all countries, a finding which seems to indicate that the firm-level investment might have decreased in these countries. This outcome is further explored in Chapter 9.

Table 3.12
Paired sample *t*-test and Wilcoxon T^{+} test

This table presents the results for the difference in firm-level capital structure ratios and firm-level characteristics in the pre-post Banking sector liberalization period using parametric and non-parametric tests. *STB* is ratio of total borrowing less than one year to total debt; *TDR* is ratio of total debt to total assets ratio; *TER* is ratio of total common equity to total assets ratio; *GROWTH* is ratio of sum of market value of equity and total debt to total assets; *BRISK* is defined as absolute value of the difference between return on asset in year *t* and *t-1*. † shows the mean rank was higher pre-liberalization, ‡ shows the mean rank was higher post-liberalization

	Pre-liberalization		Post-liberalization			
	Mean	Std	Mean	Std	*t-value*	T^{+}*-value*
India						
TDR	0.3266	0.1040	0.3013	0.1798	0.8151	-1.1371†
TER	0.3984	0.1463	0.4532	0.1589	-4.9420^{a}	-4.6370‡^{a}
STB	0.3691	0.2547	0.3979	0.2971	1.6590	-1.3500‡
INV	0.2085	0.2437	0.1417	0.1590	3.8308^{a}	-4.8220 †^{a}
GROWTH	1.8688	2.1980	1.2963	1.5831	2.4225^{b}	-3.3350‡^{b}
BRISK	0.0336	0.0475	0.0347	0.0508	-0.2560	-0.4060†
Indonesia						
TDR	0.2295	0.1783	0.4567	0.2845	-5.6590^{a}	-4.8060‡^{a}
TER	0.6012	0.1937	0.2362	0.2954	8.6280^{a}	-6.4400†^{a}
STB	0.1453	0.1320	0.2732	0.2634	-3.7710^{a}	-3.2050‡^{a}
INV	0.1456	0.1878	0.2279	0.2752	1.0461	-1.4440‡
GROWTH	1.3062	0.9861	0.8509	0.3531	3.3030^{a}	-3.2150†^{a}
BRISK	0.0441	0.0679	0.1659	0.4525	-1.4740	-1.5540‡
Malaysia						
TDR	0.1525	0.1450	0.1881	0.1541	-2.6091^{b}	-2.4970‡^{b}
TER	0.5468	0.2540	0.5815	0.1805	-1.7730	-1.7680‡
STB	0.1033	0.1089	0.0760	0.0882	2.9222^{a}	-2.8550†^{a}
INV	0.1987	0.2401	0.1130	0.1407	3.9512^{a}	--3.0021†^{a}
GROWTH	1.7663	1.0938	1.2877	1.4122	4.2314^{a}	-4.3450†^{a}
BRISK	0.0218	0.0269	0.0579	0.1175	-3.6940^{a}	-4.9040‡^{a}
Pakistan						
TDR	0.3035	0.1914	0.2394	0.1873	2.0670^{b}	-2.1410†^{b}
TER	0.3854	0.2323	0.4926	0.1622	-3.5580^{a}	-4.6250‡^{a}
STB	0.1626	0.1436	0.1611	0.1352	0.0530	-0.0690†
INV	0.1612	0.1852	0.0944	0.1452	2.4749^{b}	-3.1725 †^{b}
GROWTH	1.3836	1.2669	0.9712	0.5274	1.4990	-1.5520†
BRISK	0.0497	0.0543	0.0514	0.0671	-0.1110	-0.3840‡
South Korea						
TDR	0.4237	0.1621	0.3580	0.1898	7.4590^{a}	-6.9950†^{a}
TER	0.3257	0.1619	0.3929	0.2027	-7.2273^{a}	-7.4180‡^{a}
STB	0.2365	0.1176	0.2136	0.1370	3.9468^{a}	-4.04600‡^{a}
INV	0.1522	0.2809	0.1158	0.1469	1.2165	-0.0511†
GROWTH	0.8476	0.3096	0.6157	0.3031	14.4600^{a}	-4.6590†^{a}
BRISK	0.0255	0.0486	0.0625	0.1125	-5.0960^{a}	-7.1890‡^{a}
Thailand						
TDR	0.3620	0.2038	0.3380	0.3333	1.1660	-2.2060†^{b}
TER	0.4632	0.2036	0.4370	0.4623	1.0250	-0.75540†
STB	0.2357	0.1719	0.2097	0.2310	1.7030	-2.8210†^{a}
INV	0.2086	0.2077	0.1347	0.1741	2.8665^{a}	-3.4961†^{a}
GROWTH	1.5060	0.7478	0.9249	0.6247	7.6230^{a}	-7.4720†^{a}
BRISK	0.0412	0.1313	0.0948	0.1628	-4.3610^{a}	-5.6854‡^{a}

^{a}, ^{b}, ^{c} shows 1, 5 and 10 % level of significance

There has been a significant decrease in *GROWTH* of the firms in Indonesia, Pakistan, South Korea and Thailand (*p-value* < 0.01) in the post-liberalization period the mean rank for *GROWTH* being higher in the pre-liberalization period for these countries. There has been significant increase in *BRISK* for Malaysia, South Korea, and Thailand (*p-value* < 0.01) in the post-liberalization period. In sum, this preliminary pre-post financial liberalization analysis reveals significant economic effect on the financing choices of the firms in the case of Indonesia and South Korea, but no significant change in the financing choices of the firms in the case of Malaysia and Thailand, a finding which might be due to earlier liberalization, as indicated in Schmukler and Vesperoni (2001).

3.5. Bivariate Analysis

This section discusses the results of the Spearman rank correlation. The Spearman rank non-parametric correlation coefficients are superior to the Pearson correlation coefficients because of evidence on non-normality in these variables. The correlation coefficients were calculated for pre- and post-liberalization periods for each country. We should expect these correlation coefficients to pick up the severity of financial repression in each country and its impact on firm-level debt and equity ratios. Consequently, this study argues that when the level of government intervention is high, small changes in economic policy can deeply affect market conditions and future cash flows to a firm, a group of firms or the whole real sector of a country. The cash flows are highly dependent upon the availability of subsidized credit, and politically-generated market segmentation such as import restrictions, capacity licensing and state purchases etc (Fischer et al, 2001). If a firm has difficulty obtaining outside finance, its investment should display excess sensitivity to the availability of internal funds. If the firms were financially constrained in pre-liberalization period, a negative relationship between investment and profitability, and a negative relationship between investment and debt ratio, are to be expected. Furthermore, when governments support larger firms rather than smaller firms due to macro-economic policies, larger firms might face low financial distress. Therefore, we should expect a positive correlation between size and debt ratio, and business risk and debt ratio.

Table 3.13
Pre-liberalization Correlation Matrices

India	*TDR*	*TER*	*NDTS*	*BRISK*	*FCF*	*PROFIT*	*INV*	*SIZE*	*GROWTH*
TDR	1.0000								
TER	-0.6134[a]	1.0000							
NDTS	0.2303[a]	-0.1740[a]	1.0000						
BRISK	-0.0017	-0.0645	0.1198*	1.0000					
FCF	-0.0053[b]	-0.0134	0.0358	0.0331	1.0000				
PROFIT	-0.3071[a]	0.2414[a]	0.0842	0.2198[a]	0.1257[a]	1.0000			
INV	0.3341[a]	-0.0521	0.0489	-0.1757[a]	-0.0201	-0.2980[a]	1.0000		
SIZE	0.0584	0.0164	-0.1701[b]	-0.3291[a]	-0.0753[a]	-0.3011[a]	0.2540[a]	1.0000	
GROWTH	-0.2059[a]	0.1579[a]	0.0468	0.1367[a]	-0.6699[a]	0.5880[a]	-0.1777[a]	-0.1538[a]	1.0000
Indonesia									
TDR	1.0000								
TER	-0.7544[a]	1.0000							
NDTS	-0.0059	0.0429	1.0000						
BRISK	-0.0433	0.1292	0.1230	1.0000					
FCF	-0.0690	-0.0754	0.0440	-0.3157[a]	1.0000				
PROFIT	-0.1710	0.0014	-0.2642	-0.0217	0.1730	1.0000			
INV	0.3583[a]	0.0955	-0.0356	0.0442	-0.2157	0.0869	1.0000		
SIZE	0.0971	-0.1795	-0.2016	-0.1761	0.3161	-0.0243	-0.1451[a]	1.0000	
GROWTH	-0.0173	-0.0318	-0.0574	0.4481[a]	0.0931	-0.1147	-0.8093[a]	-0.0232	1.0000
Malaysia									
TDR	1.0000								
TER	-0.4748[a]	1.0000							
NDTS	0.0347	0.0562	1.0000						
BRISK	-0.0550	-0.0102	0.4311[a]	1.0000					
FCF	-0.0101	0.2345[b]	0.2811[a]	0.0662	1.0000				
PROFIT	-0.0752	-0.0613	0.2279[a]	0.0632	0.1345	1.0000			
INV	0.0662	-0.1923	0.2966[a]	0.7055[a]	0.0506	-0.0209	1.0000		
SIZE	0.2149[a]	-0.1897[a]	-0.3238[a]	-0.0678	-0.0335[a]	-0.3149[a]	0.0074	1.0000	
GROWTH	-0.1447[a]	0.2113[a]	0.1791[a]	0.3150	0.0037	0.1926[a]	-0.3483[a]	-0.1211	1.0000

Table 3.13 (continued...)

Pakistan	*TDR*	*TER*	*NDTS*	*BRISK*	*FCF*	*PROFIT*	*INV*	*SIZE*	*GROWTH*
TDR	1.0000								
TER	-0.2974^{a}	1.0000							
NDTS	0.3525^{a}	0.2510^{b}	1.0000						
BRISK	-0.2722^{a}	0.6086^{a}	0.0841	1.0000					
FCF	-0.1709	0.2469	-0.1014	0.1017	1.0000				
PROFIT	0.5434^{a}	-0.3418^{a}	0.1123	-0.4635^{a}	-0.2287^{a}	1.0000			
INV	-0.0928	0.1987	0.0836	0.4587^{a}	0.0369	-0.3748^{a}	1.0000		
SIZE	0.1306	-0.5103^{a}	-0.1109	-0.3149^{a}	-0.3940^{a}	0.4231^{a}	-0.3614^{a}	1.0000	
GROWTH	-0.0432	0.3026^{a}	0.0006	0.2947^{a}	0.0343	-0.0430	-0.6153^{a}	0.1273	1.0000
South Korea									
TDR	1.0000								
TER	-0.7165^{a}	1.0000							
NDTS	-0.1003^{a}	0.0680	1.0000						
BRISK	-0.0006	0.0177	-0.0926^{b}	1.0000					
FCF	-0.0393	0.0283	0.0462	-0.0187	1.0000				
PROFIT	-0.0370	0.0487	0.3373^{a}	-0.1491^{a}	0.0543	1.0000			
INV	0.0629	-0.1143^{a}	-0.0449	0.8187^{a}	-0.1170^{a}	-0.1086^{a}	1.0000		
SIZE	0.1509^{a}	0.1576^{a}	-0.0408	0.2168^{a}	0.1573^{a}	-0.0707^{a}	-0.2707^{a}	1.0000	
GROWTH	0.2539^{a}	-0.3835^{a}	0.0608	0.1856*	-0.2037^{a}	0.1864^{a}	0.2665^{a}	-0.1941^{a}	1.0000
Thailand									
TDR	1.0000								
TER	-0.7815^{a}	1.0000							
NDTS	-0.0209	-0.0435	1.0000						
BRISK	-0.2932^{a}	0.2365^{a}	0.0887	1.0000					
FCF	0.1471^{a}	-0.0122	-0.1673^{a}	-0.1998^{a}	1.0000				
PROFIT	-0.0066	0.0682	-0.0453	-0.0311	0.0481	1.0000			
INV	-0.1793^{a}	0.1458^{a}	0.0855	0.6178^{a}	-0.0985	-0.2323^{a}	1.0000		
SIZE	0.3602^{a}	-0.4197^{a}	-0.3003^{a}	-0.2007^{a}	0.1668^{a}	-0.0746	0.1799^{b}	1.0000	
GROWTH	-0.2096^{a}	0.2178^{a}	0.0235	0.4822^{a}	-0.0662	0.1506^{b}	-0.2786^{a}	-0.0629	1.0000

^{a}, ^{b}, ^{c} shows 1, 5 and 10 % level of significance

Table 3.13 (concluded)

The correlation coefficients reported in Table 3.13 show a negative relationship between *TDR* and *PROFIT* for all countries (though not significant) except Pakistan in the pre-liberalization period. A significant negative relationship between *TDR* and *GROWTH* for India, Malaysia, South Korea and Thailand (*p-value* < 0.01), suggests difficulties in borrowing for growth-oriented firms. On the other hand, a significant positive relationship between *TDR* and *SIZE* for Malaysia South Korea and Thailand (*p-value* < 0.01), indicates that only the largest firms had access to debt in these countries in the pre-liberalization period. The significant positive relationship between *TDR* and *INV* for India and Indonesia (*p-value* < 0.01) seems to suggest that firms in these countries might have obtained more external debt compared to firms in the other countries where there was favourable government intervention in the allocation of credit.

There was a weak positive correlation between *TER* and *PROFIT* in the pre-liberalization period, which varied from a low of 0.0014 for Indonesia to a high of 0.2414 for India. There was a significant positive correlation between *TER* and *SIZE* only for South Korea, while for Malaysia, Pakistan, and Thailand, it was significantly negative (*p-value* < 0.01). One possible reason for this result might be a good lending relationship with creditors. The firms have been used to obtaining long-term finance from the commercial banks rather than using stock markets. In countries such as Pakistan and Malaysia, the commercial banks are universal banks, which are involved in merchant banking as well as commercial banking, and these are advantageous for larger firms since they only need to deal with one lender (Booth et al, 2001). There is a significant positive relationship between *TER* and *GROWTH* for India, Malaysia, Pakistan and Thailand (*p-value* $<$ 0.01). Table 3.13 repeats the correlation analysis for the post-liberalization period. Theoretically, positive real interest rates after financial liberalization will provide incentives to the borrowers to invest in more productive activities. Thus, we should expect a positive relationship between *TDR* and *GROWTH*. Similarly, the financial constraints should be eased during liberalization and firms' investment should become more responsive to growth opportunities, less tied to internal cash flows and less affected by debt ratio (Gallego and Loayza, 2000).

Table 3.14
Post- Liberalization Correlation Matrices

India	*TDR*	*TER*	*NDTS*	*BRISK*	*FCF*	*PROFIT*	*INV*	*SIZE*	*GROWTH*
TDR	1.0000								
TER	-0.6949 ^{a}	1.0000							
NDTS	0.1431 ^{a}	-0.0742 ^{b}	1.0000						
BRISK	-0.4398 ^{a}	0.4741 ^{a}	-0.0271 ^{b}	1.0000					
FCF	0.2321 ^{a}	-0.0104	0.0589	-0.0988 ^{a}	1.0000				
PROFIT	-0.0805 ^{a}	0.0578	0.0328	-0.0401	-0.1187 ^{b}	1.0000			
INV	0.0867 ^{b}	0.1356 ^{a}	-0.0065	0.3431	0.0057 ^{b}	-0.2081 ^{a}	1.0000		
SIZE	0.2045 ^{a}	-0.2181 ^{a}	-0.0647 ^{a}	-0.1900 ^{a}	0.1641 ^{b}	-0.1690 ^{a}	0.1383 ^{a}	1.0000	
GROWTH	-0.2182 ^{a}	0.2394 ^{a}	-0.0286 ^{b}	0.5249 ^{a}	-0.0046	0.1029 ^{a}	-0.4942 ^{a}	-0.0016	1.0000
Indonesia									
TDR	1.0000								
TER	-0.8575 ^{a}	1.0000							
NDTS	-0.1239	0.1362 ^{a}	1.0000						
BRISK	-0.2488 ^{a}	0.1782 ^{a}	0.1645 ^{a}	1.0000					
FCF	-0.0989 ^{a}	0.1844 ^{a}	0.1339 ^{a}	-0.1133 ^{a}	1.0000				
PROFIT	0.2365 ^{a}	-0.2335 ^{a}	0.0079	-0.0970 ^{a}	-0.2040 ^{a}	1.0000			
INV	-0.3108 ^{a}	-0.2344 ^{a}	0.2189 ^{a}	0.8611 ^{a}	-0.1205 ^{a}	-0.1295 ^{a}	1.0000		
SIZE	0.3126 ^{a}	-0.2837 ^{a}	-0.2135 ^{a}	-0.2108 ^{a}	0.1150 ^{a}	-0.0428	-0.2696 ^{a}	1.0000	
GROWTH	0.1815 ^{a}	-0.1265 ^{a}	-0.0231	0.2056 ^{a}	0.0459	0.0530	-0.2238 ^{b}	0.0950 ^{a}	1.0000
Malaysia									
TDR	1.0000								
TER	-0.7751 ^{a}	1.0000							
NDTS	-0.0068 ^{b}	0.0898 ^{a}	1.0000						
BRISK	0.3751 ^{a}	0.2824 ^{a}	0.0934 ^{a}	1.0000					
FCF	0.0411	0.0247	0.0307	0.1143 ^{a}	1.0000				
PROFIT	0.0398	-0.0695 ^{b}	0.0968 ^{a}	-0.1549 ^{a}	-0.0774 ^{a}	1.0000			
INV	-0.3372 ^{a}	0.2485	-0.0085	0.7897 ^{a}	0.0779*	-0.2057 ^{a}	1.0000		
SIZE	0.1361 ^{a}	-0.1988 ^{a}	-0.2859 ^{a}	0.1111 ^{b}	0.1673 ^{a}	-0.1894 ^{a}	0.2217 ^{a}	1.0000	
GROWTH	-0.0634 ^{b}	0.0670 ^{b}	-0.1646 ^{a}	0.4220 ^{a}	0.0851 ^{a}	0.0134	-0.0939 ^{b}	-0.2077 ^{b}	1.0000

Table 3.14 (continued...)

Pakistan	*TDR*	*TER*	*NDTS*	*BRISK*	*FCF*	*PROFIT*	*INV*	*SIZE*	*GROWTH*
TDR	1.0000								
TER	-0.5180^{a}	1.0000							
NDTS	0.0095	0.1693^{a}	1.0000						
BRISK	-0.4456^{a}	0.5107^{a}	0.1028^{b}	1.0000					
FCF	-0.1826^{a}	0.1942^{a}	0.0571	0.1746^{a}	1.0000				
PROFIT	0.1532^{a}	0.0565	0.1768^{a}	-0.1416^{b}	-0.1242^{b}	1.0000			
INV	-0.5647^{a}	0.3636^{a}	0.0619	0.6671^{a}	0.0671	-0.1959^{a}	1.0000		
SIZE	0.1520^{a}	-0.2522^{a}	-0.0110	-0.1664^{a}	-0.1849^{a}	0.1544^{a}	-0.2066^{a}	1.0000	
GROWTH	0.2106^{a}	0.1173^{b}	0.0582	0.2902^{a}	0.1020^{b}	0.0443	-0.4289^{a}	0.1466^{a}	1.0000
South Korea									
TDR	1.0000								
TER	-0.7321^{a}	1.0000							
NDTS	-0.0807^{a}	0.1079^{a}	1.0000						
BRISK	-0.2039^{a}	0.2309^{a}	0.0542	1.0000					
FCF	0.0337	-0.0599^{b}	0.0432	-0.0691^{b}	1.0000				
PROFIT	0.0939^{a}	-0.0238	0.2624^{a}	-0.0556^{b}	-0.1223^{b}	1.0000			
INV	-0.3584^{a}	0.0279	0.0155	0.8635^{a}	-0.1170^{b}	-0.0802^{a}	1.0000		
SIZE	0.5333^{b}	-0.2580^{a}	0.0766^{a}	0.0285	0.0684^{b}	0.1306^{a}	-0.3594^{b}	1.0000	
GROWTH	0.1596^{a}	-0.2739^{a}	0.1015^{a}	0.1544^{b}	-0.1316^{b}	0.1160^{a}	0.1605^{a}	-0.0635^{b}	1.0000
Thailand									
TDR	1.0000								
TER	-0.8400^{b}	1.0000							
NDTS	-0.0384	0.0405	1.0000						
BRISK	-0.3365^{a}	0.3375^{a}	0.0435	1.0000					
FCF	-0.0685	0.1158^{a}	0.1122^{a}	0.0445	1.0000				
PROFIT	0.1972^{a}	-0.1973^{a}	0.1197^{a}	-0.1171^{a}	-0.1120^{a}	1.0000			
INV	-0.3865^{a}	0.3685^{a}	0.0293	0.8739^{a}	0.0102	-0.1651^{a}	1.0000		
SIZE	0.1974^{a}	-0.2490^{a}	-0.2155^{a}	-0.0138	0.1703^{a}	-0.0242	-0.1045^{a}	1.0000	
GROWTH	0.2668^{a}	-0.1823^{a}	0.1273^{a}	0.1958^{a}	0.0741^{b}	0.1039^{a}	-0.1933^{a}	0.2001^{a}	1.0000

^{a}, ^{b}, ^{c} shows 1, 5 and 10 % level of significance

Table 3.14 (concluded)

After financial liberalization, commercial banks and institutional investors might also take over the role of monitoring firms, and as a result, the moral hazard and information asymmetry will be reduced through corporate governance and banking supervision. But it might not occur if there are weak institutions and commercial banks lack the adequate research and monitoring skills to solve information asymmetry problems. Thus, in countries with weak regulations, liberalization might increase information asymmetry and aggravate adverse selection problems. As a result, firms might have become more sensitive to the availability of internal cash flows, and firms with growth opportunities might have less external finance.

This study found a significant positive relationship between *TDR* and *GROWTH* for Indonesia, Pakistan, South Korea and Thailand (*p-value* < 0.01), an outcome which is a significant change from the negative relationship found in the pre-liberalization period (see Table 3.14). This result seems to reject the agency theory argument that growth-oriented firms carry less debt since they do not wish to be exposed to greater restrictions of the external creditors. There is a significant negative relationship between *INV* and *PROFIT* in all countries (*p-value* < 0.01) that shows a reduction in the financial constraints for firms in all the countries.

A significant positive relationship between *TER* and *GROWTH* for India Malaysia, Pakistan (*p-value* < 0.01) was found but there was a significant negative relationship in Indonesia, South Korea and Thailand (*p-value* < 0.01), an outcome that might be due to the fact that the *GROWTH* of the firms declined in the latter countries in the post-liberalization period (see Table 3.11). There is a significant negative relationship between *SIZE* and *TER* for Malaysia, Pakistan, and Thailand (*p-value* < 0.01). It is interesting to note that the relationships between some variables for some countries have not only changed significantly in direction, but also in the magnitude in the post-liberalization period. For example, there is a significant positive relationship between *TDR* and *FCF* for India (0.2321) in the post-liberalization (*p-value* < 0.01) from (-0.0053) in pre-liberalization. There is a significant relationship between *TER* and *BRISK* for all countries (*p-value* < 0.01) from the less significant relationship found in the pre-liberalization period. The relationship between *TDR* and *SIZE* has become more significant (*p-value* < 0.01) for India, Indonesia, and Pakistan in the post-liberalization period, indicating that only the larger firms have been able to access long-term debt finance.

The correlation analysis presented above indicates that most of the variables have become more correlated with each other in the post-liberalization period, which might raise the concern of multicollinearity. For example, the *INV* variable has a significant positive correlation with *SIZE* for three countries – India, Malaysia, and South Korea; the *FCF* variable has a significant positive correlation with *INV* and *GROWTH* for South Korea and Thailand, and *BRISK* has a significant positive correlation with *INV* for Malaysia and Pakistan (*p-value* < 0.01). It can be argued that apparent multicollinearity is essentially a 'sample phenomenon' in the sense that in the pre-liberalization period, most of the above variables were not linearly related but they have become so in the post-liberalization sample period. The detection of multicollinearity in the post-liberalization sample period will not be of high concern (Gujrati, 1995). The use of these variables as exogenous variables in empirical analysis will still produce unbiased, consistent estimates of coefficient but the standard errors of such variables might not be smaller.

We test the hypothesis of no significant difference in correlation coefficients between the pre and post liberalization using Fisher z-test (see Appendix for detail). The test statistics reported in the Table 3.15 shows that correlation coefficeints between *TDR* and the variables *PROFIT*, *INV* and *SIZE* have changed most significantly in the case of India, Pakistan and Thailand. While, the results shows that correlation coefficeints between *TER* and the variables have changed significantly only in the case of Malaysia, South Korea and Thailand. Recall, the *INV* variable has a significant positive correlation with *SIZE* for India, Malaysia, and South Korea in post liberalization, the z-test shows that indeed it has been a significant increase from the pre-liberalization period (*p-value* <0.01).

Table 3.15
Test for Difference in Correlation Matrices Pre-Post Liberalization

India	*TDR*	*TER*	*NDTS*	*BRISK*	*FCF*	*PROFIT*	*INV*	*SIZE*	*GROWTH*
TDR	-								
TER	2.5715 ^{b}	-							
NDTS	1.5021	1.8285	-						
BRISK	7.6231 ^{a}	9.4015 ^{a}	2.3915 ^{b}	-					
FCF	4.2560 ^{a}	0.0532	0.4081	2.1444 ^{b}	-				
PROFIT	4.1768 ^{a}	3.4102 ^{a}	0.9346	2.4881 ^{b}	4.3256 ^{a}	-			
INV	4.2385 ^{a}	-0.0521	0.9024	8.7062 ^{a}	0.4200	1.5648	-		
SIZE	2.7045 ^{a}	3.0682 ^{a}	1.9427	2.7136 ^{a}	4.3751 ^{a}	2.5422 ^{b}	1.9600 ^{b}	-	
GROWTH	0.2182	1.5000	1.5000	7.8374 ^{a}	14.2421 ^{a}	10.0968 ^{a}	6.3978 ^{a}	2.7110 ^{a}	-
Indonesia									
TDR	-								
TER	2.2441 ^{b}	-							
NDTS	0.8850	0.7021	-						
BRISK	1.0987	0.2621	0.2210	-					
FCF	0.1510	1.9550	0.4550	1.0701	-				
PROFIT	3.0871 ^{a}	1.7854	2.0781 ^{b}	0.5641	2.8474 ^{a}	-			
INV	3.6265 ^{a}	1.7425	1.3441	9.3541 ^{a}	0.7281	1.6210	-		
SIZE	4.1020 ^{a}	0.8234	0.0931	0.2691	1.5814	0.1791	2.1641 ^{b}	-	
GROWTH	0.6265	0.6945	0.2501	1.9910	0.3451	1.2241	2.2835 ^{a}	0.7051	-
Malaysia									
TDR	-								
TER	7.1894 ^{a}	-							
NDTS	0.5814	0.4701	-						
BRISK	6.1791 ^{a}	5.3980 ^{a}	5.0541 ^{a}	-					
FCF	0.6961	2.9105 ^{a}	3.5071 ^{a}	0.6591	-				
PROFIT	1.6065	0.1154	1.8810	3.0601 ^{a}	2.9681 ^{a}	-			
INV	4.4832 ^{a}	4.8191 ^{a}	3.3771 ^{a}	2.0681b	0.2954	0.0415	-		
SIZE	1.1391	0.1332	0.5851	2.5102b	2.8614 ^{a}	1.8792	3.0521 ^{a}	-	
GROWTH	1.1291	2.0241b	4.7678 ^{a}	1.7031	1.1220	2.4941 ^{b}	3.6980 ^{a}	1.2231	-

Table 3.15 (continued...)

Pakistan	TDR	TER	NDTS	BRISK	FCF	PROFIT	INV	SIZE	GROWTH
TDR	-								
TER	2.1645[b]	-							
NDTS	2.9578[a]	0.7051	-						
BRISK	1.2605	0.9010	0.1191	-					
FCF	0.1641	0.3965	1.1315	0.5310	-				
PROFIT	3.7201[a]	3.3774[a]	0.5394	2.9401[a]	0.8841	-			
INV	3.4001[a]	1.1170	0.1365	1.9278	0.1881	3.6854[a]	-		
SIZE	2.0381[b]	2.5278[b]	0.8305	1.3081	1.8991	2.4487[b]	1.3986	-	
GROWTH	1.9441	1.4718	0.4361	0.0371	0.5154	0.6610	1.9580	0.1490	-
South Korea									
TDR	-								
TER	0.7025	-							
NDTS	0.4125	0.8374	-						
BRISK	4.3235[a]	4.5584[a]	3.0841[a]	-					
FCF	1.5478	1.7858	0.0640	1.0590	-				
PROFIT	2.8015[b]	1.5496	1.7580	2.0191	1.4521	-			
INV	11.3401[a]	2.6158[a]	1.1018	2.8241[a]	0.0000	0.5251	-		
SIZE	9.5246[a]	9.0985[a]	2.5298b	4.1265[a]	1.9398b	4.3491[a]	2.1215[b]	-	
GROWTH	2.5836[a]	2.6280[a]	0.8754	0.6860	1.5858	1.5394	2.3741[b]	2.8401[a]	-
Thailand									
TDR	-								
TER	2.6551[b]	-							
NDTS	0.2771	1.3291	-						
BRISK	0.7531	1.7260	0.7118	-					
FCF	3.3091[a]	1.9620	4.2971[a]	3.8710[a]	-				
PROFIT	3.2610[a]	5.4781[a]	2.6160[a]	1.3671	2.5374[b]	-			
INV	10.8241[a]	3.3081[a]	0.7781	8.6001[a]	1.5041	0.9651	-		
SIZE	2.8100[a]	3.0621[a]	1.4420	3.0090[a]	0.0574	2.7921[a]	4.5501[a]	-	
GROWTH	7.4550[a]	6.2210[a]	1.6021	5.0221[a]	2.1550[b]	0.7280	1.3861	4.0761[a]	-

[a], [b], and [c] indicates 1,5,and 10% percent level of significance

3.6. Conclusion

This chapter shows that changes in the capital structure of the firms have occurred in the post-liberalization period. It is apparent from the descriptive statistics that debt and equity ratios, and other variables exhibit differences within and across countries. The preliminary statistical analysis indicates significant changes in the debt and equity ratios across countries and correlations show changing relationships among variables during the post-liberalization period compared with the pre-liberalization environment. These findings suggest that liberalization has had an effect on the firms' capital structure. The dynamics of the capital structures are explored in Chapter 4.

Appendix -3

Fisher z-test for comparing Correlation Coefficients

To test the null hypothesis that there is no difference in the correlation coefficients of firm-level explanatory variables in pre-liberalization compared to post-liberalization period. Fisher procedure was used.

First, correlation coefficients r^{pre} and r^{post} in the pre- and post-liberalization period were transformed into quantities r_1^{pre} and r_2^{post} using the following procedure:

$$r_1^{pre} = \frac{1}{2}\ln\left(\frac{1+r^{pre}}{1+r^{pre}}\right) \text{ and } r_2^{post} = \frac{1}{2}\ln\left(\frac{1+r^{post}}{1+r^{post}}\right)$$

Second, we computed the test statistic as follows:

$$z = \frac{r_1^{pre} - r_2^{post}}{\sqrt{\frac{1}{(n_1-3)} + \frac{1}{(n_2-3)}}}$$

where n_1 and n_2 are the number of observations in the pre- and post liberalization periods.

Third, we obtain the probability values (p-values) for the corresponding z-values, if the p-value is significant at 10,5 and 1 percent level of significance, this lead to the rejection of the null of no change i.e., increase (decrease) in the correlation coefficients of firm-level explanatory variables in pre-liberalization compared to post-liberalization period. Otherwise, we conclude that there has been no significant increase (decrease) in the correlation coefficients over the two periods compared for the sample firms in each country in the sample.

Chapter 4

FINANCIAL LIBERALIZATION AND CAPITAL STRUCTURE: ECONOMETRIC ANALYSIS

4.1 Introduction

The main aim of this empirical chapter is to examine the dynamics of firms' capital structure in the context of financial liberalization. This issue is worth examining because, among other things, the liberalization of domestic financial sector might create new financing opportunities for firms in a closed economy (Schmukler and Vesperoni, 2001).So far the dynamic nature of liberalization and its impact on the capital structure of Southeast Asian countries' firms has received little attention in global finance literature. Bacchetta (1992) points out that financial liberalization will generally modify the interest rate and will alter the intertemporal decisions of firms and individuals, and possibly public sector. Thus, impact of a liberalization will be intrinsically dynamic and can be examined only in fully intertemporal framework.

Previous studies have only investigated the relationship between some indicators of banking sector and stock markets and the firms' leverage ratios, as discussed in Chapter 2. In most of these studies, the observed debt-to-equity ratio has been assumed optimal but this assumption is disputable (Heshmati, 2002). In addition, there is no empirical evidence about the capital structure adjustment process of firms in Asian countries, the majority of studies concentrating on the adjustment process of capital structure for developed countries. Therefore, this chapter fills a gap in the empirical literature.

The main contribution of our work lies in the specification of dynamic adjustment models. The following differentiate our empirical work form other existing studies, this chapter 1) empirically identifies factors determining the optimal debt ratio and equity ratio separately, 2) specifies a linear model where firm-specific and country-specific factors determine the speed of adjustment of debt and equity ratios individually and 3) quantifies the impact of banking sector, stock market and institutional developments on firm-level capital structure adjustment, which makes a new contribution to the emerging markets' capital structure literature. Thus, important contribution is that, this study considers the joint liberalization as suggested in Bacchetta (1992, p. 466), "the joint liberalization simply occurs because most countries with capital controls also have a protected and strongly regulated financial sector ... As the domestic financial liberalization will also affect the behavior of firms and individuals, the relevant analysis is one of a joint liberalization of capital movements and the domestic financial liberalization".

The rest of the chapter is laid out as follows: Section 4.2 illustrates the econometric methodology followed, which involves assessing the relationship between stylized explanatory variables and capital structure. Section 4.3 reports on the estimated results in relation to banking sector and stock market liberalization. Section 4.4 provides a comparison of the alternative specification of dynamic adjustment model. Section 4.5 concludes.

4.2 Econometric Methodology and Data

4.2.1 Model Selection

Most of the previous studies (see e.g., Booth et al, 2001; Schmukler and Vesperoni, 2001) have used linear models (with or without fixed effects) to analyze capital structure of firms in the Southeast Asian countries. However, this study proposes that a non-linear capital structure model is appropriate to investigate the economic significance of financial liberalization for these countries, since financial liberalization is a complex and non-linear process. According to Thomson (1998, p.95), "the best way of viewing the question of regulation and deregulation is not along a single dimension but as involving multidimensional adjustments." Hence, an estimation model that can explain the non-linear effect on the capital structure is required (Heshmati, 2002). One such estimation model is a partial adjustment model[1] that can explain the effects of financial liberalization on the adjustment of firms' capital structure in a given time period.

The main assumption of the model is that a firm may not be able to adjust completely to its desired or target capital structure due to government interventions, and instead, follows a pattern of partial adjustment to the desired capital structure. The target level of a debt and equity ratio might keep on changing depending upon the relative development of the financial markets environment, and the managerial expectations about the favourable outcomes of liberalization and knowledge about future events of liberalization. To the researcher's knowledge, these factors have received little attention in the literature.

The use of a partial adjustment model in capital structure research is not new, and many previous studies have used it for developed countries' firms (see e.g., Jalilvand and Harris, 1984; Fischer et al., 1989; Gatward and Sharpe 1996; Vilasuso and Minkler, 2001; Nivorozhkin, 2000; Loof, 2003; Miguel and Pindado, 2005; Guad et al., 2005; Wanzenried; 2006). The variety of adjustment models used have either examined interrelated adjustments between financing and dividend decisions (Jalilvand and Harris, 1984) or cross-adjustments between the long-term, short-term debt and equity (see Gatward and Sharpe, 1996). A notable feature of these models from the specification perspective has been the lack of parameterization of the adjustment speed coefficient. The main argument for not using variables to determine the speed of adjustment has been the problem of multi-collinearity[2]. In the case of perfect multi-collinearity, it is not possible to estimate each coefficient in the model, whereas, in the case of near multi-collinearity, the individual coefficients are not significant and have high standard errors (Brooks, 2002). Despite this concern over multi-collinearity, recent studies (Heshmati, 2002) have used variables

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[1] This model was originally proposed for dividend policy by Lintner (1956) and for financial ratios adjustment by Lev (1969). Since then, the model has been used by amongst others, David and Peles (1993), Lee and Wu (1988), Peles and Schneller (1989), Wu and Ho (1997), and more recently by Nwaeze (2001).

[2] Sharpe and Pooley (1991) argue that multi-collinearity will occur because the variables explaining the optimal debt ratio appear linearly as well as in multiplicative form with the variables of the speed of adjustment. The variables explaining target debt ratio are based on accounting ratios, which are more likely to have non-zero correlations, multi-collinearity is more likely to affect results.

explaining speed of adjustment. Thus, it can be argued that concern over the multi-collinearity problem may have been exaggerated. In this study, the firm-level and country-level variables to explain the speed of adjustment of debt and equity ratio respectively were used in the analysis.

4.2.2 Methodology

We specified a partial adjustment model in Eq. (4.1) as follows:

$$D_{i,j,t} - D_{i,j,t-1} = \delta_j^{(1)}(D_{i,j,t}^* - D_{i,j,t-1}) \tag{4.1}$$

or by re-arranging

$$D_{i,j,t} = (1-\delta_j^{(1)})D_{i,j,t-1} + \delta_j^{(1)}D_{i,j,t}^*$$

where $D_{i,j,t}$ is total debt to total assets ratio of a firm i at time t in country j. $\delta_j^{(1)}$ is adjustment speed parameter and lies between $0 < \delta_j^{(1)} \le 1$. $D_{i,j,t}^*$ is a firm i target debt ratio at time t in country j estimated from the following Eq. (4.2)

$$\begin{aligned} D_{i,j,t}^* &= \alpha_1 NDTS_{i,j,t} + \alpha_2 PROFIT_{i,j,t} + \alpha_3 TANG_{i,j,t} + \alpha_4 GROWTH_{i,j,t} + \\ &+ \alpha_5 FDC_{i,j,t} + \alpha_6 FCF_{i,j,t} + \alpha_7 INV_{i,j,t} + \alpha_8 BRISK_{i,j,t} + \alpha_9 ROE_{i,j,t} + \varepsilon_{i,j,t} \end{aligned} \tag{4.2}$$

where $\varepsilon_{i,j,t}$ is an error term, where $\varepsilon_{i,j,t} \sim iid(0,\sigma_0^2)$

Eq (4.1) implies that firms make only partial adjustment to the desired debt ratio because firms face two costs: the cost of making the adjustment and the cost of being in disequilibrium. If we assume that two costs are quadratic and additive, the total cost C_t can be written as:

$$C_t = a_1(D_{i,j,t} - D_{i,j,t-1})^2 + a_2(D_{i,j,t}^* - D_{i,j,t-1})^2$$

Given $D_{i,j,t-1}$ and $D_{i,j,t}^*$, the manager has to decide $D_{i,j,t}$ so that total cost C_t is minimized, i.e.,

$\frac{dC_t}{dD_{i,j,t}} = 0$ gives $2a_1(D_{i,j,t} - D_{i,j,t-1}) = 2a_2(D_{i,j,t}^* - D_{i,j,t})$

$$2a_1(D_{i,j,t} - D_{i,j,t-1}) = 2a_2[D_{i,j,t}^* - D_{i,j,t-1} + D_{i,j,t-1} - D_{i,j,t}]$$

$$2a_1(D_{i,j,t} - D_{i,j,t-1}) = 2a_2[(D_{i,j,t}^* - D_{i,j,t-1}) - (D_{i,j,t} - D_{i,j,t-1})]$$

$$a_1(D_{i,j,t}-D_{i,j,t-1})=a_2(D^*_{i,j,t}-D_{i,j,t-1})-a_2(D_{i,j,t}-D_{i,j,t-1})]$$

$$(a_1+a_2)(D_{i,j,t}-D_{i,j,t-1})=a_2(D^*_{i,j,t}-D_{i,j,t-1})$$

Dividing both sides by (a_1+a_2)

Thus we get

$$D_{i,j,t}-D_{i,j,t-1}=\delta^{(1)}_j(D^*_{i,j,t}-D_{i,j,t-1})$$

$$\text{where: } \delta^{(1)}_j=\frac{a_2}{a_1+a_2}$$

Maddala (2001) note that Eq. (4.1) implies that for a firm *i* target debt ratio at time *t* in country *j* if $\delta^{(1)}$=0, then, $D_{i,j,t}=D_{i,j,t-1}$, which means no adjustment takes place and there is no movement toward the target debt ratio because adjustment costs are too high. The cost of adjustment is much higher than the cost of being in disequilibrium. On the other hand, if $\delta^{(1)}$=1, then $D_{it}=D^*_{it}$, and the firm achieves its target debt ratio. On the contrary, if $\delta^{(1)}$ < 1, then, the adjustment from year *t-1* to *t* falls short of the adjustment required to achieve the target debt ratio since $\delta^{(1)}$ represents the degree of adjustment per period and it can be viewed as the speed of adjustment (Heshmati, 2001). Combining equation (4.1) and (4.2) results, we get

$$\begin{aligned}D_{i,j,t}=&(1-\delta^{(1)}_j)D_{i,j,t-1}+\beta_1 NDTS_{i,j,t}+\beta_2 PROFIT_{i,j,t}+\beta_3 TANG_{i,j,t}\\&+\beta_4 GROWTH_{i,j,t}+\beta_5 FDC_{i,j,t}+\beta_6 FCF_{i,j,t}+\beta_7 INV_{i,j,t}+\beta_8 BRISK_{i,j,t}+\beta_9 ROE_{i,j,t}+\eta_{i,j,t}\end{aligned} \tag{4.3}$$

where: $\beta_1=\delta^{(1)}_j\alpha_1$, $\beta_2=\delta^{(1)}_j\alpha_2$, $\beta_3=\delta^{(1)}_j\alpha_3$, $\beta_4=\delta^{(1)}_j\alpha_4$, $\beta_5=\delta^{(1)}_j\alpha_5$, $\beta_6=\delta^{(1)}_j\alpha_6$, $\beta_7=\delta^{(1)}_j\alpha_7$ $\beta_8=\delta^{(1)}_j\alpha_8$

$\beta_9=\delta^{(1)}_j\alpha_9$ and $\eta_{i,j,t}=\delta^{(1)}_j\varepsilon_{i,j,t}$. According to Maddala (2001) the properties of the transformed error term $\eta_{i,j,t}$ in Eq. (4.3) are the same as for $\varepsilon_{i,j,t}$. We are interested in investigating the effect of banking sector and stock market liberalization separately, as suggested by Kaminsky and Schumkler (2003), Bekeart and Harvey (2003) and Bacchetta (1992). Therefore, a partial adjustment model for the equity ratio was also set up in Eq. (4.4).

$$E_{i,j,t}-E_{i,j,t-1}=\delta^{(2)}_j(E^*_{i,j,t}-E_{i,j,t-1}) \tag{4.4}$$

$$E_{i,j,t} = (1-\delta_j^{(2)})E_{i,j,t-1} + \delta_j^{(2)} E_{i,j,t}^{*}$$

where for a firm i at time t in country j, $E_{i,j,t}$ is total common equity to total assets ratio. $E_{i,j,t}^{*}$, is a firm's target equity ratio. The speed of adjustment of a firm to its targeted equity ratio is measured by $\delta^{(2)}$. Thus, Eq. (4.4) implies that for a firm i at time t in country j if $\delta^{(2)}$=0, then, $E_{i,j,t} = E_{i,j,t-1}$, which means no adjustment takes place and there is no movement toward the target equity ratio because adjustment costs are too high. On the other hand, if $\delta^{(2)}$=1, then $E_{i,j,t} = E_{i,j,t}^{*}$, and the firm achieves its target equity ratio. On the contrary, if $\delta^{(2)} < 1$, then, the adjustment from year *t-1* to *t* falls short of the adjustment required to achieve the target equity ratio. The manager's objective function remains as described earlier i.e., to minimize the total costs as explained earlier replacing equity in place of debt level decision. The target equity ratio is function of same right side variables as in Eq. (4.2):

$$\begin{aligned} E_{i,j,t}^{*} &= \chi_1 NDTS_{i,j,t} + \chi_2 PROFIT_{i,j,t} + \chi_3 TANG_{i,j,t} + \chi_4 GROWTH_{i,j,t} + \\ &+ \chi_5 FDC_{i,j,t} + \chi_6 FCF_{i,j,t} + \chi_7 INV_{i,j,t} + \chi_8 BRISK_{i,j,t} + \chi_9 ROE_{i,j,t} + \xi_{i,j,t} \end{aligned} \tag{4.5}$$

By combing Eq. (4.4) and (4.5), we obtained Eq. (4.6):

$$\begin{aligned} E_{i,j,t} &= (1-\delta_j^{(2)})E_{i,j,t-1} + \phi_1 NDTS_{i,j,t} + \phi_2 PROFIT_{i,j,t} + \phi_3 TANG_{i,j,t} \\ &+ \phi_4 GROWTH_{i,j,t} + \phi_5 FDC_{i,j,t} + \phi_6 FCF_{i,j,t} + \phi_7 INV_{i,j,t} + \varphi_8 BRISK_{i,j,t} + \phi_9 ROE_{i,j,t} + \kappa_{i,j,t} \end{aligned} \tag{4.6}$$

Where: $\phi_1 = \delta_j^{(2)}\chi_1$, $\phi_2 = \delta_j^{(2)}\chi_2$, $\phi_3 = \delta_j^{(2)}\chi_3$, $\phi_4 = \delta_j^{(2)}\chi_4$, $\phi_5 = \delta_j^{(2)}\chi_5$, $\phi_6 = \delta_j^{(2)}\chi_6$, $\phi_7 = \delta_j^{(2)}\chi_7$,

$\phi_8 = \delta_j^{(2)}\chi_8$ $\phi_9 = \delta_j^{(2)}\chi_9$ and $\kappa_{i,j,t} = \delta_j^{(2)}\xi_{i,j,t}$.

$$\begin{aligned} D_{i,j,t} &= (1-\delta_j^{(1)})D_{i,j,t-1} + \beta_1 NDTS_{ij,t} + \beta_2 PROFIT_{i,j,t} + \beta_3 TANG_{i,j,t} \\ &+ \beta_4 GROWTH_{i,j,t} + \beta_5 FDC_{i,j,t} + \beta_6 FCF_{i,j,t} + \beta_7 INV_{i,j,t} + \beta_8 BRISK_{i,j,t} + \beta_9 ROE_{i,j,t+} \eta_{i,j,t} \end{aligned} \tag{4.7}$$

$$\begin{aligned} E_{i,j,t} &= (1-\delta_j^{(2)})E_{i,j,t-1} + \phi_1 NDTS_{ij,t} + \phi_2 PROFIT_{i,j,t} + \phi_3 TANG_{i,j,t} \\ &+ \phi_4 GROWTH_{i,j,t} + \phi_5 FDC_{i,j,t} + \phi_6 FCF_{i,j,t} + \phi_7 INV_{i,j,t} + \phi_8 BRIEK_{i,j,t} + \phi_9 ROE_{i,j,t} + \kappa_{i,j,t} \end{aligned} \tag{4.8}$$

The model specified in Eq. (4.7) and (4.8) have been referred to as *constant speed of adjustment* models in the literature, which assume that speed of adjustment to target debt and equity ratio is not time-varying and is similar across firms in a country.

We make a refinement to the dynamic specification in equations (4.7) and (4.8) and assume that partial adjustment parameter is a function of the firm size, growth, ownership, a country's status of banking sector liberalization $BLIB_{i,j,t}$, stock market liberalization $SLIB_{i,j,t}$; institutional developments $INST_{i,j,t}$ (see Chapter 3) and industry factors which are captured by dummy variables denoting the 2-digit industry SIC codes. Thus, we parameterize the partial adjustment parameters $\delta_j^{(1)}$ and $\delta_j^{(2)}$ as follows:

$$\begin{aligned}
&D_{i,j,t} = (1-\delta_{i,j,t}^{(1)})D_{i,j,t} + \delta_{i,j,t}^{(1)} D_{i,j,t}^{*} \\
&\text{where } D_{i,j,t}^{*} = \beta_{0,j} + \beta_1 NDTS_{i,j,t} + \beta_2 PROFIT_{i,j,t} + \beta_3 TANG_{i,j,t} + \beta_4 GROWTH_{i,j,t} + \\
&\qquad + \beta_5 FDC_{i,j,t} + \beta_6 FCF_{i,j,t} + \beta_7 INV_{i,j,t} + \beta_8 BRISK_{i,j,t} + \beta_9 ROE_{i,j,t} + \varepsilon_{i,j,t} \\
&\delta_{i,j,t}^{(1)} = \delta^{(1)}{}_{0,j} + \delta_1^{(1)} BLIB_{i,j,t} + \delta_2^{(1)} SLIB_{i,j,t} + \delta_3^{(1)} INST_{i,j,t} + \delta_4^{(1)} GROWTH_{i,j,t} + \delta_5^{(1)} SIZE_{i,j,t} \\
&\qquad + \delta_6^{(1)} OWN1_{i,j,t} + \delta_7^{(1)} OWN2_{i,j,t} + \delta_8^{(1)} SIC1_{i,j,t} + \delta_9^{(1)} SIC2_{i,j,t} + \delta_{10}^{(1)} SIC3_{i,j,t} + \delta_{11}^{(1)} SIC4_{i,j,t}
\end{aligned} \tag{4.9}$$

$$\begin{aligned}
&E_{i,j,t} = (1-\delta_{i,j,t}^{(2)})E_{i,j,t} + \delta_{i,j,t}^{(2)} E_{i,j,t}^{*} \\
&\text{where } E_{i,j,t}^{*} = \phi_{0,j} + \phi_1 NDTS_{i,j,t} + \phi_2 PROFIT_{i,j,t} + \phi_3 TANG_{i,j,t} + \phi_4 GROWTH_{i,j,t} + \\
&\qquad + \phi_5 FDC_{i,j,t} + \phi_6 FCF_{i,j,t} + \phi_7 INV_{i,j,t} + \phi_8 BRISK_{i,j,t} + \phi_9 ROE_{i,j,t} + e_{i,j,t} \\
&\delta_{i,j,t}^{(2)} = \delta_{0,j}^{(2)} + \delta_1^{(2)} BLIB_{i,j,t} + \delta_2^{(2)} SLIB_{i,j,t} + \delta_3^{(2)} INST_{i,j,t} + \delta_4^{(2)} GROWTH_{i,j,t} + \delta_5^{(2)} SIZE_{i,j,t} \\
&\qquad + \delta_6^{(2)} OWN1_{i,j,t} + \delta_7^{(2)} OWN2_{i,j,t} + \delta_8^{(2)} SIC1_{i,j,t} + \delta_9^{(2)} SIC2_{i,j,t} + \delta_{10}^{(2)} SIC3_{i,j,t} + \delta_{11}^{(2)} SIC4_{i,j,t}
\end{aligned} \tag{4.10}$$

We refer to models in equations (4.9) and (4.10) as *unrestricted* dynamic adjustment model and models in (4.7) and (4.8) as *restricted* dynamic adjustment models because latter models restrict speed of adjustment as being constant. It is hypothesized that the banking sector liberalization policies positively influence the speed adjustment of debt ratio (one-tailed, $BLIB_{i,j,t} > 0$). The study contends that the influence of $BLIB_{i,j,t}$ on the speed of adjustment of debt ratio works through financial intermediation channels as suggested by McKinnon and Shaw (1970). In the pre (or partial)-liberalization period, a high concentration of assets in government-owned banks and the allocation of credit to priority sectors without any credible screening might cause crowding out for some firms. But as domestic financial liberalization proceeds, foreign banks are allowed to enter the domestic market, and scope of banking services improves, thereby increasing the size of banking sector and effecting financial sector development, as firms are able to borrow from foreign/private banks domestically and internationally, and to adjust to the desired ratio. Thus, we should expect a positive relationship between $BLIB_{i,j,t}$ and $\delta^{(1)}_{i,j,t}$.

Similarly, it is hypothesized that the stock market liberalization policies will positively influence the speed of adjustment of equity ratio (one-tailed, $SLIB_{i,j,t}$ >0). The stock market liberalization is theoretically related to the removal of quantitative restrictions from stock markets and the increase in ownership of shares by foreign investors. In addition, relaxations in the listing requirements and the influence of privatization of state-owned firms might increase the breadth of domestic stock markets. The foreign listing of domestic firms provides the diversification advantage to local firms and lowers the cost of capital. We should expect a positive relationship between $SLIB_{i,j,t}$ and $\delta^{(2)}_{i,j,t}$ because stock market opening will increase the private capital flows, which will increase the liquidity of the stock markets. Firms will raise more equity finance due to lower cost of equity capital. In addition, by cross-listing on foreign stock exchanges, firms will be able to adjust to the desired equity ratio. La Porta et al. (1997) have shown that legal environment of a country also effect debt or equity decisions of firms, and Wanzenried (2006) find that a better protection of shareholders affects the adjustment process in a positive way.

Besides, the country-level liberalization variables, there are firm-specific variables that also explain the speed of adjustment of debt and equity ratio. Heshmati (2002, p. 217) suggests that the set of variables explaining the speed of adjustment or debt ratio may or may not include those that determine optimal debt (equity) ratio and two set of variables can be partially overlapping.

Corporate ownership (OWN)

In addition to liberalization policies, the ownership of a firm may also influence the speed of adjustment of debt and equity ratio to target ratios, in which respect there are two different arguments regarding the impact of foreign ownership on the speed of adjustment. These may be referred to as the 'reputation effect' of the parent company and the 'local tax and financial regime effect' (Desai et al., 2003; Noe, 2000). According to the 'reputation effect' suggested by Harrison and McMillan (2002), large foreign-owned firms are better off than local firms because foreign firms have access to the domestic credit market by virtue of the reputation of their parent companies. The local banks do not like to lend to domestic firms due to moral hazard and information asymmetry. They can not recover the extra cost of lending to the domestic firms, and hence prefer to lend to the foreign enterprises. As a result, local firms incur a higher cost on debt finance due to information asymmetry and capital controls. One implication of this local credit rationing would be that the foreign firms will have a faster speed of adjustment to target than local firms.

On the other hand, according to the 'local taxes and financial regime effect' (Desai et al., 2003), multinationals concentrate their borrowings in creditor-friendly regimes. The foreign firms can renegotiate debt restructuring with creditors in times of financial distress in such countries. In contrast, in less-creditor-friendly regimes, the parent company might use internal capital markets to assist foreign subsidiary firms. The higher costs associated with local borrowings would reduce the optimal amount of debt for multinational corporations. Thus, other things being equal, foreign firms will have a faster speed of adjustment in creditor-friendly liberalized regimes. In the absence of creditor-friendly environments such firms will rely more on the internal capital markets to avoid expensive external finance and will demonstrate a slower speed of adjustment compared to domestic firms.

Besides the 'reputation effect' and 'local taxes and financial regime effect, there are other factors that might also influence the speed of adjustment of debt and equity ratios of the foreign firms. Ethier and Horn (1990) argue that multinational corporations have proportionately more intangible assets in their asset base. Since such assets are not easily collateralizable, these firms have lower leverage, and therefore, a slower speed of adjustment. Similarly, Kim and Lyn (1986) suggest that multinational corporations often outperform local companies in host countries and have more growth opportunities. If leverage is negatively related to growth opportunities, one would expect foreign ownership to be negatively associated with the adjustment speed of the debt ratio. The empirical evidence indicates that multinationals tend to carry less debt in their capital structure than domestic firms (Michel and Shaked, 1986; Lee and Kwok, 1988). Thus, we can hypothesize that foreign ownership will be negatively related to speed of adjustment in Southeast Asian countries due to tax effects, legal regime, and growth opportunities. In order to capture the impact of foreign vs. domestic ownership of firms on the speed of adjustment of debt ratio and the speed of adjustment of equity ratio , a dummy variable *OWN1* equal to 1 when a firm is more than 50% owned by foreigners and otherwise 0, was used.

Likewise, recent studies (see Kim et al, 2006; Fraser et al., 2006; Wiwattanakantang, 1999) have shown that political relationship and family ownership of firms have significant influence on the capital structure of Malaysian and Thailand firms. Therefore, we include a dummy variables *OWN2* equal to 1 for those firms which belong to family or group and otherwise 0.

Firm size (SIZE)

The size of the firm also affects the speed of adjustment to target capital structure. A large firm would find it easier to adjust to a target than would a small firm in a given time period (Lev, 1969). The variable size also captures other firm-specific effects like informational asymmetry as well as financial strength. Heshmati (2002, p. 218) suggests that "if changing capital structure involves substantial fixed costs, these costs will be proportionally small for larger firms, and hence, larger firms would adjust to the desired capital structure more readily than smaller firms". Deesomsak et al. (2004) found a positive relationship between size and debt ratio for Malaysia and Thailand, and Booth et al. (2001) report a significant positive relationship for South Korea, Malaysia and Pakistan but no significant relationship for India and Thailand. On the contrary, Wiwattanakantang (1999) found a positive relationship using book value and market value measure of leverage for Thailand. This implies that size might have a positive influence on the speed of adjustment of the debt ratio. The variable *GROWTH* is also included in the list of explanatory variables for speed of adjustment of debt and equity ratio in this study's analysis.

Heshmati (2002, p.218) argues, "a growing firm may find it easier to change its capital structure by choosing the source and composition of the new financing. A non-growth firm on the other hand, can only change its capital structure by issuing equity. Hence firms with growth opportunities are expected to adjust faster towards the optimal capital structure compared to noon-growth firms". Therefore, we should expect a positive relationship between *GROWTH* and speed of adjustment of debt ratio and equity ratio. Thus, distinctive and salient features of our dynamic models in E. (4.9) and Eq. (4.10) are:

- Unlike previous studies which assume the same target debt and equity ratio for all firms in the same industries and over time (Peles and Schneller, 1989), these models allows the target debt and equity ratios to vary across firms and over time. In this way, each firm has its own unique target of debt and equity ratio.
- Unlike previous studies which assume that all firms have the same adjustment speed (see e.g., Peles and Schneller, 1989, Miguel and Pindado, 2001; Gatward and Sharpe, 1996, Gaud et al., 2005), these models allows adjustment speed to vary across firms and over time. Although the firms operate in the same country or same sector of industry, there is no reason why they should all react with exactly the same speed (Gallizo and Salvador, 2003). It is argued in this study that firms in each country might have a different speed of adjustment because as the target level varies, so also might the speed of adjustment.
- The models in this study are not calibrated to determine the time taken to complete adjustment because the assumption is made that the firm's level target changes each period, and due to rigidity of adjustment costs, only a partial adjustment would take place.
- Only the magnitude and changes in the speeds of adjustment are of interest in this study. More specifically, the study is concerned with detecting changes in the magnitude of speed of adjustment before and after financial liberalization, which removes the question as to why there is no interest in the time taken for complete adjustment which is irrelevant in a time-varying framework.

4.2.3 Selection of Sample

We use only those listed non-financial firms for estimation of our *restricted* and *unrestricted* dynamic adjustment models which have at least nine years of continuous financial data available from *Datastream* and *Worldscope*. The requirement of a longer continuous data for firms is higher essential to capture adjustments as suggested in previous studies. For example, Miguel and Pindado (2001) and Gaud et al. (2005) have used at least six consecutive years of data for the estimation of restricted dynamic model. However, the author believes that a longer time series is required to reasonably gauge the economic impact of liberalization. The available firm-level data set meeting the above criteria was comprised of 779 firms over the period 1991-2004 (see Table 4.1). Limited financial data for India and Pakistan for the year 1991 and for Indonesia, Malaysia, South Korea and Thailand for the year 2004, is available. In addition to the outlier observations, firm-level observations were lost due to the use one year lag of debt and equity ratio, and measurement of the firm-level investment variable. Thus, out of the total 779 firms, data from 650 firms were used for the empirical analysis in the subsequent sections.

Table 4.1
Structure of Sample

This table shows the number of firms having at least nine years of firm-level observations and the final number of listed non-financial firms in the sample after removal of outliers using outlier detection criteria.

Country	Years	Number of firms	Final Sample
India	1991-2004	142	114
Indonesia	1991-2004	120	93
Malaysia	1991-2004	126	112
Pakistan	1991-2004	62	33
South Korea	1991-2004	200	180
Thailand	1991-2004	129	118
Total		779	650

4.3 Econometric Results

This section presents the results obtained by using firstly, the *restricted* dynamic adjustment models in Eq. (4.7) and (4.8), and then secondly, using the *unrestricted* dynamic models. To the best of the researcher's knowledge, this is the first study that has estimated separately the adjustment model for debt and equity ratio for the sample countries.

4.3.1 Restricted Dynamic Adjustment Models

The restricted dynamic adjustment models do not allow the speed of adjustment parameters to vary over time and across firms, thus imposing the constraints of constant speed of adjustment of debt ratio and equity ratio across firms and over time in each country respectively. The explanatory power of the model shown by $Adj.\ R^2$ values indicate model has performed better for most of the countries except Indonesia and Malaysia (see Table 4.1 Panel A and B). The diagnostics reported in the table show first-order autocorrelation in residuals as shown by *DW* test values in the case of Indonesia, and Malaysia. The *JB* test statistics show significant evidence of non-normality in the residuals.

The significant coefficients for the parameters of the speed of adjustment of debt ratio $\delta^{(1)}$ and equity ratio $\delta^{(2)}$ in Table 4.1 indicate that firms bear transaction costs when they decide to adjust the debt ratio and equity ratio of the previous period to the target debt ratio and equity ratio in the current period as in Miguel and Pindado (2001). The results of our econometric analysis also corroborate all the expected relationship between the target debt ratio and explanatory variables determining the target debt ratio in Panel A. For instance, *NDTS* and *PROFIT* are significantly negative (p-value < 0.01) in most of the countries; *TANG* variable has significant positive coefficient in all the sample countries. On the other hand, some variables do not have any significant relationship. We find that using equity ratio as dependent variable, some of the variables have similar signs and significance as found in the case of debt ratio as dependent variable. For instance, *NDTS* and *PROFIT* variables have positive signs compared to significantly negative signs in the Panel A. In order to check that above specification do not have a omitted variable bias, i.e., variables which have been used in dynamic specifications in the recent studies such as Gaud et al. (2005) and Miguel and Pindado (2001) but ignored by us. Thus, if the omitted variables are found to be significant in our case, then, our models are definitely mis-specified.

Table 4.2
Estimation of Restricted Dynamic Adjustment Models-I

The table presents the estimation results of the restricted dynamic model in Eq. (4.7) in Panel A and Eq. (4.8) equity ratio in Panel B shown as follows:.

$$D_{i,j,t} = (1-\delta_j^{(1)})D_{i,j,t-1} + \beta_1 NDTS_{i,j,t} + \beta_2 PROFIT_{i,j,t} + \beta_3 GROWTH_{i,j,t} + \beta_4 TANG_{i,j,t} + \beta_5 INV_{i,j,t} + \beta_6 FCF_{i,j,t} + \beta_7 FDC_{i,j,t} + \beta_8 BRISK_{i,j,t} + \beta_9 ROE_{i,j,t} + \eta_{i,j,t}$$

$$E_{i,j,t} = (1-\delta_j^{(2)})E_{i,j,t-1} + \phi_1 NDTS_{\ i,j,t} + \phi_2 PROFIT_{\ i,j,t} + \phi_3 GROWTH_{\ i,j,t} + \phi_4 TANG_{\ i,j,t} + \phi_5 INV_{\ i,j,t} + \phi_6 FCF_{\ i,j,t} + \phi_7 FDC_{\ i,j,t} + \phi_8 BRISK_{\ i,j,t} + \phi_9 ROE_{\ i,j,t} + \kappa_{i,j,t}$$

The dependent variable is total debt to total assets ratio in Panel A and total common equity ratio to total assets in Panel B.*NDTS* is the ratio of total depreciation expenses to total assets; *PROFIT* is ratio of earning before interest taxes and depreciation to total assets; *TANG* is ratio of net fixed assets to total assets; *GROWTH* is ratio of sum of market value of equity and total debt to total assets; *FDC* is ratio of total current assets divided by current liabilities; *FCF* is profitability multiplied by reciprocal of *q*-ratio (market to book ratio obtained from *Datastream*); *INV* is total investment in plant, property and equipment (obtained from cash flow statements form *Worldscope*); *ROE* is ratio of earnings after tax to total common shareholders equity; .*BRISK* is defined as absolute value of the difference between return on asset in year *t* and *t-1*; All variables are nominal. *DW Test* is Durbin-Watson test for serial correlation in the residuals, Wald test for the hypothesis that the given set regressors are jointly zero; *J-B Test* is Jarque-Bera Normality test for residuals. The standard errors are shown in parenthesis using White correction for Heteroskedasticity. ^{a}, ^{b}, and ^{c} respectively denote statistical significance at a 1-, 5-, and 10-percent level

Panel: A

Country	$\delta^{(1)}$	*NDTS*	*PROFIT*	*GROWTH*	*TANG*	*INV*	*FCF*	*FDC*	*BRISK*	*ROE*	*DW*	*Wald*	*JB*	*Adj. R²*
India	0.2713^{a}	-1.6178^{a}	-1.2608^{a}	0.0238	0.8516^{a}	0.0376	-0.2447	0.0304^{c}	0.3456	0.3801^{a}	2.09	8.37^{a}	19.36^{a}	0.6751
	(0.0224)	(0.6441)	(0.3343)	(0.0171)	(0.0637)	(0.0492)	(0.1858)	(0.0178)	(0.2916)	(0.0826)				
Indonesia	0.6155^{a}	-1.0440^{a}	-1.3003^{a}	0.1423^{a}	0.7711^{a}	0.0572	0.3042b	-0.0105	0.7087^{a}	0.03155^{a}	0.81^{a}	2.98	6.84^{a}	0.2994
	(0.0379)	(0.5490)	(0.2578)	(0.0253)	(0.0697)	(0.0226)	(0.1452)	(0.0116)	(0.1197)	(0.0148)				
Malaysia	0.6389^{a}	1.5750^{a}	-1.4809^{a}	0.0816^{a}	0.3231^{a}	0.0365^{a}	0.7861^{a}	-0.0254	0.5231^{a}	-0.0209^{a}	0.71^{a}	7.57^{a}	28.85^{a}	0.1430
	(0.0281)	(0.5012)	(0.1733)	(0.0106)	(0.0390)	(0.0327)	(0.1219)	(0.0845)	(0.1113)	(0.0123)				
Pakistan	0.2329	-2.9186^{a}	0.0708	-0.0390	0.7615^{a}	0.3119	-0.2358^{c}	0.0880^{b}	0.0322	0.0759^{a}	1.93	10.66^{a}	6.15^{a}	0.6825
	(0.0400)	(1.2173)	(0.4483)	(0.0468)	(0.1445)	(0.3005)	(0.1364)	(0.0438)	(0.0742)	(0.0412)				
South Korea	0.1832^{a}	-1.1766^{a}	-3.3261^{a}	0.6327^{a}	0.4726^{a}	0.1007	0.5633^{a}	-0.0153	-2.0045	0.0715^{a}	1.95	7.59^{a}	47.70^{a}	0.7109
	(0.0155)	(0.5822)	(0.4744)	(0.0526)	(0.0831)	(0.2103)	(0..1801)	(0.0149)	(0.2640)	(0.0418)				
Thailand	0.1321^{a}	0.5941	-1.9685^{a}	0.3477^{a}	0.4647^{a}	0.0773	-0.0644	-0.0534	1.0527^{a}	0.0229	2.13	0.19	27.35^{a}	0.7290
	(0.0180)	(1.3633)	(0.7497)	(0.0758)	(0.1633)	(0.1455)	(0.5018)	(0.0999)	(0.4450)	(0.0505)				

Panel: B

Country	$\delta^{(2)}$	*NDTS*	*PROFIT*	*GROWTH*	*TANG*	*INV*	*FCF*	*FDC*	*BRISK*	*ROE*	*DW*	*Wald*	*JB*	*Adj. R²*
India	0.3425^{a}	0.9070^{a}	0.9487^{a}	0.0976	0.0834	-0.0193	0.2460^{a}	0.1781^{a}	-0.0210	-0.1523^{a}	1.81^{b}	6.60^{a}	45.44^{a}	0.7682
	(0.0173)	(0.3488)	(0.1744)	(0.0918)	(0.0351)	(0.0261)	(0.1009)	(0.0972)	(0.1591)	(0.0433)				
Indonesia	0.8141^{a}	1.2255^{a}	0.4160^{a}	0.0292	0.2433^{a}	-0.0129	0.1569^{c}	0.1041^{a}	0.0458	-0.0384	0.89^{a}	16.03^{a}	40.47^{a}	0.2570
	(0.0343)	(0.3512)	(0.1737)	(0.0166)	(0.0442)	(0.0146)	(0.0952)	(0.0751)	(0.0791)	(0.0961)				
Malaysia	0.8187^{a}	-0.4828	0.0742	0.0347	0.4054^{a}	0.0588^{a}	0.0344	0.1753^{a}	0.0862	0.0421	0.62^{a}	1.27	7.46^{a}	0.3092
	(0.0206)	(0.3857)	(0.1310)	(0.0817)	(0.0298)	(0.0251)	(0.0936)	(0.0650)	(0.0859)	(0.0952)				
Pakistan	0.4238^{a}	0.2068	1.4231^{a}	0.0125	0.1192^{a}	-0.0936	0.0501	0.1118^{a}	0.0738	-0.0614	1.97	0.62	13.27^{a}	0.7961
	(0.0362)	(0.2433)	(0.0210)	(0.0210)	(0.0500)	(0.1167)	(0.0596)	(0.0182)	(0.0303)	(0.0193)				
South Korea	0.1428^{a}	1.5507^{a}	5.3317^{a}	-0.3597^{a}	0.1806	0.2196	-0.0569	0.1457	-0.0283	0.0776	1.76^{a}	3.56b	43.80^{a}	0.8166
	(0.0142)	(0.6727)	(0.7126)	(0.0667)	(0.0973)	(0.2403)	(0.2017)	(0.0174)	(0.1958)	(0.0474)				
Thailand	0.2217^{a}	1.0326^{a}	0.7811^{a}	0.0368	0.2390^{a}	-0.0447	0.2298	0.0783	-0.2154	0.0507^{c}	2.12	1.97	33.54^{a}	0.7416
	(0.0198)	(0.6665)	(0.3557)	(0.0340)	(0.08010	(0.0718)	(0.2441)	(0.0950)	(0.0219)	(0.0300)				

The variables used by Miguel and Pindado (2001) and as determinants of the target debt ratio are different from the ones used by us in Eq. (4.7) which can be seen from Eq. (4.11 and 4.12) below:

$$D_{i,j,t} = (1-\delta_j^{(1)})D_{i,j,t-1} + \beta_1 NDTS_{i,j,t} + \beta_2 PROFIT_{i,j,t} + \beta_3 INV_{i,j,t} + \beta\ FDC_{i,j,t} + \beta_5 SIZE_{i,j,t} + \mu_{i,j,t} \quad (4.11)$$

$$D_{i,j,t} = (1-\delta_j^{(1)})D_{i,j,t-1} + \beta_1 PROFIT_{i,j,t} + \beta_2 GROWTH_{i,j,t} + \beta_3 TANG_{i,j,t} + \beta_4 FDC_{i,j,t} + \iota_{i,j,t} \quad (4.12)$$

The estimation results using specifications of Gaud et al. (2005) are shown in Table 4.2 in Panel A and Miguel and Pindado (2001) in Panel B respectively. The *Adj.* R^2 shows that explanatory power of the models in Panel A and B is higher for some countries than others. These results suggest that the model is incorrectly specified due to the omission of the variables such as *NDTS, FCF,* and *ROE* in Panel A. Furthermore, test for the absence of first order serial correlation in the errors show evidence of significant serial correlation in countries (*p*-values <0.01) (see Table 4.2).

Despite the apparent worst results of the above specification to describe adjustments in capital structure of the firms, it was found that coefficients on the adjustment speed parameters are significantly positive for all countries (*p*-values <0.01). Both models have produced significantly higher coefficients for the speed of adjustment of debt ratio for firms in Pakistan, and Thailand. For example, the estimated coefficients for the speed of adjustment of debt ratio for are: 0.3049 and 0.3379 for Pakistan respectively using Guad et al (2005) and Miguel and Pindado (2001) (see Panel A and Panel B, Table 4.2). Whereas, in the case of other countries, there is no consistency in the estimates of the speed of adjustment of debt ratio, it is higher using Gaud et al. (2005) for India and Indonesia but lower for the same countries using Miguel and Pindado (2001). These results seem to suggest that dynamic adjustment model used in these studies might be better specification for the European financial environment (the sample of firms used in these papers are Swiss and Spanish non-financial listed firms). These models do not sufficiently explain dynamics for Southeast Asian countries.

Table 4.3
Estimation of the Restricted Dynamic Adjustment Model-II

This table presents the estimation results for the models used by Gaud et al (2005) in Panel A and using Miguel and Pindado (2001) in Panel B. The dependent variable is total debt to total assets ratio in both panels. The explanatory variables are already defined in Table 4.1.

$$D_{i,j,t} = (1-\delta_j^{(1)})D_{i,j,t-1} + \beta_1 NDTS_{i,j,t} + \beta_2 PROFIT_{i,j,t} + \beta_3 INV_{i,j,t} + \beta_4 FDC_{i,j,t} + \beta_5 SIZE_{i,j,t} + \mu_{i,j,t}$$

$$D_{i,j,t} = (1-\delta_j^{(1)})D_{i,j,t-1} + \beta_1 PROFIT_{i,j,t} + \beta_2 GROWTH_{i,j,t} + \beta_3 TANG_{i,j,t} + \beta_4 FDC_{i,j,t} + \iota_{i,j,t}$$

DW Test is Durbin-Watson test for serial correlation in the residuals, Wald test for the hypothesis that the given set regressors are jointly zero;
J-B Test is Jarque-Bera Normality test for residuals. The standard errors are shown in parentheses using the White correction for Heteroskedasticity.

Panel :A

Country	$\delta^{(1)}$	*PROFIT*	*GROWTH*	*TANG*	*FDC*	*SIZE*	*DW*	*Wald*	*JB*	*Adj. R²*
India	0.1776^a	-1.6428^a	0.0212	0.3995^a	-0.0582^a	0.0545^a	1.87^b	33.07^a	5.13^a	0.7228
	(0.0171)	(0.2562)	(0.01206)	(0.0793)	(0.0173)	(0.0822)				
Indonesia	0.2886^a	-2.4984^a	0.1178	-0.1015	0.0586^a	-0.0749	1.89	2.69^c	27.81^a	0.7406
	(0.0309)	(0.3338)	(0.0306)	(0.1273)	(0.0771)	(0.0451)				
Malaysia	0.1032^a	-1.4313^a	0.0260	1.0290^a	-1.0003^a	0.3031^a	2.10	2.95	4.67^a	0.4578
	(0.0311)	(0.4057)	(0.0481)	(0.0596)	(0.0347)	(0.1996)				
Pakistan	0.3049^a	-1.0117^a	0.0769	0.3979^a	0.0279	-0.0739^b	2.34	3.95^b	2.28	0.6990
	(0.1040)	(0.4564)	(0.0478)	(0.1212)	(0.0649)	(0.0308)				
South Korea	0.4279^a	-1.4892^a	0.4011^a	-0.0464	0.0230^a	-0.0503^a	1.74	8.23^a	55.15^a	0.4216
	(0.1114)	(0.5030)	(0.0845)	(0.0700)	(0.0372)	(0.0142)				
Thailand	0.6421^a	-0.9774	0.1784^c	-0.0659	-0.0389^a	0.0368	1.34^a	3.90^b	6.51^a	0.4743
	(0.1644)	(0.5102)	(0.0859)	(0.0541)	(0.0725)	(0.0775)				

Panel: B

	$\delta^{(1)}$	*PROFIT*	*NDTS*	*INV*	*FDC*	-	*DW*	*Wald*	*JB*	*Adj. R²*
India	0.0425^a	-4.3889^a	2.7411^c	3.2812^a	0.0436	-	1.98	7.86^a	0.04	0.5173
	(0.0104)	(1.3211)	(1.1400)	(0.8442)	(0.0621)					
Indonesia	0.0892^a	-1.6602^a	-0.8769	-0.3529^a	-0.2285*	-	1.72	11.65^a	10.33^a	0.3878
	(0.0231)	(0.3003)	(0.6625)	(0.1338)	(0.0893)					
Malaysia	0.1682^a	-1.0403^a	2.1655^a	0.1193	-0.0515^a	-	1.47^a	3.89^b	9.04	0.1487
	(0.0328)	(0.4016)	(1.4050)	(0.1702)	(0.0131)					
Pakistan	0.3379^a	0.2087^a	-0.2773	0.1951	0.2115^a	-	1.96	0.02	1.05	0.3253
	(0.0792)	(0.1696)	(0.3472)	(0.2069)	(0.0454)					
South Korea	0.1587^a	-4.6181^a	6.4454^a	0.1359^a	-0.1116	-	2.01	2.94^c	37.21^a	0.6232
	(0.0150)	(0.4197)	(0.8016)	(0.0226)	(0.1643)					
Thailand	0.5148^a	-1.0167^a	9.0413^a	-0.1927	-0.0430	-	1.41^a	2.79	41.03^a	0.3891
	(0.0272)	(0.2084)	(0.5801)	(0.1779)	(0.0103)					

^{a}, ^{b}, and ^{c} respectively denote statistical significance at a 1-, 5-, and 10-percent level.

Changes in Debt and Equity Adjustment Speed Coefficients

In this section, the speed of adjustments is compared by splitting the sample period into pre-post liberalization periods using dummy variables *BLIB* and *SLIB*. Table 4.4 compares the estimated coefficients of the adjustment speed of debt ratio δ_1 and equity ratio, δ_2, estimated using the following equations:

$$\begin{aligned} D_{i,j,t} = {} & (1-\delta_j^{(1)})D_{i,j,t-1} + \beta_1 NDTS_{i,j,t} + \beta_2 PROFIT_{i,j,t} + \beta_3 TANG_{i,j,t} \\ & + \beta_4 GROWTH_{i,j,t} + \beta_5 FDC_{i,j,t} + \beta_6 FCF_{i,j,t} + \beta_7 INV_{i,j,t} + \beta_8 BRISK_{i,j,t} + \beta_9 ROE_{i,j,t} + \eta_{i,j,t} \end{aligned} \tag{4.7}$$

$$\begin{aligned} E_{i,j,t} = {} & (1-\delta_j^{(2)})E_{i,j,t-1} + \phi_1 NDTS_{i,j,t} + \phi_2 PROFIT_{i,j,t} + \phi_3 TANG_{i,j,t} \\ & + \phi_4 GROWTH_{i,j,t} + \phi_5 FDC_{i,j,t} + \phi_6 FCF_{i,j,t} + \phi_7 INV_{i,j,t} + \phi_8 BRIEK_{i,j,t} + \phi_9 ROE_{i,j,t} + \kappa_{i,j,t} \end{aligned} \tag{4.8}$$

The coefficients of the adjustment speed of debt ratio ($\delta_j^{(1)}$) increased significantly (p-value <0.01) in size during the post-liberalization period for Malaysia, Pakistan, South Korea and Thailand from the pre-liberalization level. The coefficients show a substantial increase in magnitude from 0.0858 to 0.4519, and 0.0571 to 0.5450 for South Korea and Thailand respectively. The increase in magnitude of coefficients for Malaysia, Thailand and South Korea can be explained to some extent, by a higher volume of private sector debt issues in these countries[3].

Table 4.4
Coefficients of Speed of Adjustment of Debt and Equity Ratio

The coefficients of speed of adjustment of debt $\delta_j^{(1)}$ and equity ratio $\delta_j^{(2)}$ were obtained by estimating equation (4.7) and (4.8) for the Pre-liberalization (Pre) (i.e., *BLIB* < 5, *SLIB*< 5) and Post-liberalization periods (Post) (i.e., *BLIB* > 5, *SLIB*> 5). Std. denotes standard error of estimated coefficients for each country.

	Speed of adjustment Debt ratio				Speed of adjustment Equity ratio			
	Pre		Post		Pre		Post	
Country	$\delta_j^{(1)}$	Std.	$\delta_j^{(1)}$	Std	$\delta_j^{(2)}$	Std.	$\delta_j^{(2)}$	Std
India	0.2015^a	0.0346	0.0845^a	0.0191	0.2356^a	0.1351	0.2113^a	0.0169
Indonesia	0.4508^a	0.1427	0.1930^a	0.0424	0.2808^a	0.0486	0.2454^a	0.0268
Malaysia	0.0916^a	0.0469	0.1431^a	0.0327	0.1193^a	0.0434	0.1035^a	0.0226
Pakistan	0.1984^a	0.0838	0.2649^a	0.1018	0.3698^a	0.1196	0.6306^a	0.1015
South Korea	0.0858^a	0.0237	0.4519^a	0.1152	0.1278^a	0.0436	0.3300^a	0.1164
Thailand	0.0571^a	0.0273	0.5450^a	0.0232	0.3483^a	0.0718	0.1380^a	0.0189

^{a}, ^{b}, and ^{c} respectively denote statistical significance at a 1-, 5-, and 10-percent level

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[3] The long-term private debt issues in Malaysia increased from US$ 2.60 billion during 1980-85 to US$ 13.10 billion during 1991-1995; Thailand, from US$ 0.10 billion to US$ 17.20 billion, and in South Korea from US$ 62.20 billion to US$ 120.30 billion respectively (Aylward and Glen, 1996).

On the other hand, the magnitude of coefficient decreased from 0.2015 to 0.0845 for India, and Indonesia significantly (*p*-value <0.01). One plausible explanation for this unexpected decrease might be the absence of well-functioning long-term debt markets in these two countries unlike in their counterpart countries. It might also be due to the parallel developments in the stock markets that may have led firms to find themselves with a lower debt ratio than target debt ratio. Thus, managers might be inclined to borrow less and issue equity due to stock market development.

The coefficient on the speed of adjustment of equity ratio $\delta_j^{(2)}$ was significantly higher for Pakistan and Thailand in the pre-liberalization period (*p*-value < 0.01). However, after full liberalization of the stock markets, the coefficient showed a significant increase only for Pakistan and South Korea, whereas, in the case of India, Indonesia, Malaysia and Thailand, there was a significant decrease in the coefficient (*p*-value < 0.01). It appears that the impact of stock market liberalization was temporary in the latter countries. There has been a greater decline in the magnitude of the coefficient from 0.3483 to 0.1380 for Thailand, and a relatively smaller decline of 2%-4% for India, Malaysia, and Indonesia respectively. This finding appears puzzling because we should expect firms to adjust more rapidly to their equity targets in the full liberalization period, but when this is linked to the aggregate new equity issues in each country, an explanation can be provided for these unexpected adjustment patterns. Aggregate equity issue data from the survey of primary securities markets issuance carried out by Aylward and Glen (1999) over the period 1980-95, was used to highlight these adjustments.

In Indonesia, aggregate equity finance increased from US$ 1.20 billion in 1989 to US$ 3.10 billion in 1990 but it fell considerably to US$ 0.50 billion in 1991. Although there was a swift recovery in equity issuance in 1994, when it rose to the exceptionally high level of US$ 4.80 billion, it dropped again, falling to US$ 3.90 billion in 1995. Thus, we can infer that this pattern of equity issuance in Indonesia is reflected in a decline in speed of adjustment in the full liberalization period. On the other hand, in India, the aggregate equity finance increased to US$ 0.70 billion during 1994-95 from US$ 0.10 billion during 1992-93. However, this proved to be one–off increase as indicated by the decline in the subsequent periods, reaching the lowest level of US$ 53.20 million during 1998-99. The speed of adjustment shows a significant decrease for Thailand (*p*-value <0.01). One plausible contributing factor to this decline might be the significant reversal in equity issues in Thailand. The aggregate equity finance increased to the highest level of US$ 8.90 billion in 1992 from US$ 0.40 billion in 1988; however, it fell noticeably to US$ 1.30 billion (Aylward and Glen (1999). Although there was recovery in the aggregate equity issuance in 1995, the volume of new issuance did not match the peak level in the early 1990s.

There is no significant decline for Malaysia in the full liberalization. In Malaysia, aggregate equity finance increased from US$ 0.4 billion in 1988 to U.S$ 3.10 billion in 1990, but in the subsequent years, the pattern of equity issuance was not persistent. Much of the new finance raised in Malaysia from the equity market in later years was from rights issues, which mobilized 43% of the total funds raised during 1993-1997, while IPOs only accounted for only 31% of the total fund raised from the stock market (Thompson, 1998).

For Pakistan and South Korea, the speed of adjustment of equity ratio was relatively higher than in the other countries, possible explanations lying in the gradual opening of the Korean stock market to foreign investors, and the privatization deals in Pakistan. For example, the gradual opening of the Korean stock market and direct investment by foreigners led to an increase in the aggregate equity issuance from US$ 10.60 billion to US$ 21.80 billion.

In Pakistan, the speed of adjustment of equity ratio might have responded two stock market opening and privatization of SOEs. The Karachi Stock Exchange was opened to foreign investors and corporations in 1991, after which time they were allowed to own 100% of equity in any industry with the exception of a few strategic ones, such as defense and security printing. The firms responded to the opening of stock markets, as the aggregate equity issuance increased from US$ 0.10 billion in 1991 to US$ 0.60 billion in 1994. In total, 45 privatization deals in the chemicals, cement food and allied sector were completed in 1992 alone, with a further 30 such deals being completed during 1994-1996. These privatization activities might also have had a significant impact on equity issuance and subsequently on adjustment speed. If we compare the number of privatization deals completed across countries, the result adds more weight to the argument that privatization has generated a more significant effect in Pakistan than in other countries. For example, the total number of privatization deals completed in the manufacturing sector was 22 in Indonesia, 45 in Malaysia, 14 in Thailand, 66 in India, and 95 in Pakistan over the period of 1991-2000.

Another possible explanation for the higher speed of adjustment in South Korea, in comparison to other countries might be related to the agency cost argument. If the increase in the marginal agency costs of debt changes managerial preference for equity finance, we should expect an increase in the equity issuance. In this way, the speed of adjustment of equity ratio would be related to the changing marginal agency cost of equity. In South Korea, the total listed equity capital increased from US$ 6.1 billion in 1997 to US$ 9.5 billion in 1998, while over the same period the aggregate equity issuance for India, Indonesia, Pakistan and Malaysia decreased[4].

Other possible reasons for the decline in speed of adjustment of equity ratio in particular during the Asian financial crisis, might exist. Firstly, the fall in the equity issuance in some countries might be due to asset relocation, since those firms experiencing problems with creditors sold their assets to foreign investors in most financial distress situations and when

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[4] The aggregate equity issuance fell from US$ 61.71 million to US$ 16.11 million for Pakistan; US$ 1.68 billion to US$ 0.02 billion for Indonesia, and from US$ 6.19 billion to US$ 0.43 billion for Malaysia (Aylward and Glen, 1999).

facing uncertainty. Secondly, the reforms aimed at reducing the marginal agency cost of debt and equity during and after the crisis, would have different consequences for the capital structure of firms. The governments might have reduced debt-related marginal costs by improvements in practices related to debt contracts, promotion of financial contracts improving accounting and auditing practices and passing bankruptcy laws. For example, in Indonesia (see Hasnan, 2000), the government initiated schemes to allow firms to reduce their external debt through debt-equity swap but these efforts did not attract much attention from the corporate sector.

On other hand, in order to reduce equity related agency costs, governments might have established a good corporate governance system, strengthening the authority of the Securities and Exchange Commission, and improving the standard of disclosure of securities-related information. The governments in Indonesia, Malaysia, South Korea and Thailand initiated reforms to reduce the marginal agency costs of equity by improving the insolvency laws and disclosure laws. The reviewed insolvency laws were implemented in crisis-ridden countries in 1998 and 1999 respectively, while the revised corporate disclosure laws were implemented in 1999 and 2002 in Malaysia and South Korea. As a result of these reforms, aggregate equity issuance increased in both countries.

From the above, it is possible to draw the following conclusions. Firstly, the speed of adjustment of equity ratio has been sensitive not only to the pro-liberalization policies but also to the ad hoc policies implemented to counter the adverse outcomes of the Asian financial crisis. Secondly, banking sector liberalization has had a significant effect only in those countries with long-term bond markets. Thirdly, stock market liberalization has a short-lived effect on the speed of adjustment of the firms in those countries which have opened their stock markets during the 1980s (Indonesia, Malaysia and Thailand), while, it seems to have had a more persistent effect in those countries which opened their stock markets in the 1990s.

4.3.2 Unrestricted Dynamic Adjustment Model

Optimal Debt ratio and Speed of Adjustment of Debt ratio

This section present the results using *unrestricted* dynamic adjustment model for debt ratio for the sample countries. The diagnostic results show evidence of non-normality in the residuals but there is no evidence of serial correlation as shown by *DW test*. The variables have significant explanatory power as indicated by rejection of null hypothesis shown by *Wald* tests. The econometric results in Table 4.5 show that almost all the variables have the expected relationships with target debt ratio for most of the countries in the sample, thereby confirming the predictions of the pecking order theory, resource-based and non-debt tax shield argument respectively. The *Wald-Test* shows that all the variables are statistically significant. The expected negative relationship between *NDTS* and target debt ratio was observed for all the countries (p-value <0.01 and 0.05), and a significant negative relationship between *PROFIT* and optimal debt ratio (p-value <0.01 and 0.10) was also found. It emerged that *TANG* is significant for India and Pakistan (p-value <0.01). It appears that the availability of collateral in the borrowing decisions of Indian and Pakistani firms has become indispensable since banking sector liberalization.

The coefficient for the *GROWTH* has the expected negative relationship only for India, and is significantly positive for South Korea, and Thailand (p-value <0.01). This finding appears to support the resource-based theory argument of possible link interaction between growth opportunities and tangible assets. These findings are similar to previous studies which have found a positive relationship (see Homaifa et al., 1994; Boyle and Eckhold, 1997). There is significant negative relationship between *FDC* and debt ratio for all countries except Pakistan (p-value <0.01). There is a positive relationship between *FCF* and debt ratio for Malaysia, South Korea and Thailand (p-value <0.01).

Table 4.5
Estimation Results of Unrestricted Dynamic Adjustment Model (Debt ratio)

The table presents the estimation results of unrestricted dynamic adjustment model for debt ratio:

$$D_{i,j,t} = (1-\delta^{(1)}_{i,j,t})D_{i,j,t} + \delta^{(1)}_{i,j,t}D^{*}_{i,j,t}$$

$$\text{where } D^{*}_{i,j,t} = \beta_{0,j} + \beta_1 NDTS_{i,j,t} + \beta_2 PROFIT_{i,j,t} + \beta_3 TANG_{i,j,t} + \beta_4 GROWTH_{i,j,t} + \\ + \beta_5 FDC_{i,j,t} + \beta_6 FCF_{i,j,t} + \beta_7 INV_{i,j,t} + \beta_8 BRISK_{i,j,t} + \beta_9 ROE_{i,j,t} + \varepsilon_{i,j,t}$$

$$\delta^{(1)}_{i,j,t} = \delta^{(1)}{}_{0,j} + \delta^{(1)}_1 BLIB_{i,j,t} + \delta^{(1)}_2 SLIB_{i,j,t} + \delta^{(1)}_3 INST_{i,j,t} + \delta^{(1)}_4 GROWTH_{i,j,t} + \delta^{(1)}_5 SIZE_{i,j,t} \\ + \delta^{(1)}_6 OWN1_{i,j,t} + \delta^{(1)}_7 OWN2_{i,j,t} + \delta^{(1)}_8 SIC1_{i,j,t} + \delta^{(1)}_9 SIC2_{i,j,t} + \delta^{(1)}_{10} SIC3_{i,j,t} + \delta^{(1)}_{11} SIC4_{i,j,t}$$

The dependent variable is total debt to total assets ratio. *NDTS* is the ratio of total depreciation expenses to total assets; *PROFIT* is ratio of earning before interest and taxes to total assets; *TANG* is ratio of net fixed assets to total assets; *GROWTH* is ratio of sum of market value of equity and total debt to total assets; *FDC* is ratio of total current assets divided by current liabilities; *FCF* is profitability multiplied by reciprocal of *q*-ratio (market to book ratio obtained from Datastream); *INV* is total investment in plant, property and equipment (obtained from cash flow statements form Worldscope), *ROE* is ratio of earnings after tax to total common shareholders equity; *BRISK* is defined as absolute value of the difference between return on asset in year *t* and *t-1*; *SIZE* is measured as natural log of total assets. All variables are nominal. *BLIB* is a dummy variable equal to 1 when the sum of banking sector liberalization measures is > 5 and 0 otherwise; *SLIB* is a dummy variable equal to 1 when the sum of stock market liberalization measures is >5 and 0 otherwise; *INST* is a dummy variable equal to 1 when the sum of institutional developments is > 5. *OWN1* is a dummy variable equal to 1 for foreign-owned firm and 0 otherwise. *OWN2* is a dummy variable equal to 1 if a firm belong to a group of firms and 0 otherwise. *SIC1, SIC2, SIC3* and *SIC4* are the industry dummies. Standard errors are White adjusted and reported in the parenthesis.

	Country					
	India	Indonesia	Malaysia	Pakistan	South Korea	Thailand
Determinants of target debt ratio: $D^{*}_{i,j,t}$						
Constant	0.4789[a]	0.5187[a]	0.3257[a]	0.2424[b]	0.1659[a]	0.5012[a]
	(0.0443)	(0.0330)	(0.0178)	(0.0949)	(0.0433)	(0.0633)
NDTS	-1.9108[a]	-1.0801[a]	1.0017[a]	-1.9173[a]	-1.7993[a]	-2.1332[a]
	(0.2881)	(0.2789)	(0.3185)	(0.7370)	(0.3235)	(0.7243)
PROFIT	-0.9903[a]	-0.6439[a]	-1.1009[a]	0.0996	-2.6681[a]	-3.3665[a]
	(0.1919)	(0.1794)	(0.1366)	(0.0329)	(0.2860)	(0.4851)
GROWTH	-0.0410[a]	0.0214	0.0111	0.0594	0.7138[a]	0.3208[a]
	(0.0096)	(0.0204)	(0.0090)	(0.0537)	(0.0514)	(0.0519
TANG	0.3904[a]	0.1396[a]	-0.0561	0.4206[a]	0.0156	-0.0258
	(0.0052)	(0.0521)	(0.0313)	(0.1401)	(0.0616)	(0.0882)
INV	0.0391	-0.1343	-0.0440	0.4427	0.0327	-0.0126
	(0.0353)	(0.0865)	(0.0207)	(0.2727)	(0.1115)	(0.0872)
FCF	-0.7314[a]	-0.1576	0.4588[a]	-0.2073	0.3872[a]	1.1718[a]
	(0.1462)	(0.1196)	(0.0949)	(0.1085)	(0.0929)	(0.2558)
FDC	-0.0418[a]	-0.0589[a]	-0.1494[a]	-0.0710	-0.0479[a]	-0.0806[a]
	(0.0127)	(0.0070)	(0.0108)	(0.0451)	(0.0119)	(0.0319)
BRISK	0.2970	0.3663[a]	0.0370	0.0118	-0.8563[a]	-0.2035
	(0.1812)	(0.0761)	(0.0752)	(0.0461)	(0.1293)	(0.1994)
ROE	0.3080[a]	-0.0085	0.0085	0.0267	-0.0022	0.0041
	(0.0530)	(0.0087)	(0.0082)	(0.0263)	(0.0093)	(0.0037)
Speed of adjustment of debt ratio: $\delta^{(1)}_{i,j,t}$						
Constant	0.3085	-0.4860	1.1724[a]	0.0388	0.0052	-0.1310
	(0.2898)	(0.8425)	(0.2277)	(0.4124)	(0.1265)	(0.2610)
BLIB	-0.3517[a]	1.6472[b]	0.0306	-0.0822	0.0651[a]	0.1559[a]
	(0.0596)	(0.8161)	(0.0822)	(0.1135)	(0.0336)	(0.0474)
SLIB	0.2718	-0.3254[b]	-0.1602	0.2446[a]	0.1711	-0.1587
	(0.1876)	(0.1303)	(0.1291)	(0.1225)	(0.1078)	(0.2359)
INST	0.1494[b]	0.0355	0.1279[b]	0.0762	-0.0484[b]	0.0043
	(0.0659)	(0.0592)	(0.0548)	(0.0893)	(0.0200)	(0.1063)
GROWTH	0.0016	-0.0768[b]	-0.0333	-0.0412	-0.1411[a]	-0.1333[a]
	(0.0150)	(0.0353)	(0.0243)	(0.0224)	(0.0109)	(0.0186)
SIZE	0.0113	0.0156	-0.0023	0.0011	0.0202[a]	0.0435[a]
	(0.0125)	(0.0210)	(0.0167)	(0.0373)	(0.0065)	(0.0132)

OWN1	-0.0140	0.0518	-0.4047 ^{a}	0.0905	-0.0145	0.1533 ^{a}
	(0.0386)	(0.0770)	(0.0838)	(0.0869)	(0.0373)	(0.0300)
OWN2	0.6151 ^{a}	0.0685	0.0066	-0.0134	-0.0629 ^{a}	0.0299
	(0.0579)	(0.0627)	(0.0667)	(0.0805)	(0.0266)	(0.0533)
SIC1	-0.2874	-0.0775	-0.2118 ^{a}	-0.2521	-0.1208	-0.3458 ^{a}
	(0.1911)	(0.1038)	(0.1049)	(0.1810)	(0.0663)	(0.0907)
SIC2	-0.2851	-0.2420 ^{a}	-0.1769	-0.0921	-0.0729	-0.2494 ^{a}
	(0.1613)	(0.0986)	(0.1090)	(0.1424)	(0.0500)	(0.0670)
SIC3	-0.4298 ^{a}	-0.1468	-0.1185	-0.0692	-0.0666	-0.2529 ^{a}
	(0.1632)	(0.1083)	(0.1117)	(1.5043)	(0.0503)	(0.0684)
SIC4	-0.5195 ^{a}	-0.1558	-0.2002	-0.0291	-0.2216	-0.1549 ^{b}
	(0.1717)	(0.1294)	(0.1212)	(0.0431)	(0.0553)	(0.0764)
Adjusted R^2	0.8155	0.7523	0.7420	0.7086	0.7953	0.7641
DW Test	1.9481	1.9333	2.1457	1.8660	1.8433	2.0421
Wald Test	68.9707 ^{a}	26.0038 ^{a}	6.8441 ^{a}	9.4131 ^{a}	22.2662 ^{a}	18.6357 ^{a}
JB Test	3.8992 ^{c}	8.5224 ^{a}	2.9867	0.0016	4.5676 ^{a}	2.0598
N	940	858	944	414	1038	1156

^{a}, ^{b}, and ^{c} respectively denote statistical significance at a 1-, 5-, and 10-percent level, *DW Test* is Durbin-Watson test for serial correlation in the residuals, Wald test for the hypothesis that the given set regressors are jointly zero; *J-B Test* is Jarque-Bera Normality test for residuals. Note we made adjustment for firs-order autocorrelation in the residuals found for India, Indonesia, and Malaysia by using second lag of the dependant variable on the right hand side.

Speed of Adjustment of Debt ratio

The coefficient of *BLIB* is significantly positive in Indonesia, South Korea and Thailand (*p*-value <0.01. *SLIB* is significant in Pakistan suggesting that stock market liberalization lead to increase in the speed of adjustment. These findings confirm that stock market development is not an obstacle in the way of obtaining debt similar to the findings of Demirguc-Kunt and Maksimovic (1995, 1996). The impact of *INST* on the speed of adjustment has been significantly positive in the case of India and Malaysia (*p*-value <0.05). The variable *GROWTH* has a negative effect on the speed of adjustment of debt ratio in most countries but significant in the case of Indonesia, South Korea and Thailand (*p*-value < 0.01, 0.05). A negative coefficient is interpreted as firms with higher growth opportunities adjust more slowly towards the optimal debt ratio. Heshmati (2002) suggest that such firms make small adjustments which are accomplished as a part of normal operations while larger adjustments are made using new issue of shares. The variable *SIZE* has a significant positive relationship with the speed of adjustment of debt ratio only in the case of Thailand and South Korea (*p*-value <0.01). The *OWN1* is significantly positive for Thailand and *OWN2* in India (*p*-value <0.01). The industry dummies are significantly negative in India and Thailand (*p*-value <0.01), suggesting that firms are not motivated to target industry level target debt ratios[5].

Optimal Equity Ratio and Speed of Adjustment of Equity Ratio

This section reports the determinants of optimal equity ratio, and speed of adjustment of equity ratio in Table 4.6. The diagnostic results show evidence of non-normality in the residuals but there is no evidence of serial correlation as shown by *DW test*. The variables have significant explanatory power as indicated by rejection of null hypothesis shown by *Wald* tests.

Evidence is found of a significant positive relationship between *PROFIT* and equity ratio for all countries except Thailand (*p*-value < 0.01). There is a negative relationship between *GROWTH* and equity ratio in Pakistan and South Korea but significantly positive in Thailand (*p*-value < 0.01). Titman and Wessels (1988) also found an inverse relationship between equity ratio and growth opportunities. Also, no significant relationship is found between *INV* and optimal equity ratio for all countries. This finding indicates that investment did not increase in proportion to the new equity issued by firms. This result is similar to that observed by Bhaduri and Khasnobis (2002) results for India. There is a significant positive relationship between *FDC* and equity ratio for all countries (*p*-value < 0.01). These findings suggest that firms in these countries raise new funds from seasoned equity offerings to offset temporary liquidity shortages. There is a negative relationship between *BRISK* and equity ratio for Indonesia, on the other hand, *BRISK* is significantly positive related to the equity ratio only in the case of South Korea which is supported by Chemmanur and Fulghieri (1997) that when insiders have private information about the underlying risk as well as the expected value of their firm's future cash flows, different types of equity classes are issued.

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[5] Lev (1969) firm's adjustment to industry-level debt ratio would depend on how confidently it expects the change to persist since it is useless to adjust the ratio to random fluctuations in the target. Accordingly, we should expect that when the industry mean is highly variable, and thus reflective of a large random component, the adjustment coefficient would be relatively small here even negative.

Table 4.6

Estimation Results of Unrestricted Dynamic Adjustment Model (Equity ratio)

The table presents the estimation results of the unrestricted dynamic adjustment model for equity ratio:

$$E_{i,j,t} = (1-\delta^{(2)}_{i,j,t})E_{i,j,t} + \delta^{(2)}_{i,j,t}E^*_{i,j,t}$$

$$\text{where}\, E^*_{i,j,t} = \phi_{0,j} + \phi_1 NDTS_{i,j,t} + \phi_2 PROFIT_{i,j,t} + \phi_3 TANG_{i,j,t} + \phi_4 GROWTH_{i,j,t} + $$
$$+\phi_5 FDC_{i,j,t} + \phi_6 FCF_{i,j,t} + \phi_7 INV_{i,j,t} + \phi_8 BRISK_{i,j,t} + \phi_9 ROE_{i,j,t} + e_{i,j,t}$$

$$\delta^{(2)}_{i,j,t} = \delta^{(2)}_{0,j} + \delta^{(2)}_1 BLIB_{i,j,t} + \delta^{(2)}_2 SLIB_{i,j,t} + \delta^{(2)}_3 INST_{i,j,t} + \delta^{(2)}_4 GROWTH_{i,j,t} + \delta^{(2)}_5 SIZE_{i,j,t}$$
$$+\delta^{(2)}_6 OWN1_{i,j,t} + \delta^{(2)}_7 OWN2_{i,j,t} + \delta^{(2)}_8 SIC1_{i,j,t} + \delta^{(2)}_9 SIC2_{i,j,t} + \delta^{(2)}_{10} SIC3_{i,j,t} + \delta^{(2)}_{11} SIC4_{i,j,t}$$

The dependent variable is total common equity to total assets ratio. *NDTS* is the ratio of total depreciation expenses to total assets; *FDC* is ratio of total current assets divided by current liabilities; *PROFIT* is ratio of earning before interest and taxes to total assets; *ROE* is ratio of earnings after tax to total common shareholders equity; *BRISK* is defined as absolute value of the difference between return on asset in year *t* and *t-1*; *TANG* is ratio of net fixed assets to total assets; *GROWTH* is ratio of sum of market value of equity and total debt to total assets; *FCF* is profitability multiplied by reciprocal of *q*-ratio (market to book ratio obtained from *Datastream*); *INV* is total investment in plant, property and equipment (obtained from cash flow statements form *Worldscope*), *SIZE* is measured as natural log of total assets. All variables are nominal. *BLIB* is a dummy variable equal to 1 when the sum of banking sector liberalization measures is > 5 and 0 otherwise; *SLIB* is a dummy variable equal to 1 when the sum of stock market liberalization measures is >5 and 0 otherwise; *INST* is a dummy variable equal to 1 when the sum of institutional developments is > 5. *OWN1* is a dummy variable equal to 1 for foreign-owned firm and 0 otherwise. *OWN2* is a dummy variable equal to 1 if a firm belongs to a group of firms and 0 otherwise. *SIC1, SIC2, SIC3* and *SIC4* are the industry dummies. Standard errors are White adjusted and reported in the parenthesis.

	Country					
	India	Indonesia	Malaysia	Pakistan	South Korea	Thailand
Determinants of target equity ratio: $E^*_{i,t}$						
Constant	0.0097	0.2752[a]	0.2709[a]	-0.0852	-0.1090	-0.1334
	(0.0409)	(0.0223)	(0.0198)	(0.0443)	(0.0775)	(0.0685)
NDTS	0.8497[a]	1.0022[a]	0.0746	0.2560	1.2705[b]	0.1223
	(0.3062)	(0.2312)	(0.3252)	(0.2691)	(0.5487)	(0.5068)
PROFIT	0.9109[a]	0.5532[a]	0.4107[a]	0.7984[a]	5.9588[a]	-0.0413
	(0.1714)	(0.1079)	(0.1156)	(0.1608)	(0.6933)	(0.3244)
GROWTH	0.0159	-0.0172	0.0112	-0.0481[b]	-0.5389[a]	0.0836[a]
	(0.0019)	(0.0113)	(0.0077)	(0.0202)	(0.0816)	(0.0244)
TANG	0.0173	-0.0206	0.1482[a]	0.3094[a]	0.5121[a]	0.2693[a]
	(0.0477)	(0.0362)	(0.0307)	(0.0655)	(0.1104)	(0.0733)
INV	-0.0272	-0.0064	0.0159	-0.0078	-0.0697	-0.0208
	(0.0298)	(0.0112)	(0.0216)	(0.1161)	(0.1827)	(0.0414)
FCF	0.4139[a]	0.0058	-0.1042	0.0245	-0.3718[b]	1.2594[a]
	(0.1264)	(0.0596)	(0.0709)	(0.0440)	(0.1894)	(0.3755)
FDC	0.1612[a]	0.0609[a]	0.0977[a]	0.2244[a]	0.2022[a]	0.1406[a]
	(0.0124)	(0.0052)	(0.0057)	(0.0215)	(0.0221)	(0.0163)
BRISK	-0.1659	-0.1550[a]	-0.0544	-0.0184	0.4331[a]	-0.0491
	(0.1616)	(0.0578)	(0.0706)	(0.0235)	(0.2067)	(0.2394)
ROE	-0.2050[a]	0.0066	0.0029	-0.0369[b]	-0.0225	0.0035
	(0.0466)	(0.0071)	(0.0016)	(0.0179)	(0.0035)	(0.0023)
Speed of adjustment of Equity ratio: $\delta^{(2)}_{i,j,t}$						
Constant	0.4299	1.2273	1.4217[a]	0.8743	-0.0158	0.0796
	(0.2301)	(0.9431)	(0.2385)	(0.5159)	(0.1082)	(0.2146)
BLIB	-0.3625[a]	0.1152	0.3676[a]	-0.3256[a]	0.0684	-0.0184
	(0.0520)	(0.9220)	(0.0762)	(0.1610)	(0.0484)	(0.0441)
SLIB	0.3297[a]	-0.1799	-0.0138	0.5028[a]	0.1000[a]	-0.4365[b]
	(0.1092)	(0.1151)	(0.1362)	(0.1530)	(0.0046)	(0.1994)
INST	0.1631[a]	0.0191	0.0097	-0.3550[a]	-0.0313[a]	-0.1020
	(0.0579)	(0.0556)	(0.0482)	(0.0835)	(0.0121)	(0.1163)
GROWTH	0.0034	0.0332	-0.0382	0.1800[a]	0.0598[a]	0.1065[a]
	(0.0156)	(0.0353)	(0.0238)	(0.0286)	(0.0103)	(0.0282)
SIZE	0.0017	-0.0076	-0.0490[a]	-0.0467	0.0163[a]	0.0428[a]
	(0.0129)	(0.0188)	(0.0168)	(0.0376)	(0.0042)	(0.0130)
OWN1	0.0499	-0.0001	0.3830[a]	0.3794[a]	-0.0341	0.0924[a]
	(0.0379)	(0.0744)	(0.0689)	(0.1008)	(0.0356)	(0.0335)

OWN2	0.3057^{a}	-0.0396	-0.0385	0.1985^{a}	-0.0178	0.1071^{a}
	(0.0687)	(0.0661)	(0.0633)	(0.0953)	(0.0157)	(0.0379)
SIC1	-0.4158^{a}	-0.1872	-0.1806	0.1609	-0.1461^{a}	-0.0399
	(0.1590)	(0.0980)	(0.1004)	(0.1773)	(0.0435)	(0.0505)
SIC2	-0.3342^{a}	-0.2020^{b}	-0.0584	0.0845	-0.0485	-0.2153^{a}
	(0.1187)	(0.0904)	(0.1053)	(0.1497)	(0.0300)	(0.0493)
SIC3	-0.3839^{a}	-0.2512^{b}	-0.1813	0.1587	-0.0093	-0.0636
	(0.1213)	(0.0988)	(0.1077)	(0.1643)	(0.0303)	(0.0468)
SIC4	-0.3344^{b}	-0.1965	-0.0277	0.1197	-0.0446	-0.0971
	(0.1369)	(0.1282)	(0.1197)	(0.0490)	(0.0422)	(0.0575)
Adjusted R^2	0.7013	0.3098	0.3386	0.8277	0.8271	0.7651
DW Test	1.8309	1.9033	1.8443	2.0446	1.7561	2.0686
Wald Test	9.7952^{a}	17.3855^{a}	4.5233^{c}	6.5814^{a}	4.0213^{c}	2.6071^{a}
JB Test	2.7294	1.8190	2.1018	3.3314	2.3632^{a}	1.9780
N	940	858	944	414	1034	1156

^{a}, ^{b}, and ^{c} respectively denote statistical significance at a 1-, 5-, and 10-percent level, *Wald* test for the hypothesis that the given set regressors are jointly zero; *DW Test* is Durbin-Watson test for serial correlation in the residuals. *J-B Test* is Jarque-Berra Normality test for residuals.

Speed of Adjustment of Equity ratio

The variable *SLIB* is significantly positive for India, Pakistan and South Korea (*p*-value <0.01 and 0.10). In the case of Pakistan and South Korea, firms with more favourable equity valuation might have issued new equity and reduced debt ratio. This explanation is more pertinent to the market timing hypothesis that stresses that firms coincide their equity issues with times when equity prices are high to avoid under-investment. *GROWTH* variable has a positive influence on the speed of adjustment of equity ratio for Pakistan, South Korea and Thailand (*p*-value <0.01). This confirms the earlier indication that firms with growth opportunities issue new shares for larger adjustments. The variable *SIZE* has a positive effect on the speed of adjustment for South Korea and Thailand (*p*-value <0.01). The influence of foreign ownership on speed of adjustment, shown by the coefficient of *OWN1* is significantly positive for Malaysia, Pakistan and Thailand (*p*-value <0.01). As in the case of debt ratio in Table 4.5, here too, the industry effect on the speed of adjustment of equity ratio are significantly negative in India, Indonesia and Thailand (*p*-value <0.01), suggesting that firms are not motivated to target industry level target equity ratios.

The difference in the estimation results obtained from *unrestricted* dynamic adjustment model Table 4.5 and *restricted* adjustment model in Table 4.2 and Table 4.3 are not negligible. The explanatory power increased dramatically when costly adjustments of debt and equity ratio are accounted for in the model, thus, our specification of time-varying speed of adjustment of debt ratio and equity ratio has performed clearly better. The results prove that *restricted* model specification ignored the variables- *BLIB, SLIB, INST,* and firm-level variables *SIZE, GROWTH* and industry factors which we found have significant effect on the speed of adjustments.

In sum, these findings seem to suggest the absence of a homogenous effect of liberalization on capital structure dynamics across Southeast Asian countries. It appears that the banking sector liberalization has a significant positive effect on a firm's speed of adjustment of debt ratio but the stock market liberalization has a less similar positive effect on a firm's speed of adjustment of equity ratio. This finding is similar to that of Schmukler and Vesperoni (2001) that access to international equity and bond markets led to an increase in the debt ratio of firms in Indonesia, South Korea, and Thailand. A summary of the retrospective analysis of liberalization and associated sequencing strategies of the sample countries and their impact on the adjustment speed of firms' capital structure is given below:

Sequence 1: Removal of exogenous interest rate ceilings, high reserve requirements and reduction in priority loans, stock market opening and privatization of state owned enterprises:

This liberalization strategy appears to be followed by Indonesia, Malaysia and Thailand. The spacing between interest rate liberalization and stock market liberalization in these countries varied from six years for Indonesia, five years for Malaysia, to three years for Thailand. The sequencing strategy has a significant positive effect on the speed of adjustment of debt ratio for Indonesia and Thailand. Some commentators hinted that Indonesia as a country which adopted the wrong sequencing in their liberalization process, i.e., starting off with capital account liberalization but its banking sector continued to suffer from repression and heavy interventions. Paradoxly, our results show it has been beneficial for adjustment of debt ratios.

Sequence 2: Privatization of banks, foreign bank entry, increase in scope of banking services and prudential regulation, first country fund and stock market opening:

This liberalization strategy appears to be followed by South Korea and to some extent by India and Pakistan. The spacing between interest rate liberalization and stock market liberalization for these countries also varied from one year for South Korea, four years for Pakistan, to six years for India. The sequencing strategy has a significant positive effect on the speed of adjustment of debt ratio for South Korea due to less spacing (shorter lag) as compared to other countries wherein there was more spacing (longer lags) in the implementation of reforms either in the banking sector or stock markets.

These new empirical findings are opposite to the suggestion of 'optimal spacing' between liberalization of domestic financial markets and capital account liberalization. They are supported by the argument that 'initial conditions' in the financial system and 'competition of instruments' (Sachs, 1988) might produce different outcomes of liberalization and consequently changes in capital structure decisions of firms. By allowing competition in the banking sector and increasing the autonomy of banks to institute market discipline in lending practices, this sequence might have reduced 'information asymmetry' and created the 'balance sheet effect'. The new potential borrowers who have been deterred due to credit rationing at lower rates, would have been able to enter the market and borrow after liberalization. Thus, these findings tentatively reject the idea of the 'over-borrowing syndrome' in the aftermath of liberalization, and rather suggest that a higher speed of adjustment of debt ratio might reflect firms' efforts to maximize the advantages from liberalization i.e. to attain optimal target debt ratio. This finding is explored in detail in Chapter 6.

The findings imply that the opening of stock markets and integration with international financial markets might have reduced the cost of equity capital in some countries due to 'information effect' and might have caused a positive spillover effect on the speed of adjustment of equity ratio, but the estimates do not indicate this channel of the effect. These two interrelated arguments are explored in Chapters 7 and 8.

4.4 Alternate Model Specification

This sections reports the results using competing target adjustment models, such as the inter-related adjustment model specification (see Gatward and Sharpe, 1996). The comparison of the unrestricted dynamic adjustment model developed for this study with other this adjustment model will provide a better assessment of our models.

4.4.1 Inter-related Target Adjustment Model of Debt and Equity Ratio

The inter-related adjustment model of_Gatward and Sharpe (1996) is motivated as follows: for a typical firm *i* at the end of period *t*:

$$YE_{it} + YL_{it} + YS_{it} = 1 \qquad (4.13)$$

Where *YE* is the common equity to total assets ratio, *YL* is the long-term debt to total assets ratio, and *YS* is the short-term debt to total assets ratio. The behavioural equation postulate that changes in the equity (long-term debt) ratio derive from three sources: (i) the firm gradually adjusts its beginning of period equity (long-term debt) ratio to its desired or long-run equilibrium ratio as to minimize the total transaction costs and the opportunity cost of diverging from the long-run equilibrium ratio; (ii) because of interdependence and differing adjustment costs across debt categories, changes in the long-term and short-term debt ratios may impact on the equity ratio (and similarly) changes in the equity and short-term debt ratios may impact on the long-term debt ratio; and (iii) various transitory factors, or innovations, may cause the equity (long-term debt) ratio to diverge from its desired or long-run equilibrium level. Incorporating these three elements and assuming two innovations, denoted by *I*1 and *I*2 respectively, defined as $I1_{it} = \frac{(\Delta TA_{it})}{TA_{i,t-1}}$ and $I2_{it} = \frac{(\Delta NIATD_{it})}{TA_{i,t-1}}$, where, *TA* is beginning of the period total assets and *NIATD* is net income after taxes and dividends. Note that we do not estimate the coefficients for the short-term debt as in Gatward and Sharpe (1996) rather we use total debt ratio and total equity ratio only as dependent variables in estimation . The behavioural equations for equity and total debt are given by:

$$\Delta YD_{i,j,t} = {}_L\lambda_0\left[(YL^*_{i,j,t} - YL_{i,j,t-1}) + {}_L\lambda_1\Delta YE_{i,j,t} + {}_L\lambda_2\Delta YS_{i,j,t} + {}_L\lambda_3 I1_{i,j,t} + {}_L\lambda_4 I2_{i,j,t}\right] \tag{4.14}$$

$$\Delta YE_{i,j,t} = {}_E\lambda_0\left[(YE^*_{i,j,t} - YE_{i,j,t-1}) + {}_E\lambda_1\Delta YL_{i,j,t} + {}_E\lambda_2\Delta YS_{i,j,t} + {}_E\lambda_3 I1_{i,j,t} + {}_E\lambda_4 I2_{i,j,t}\right] \tag{4.15}$$

where an (*) indicates the desired or long-run equilibrium level of the variables, ${}_E\lambda_K$ and ${}_L\lambda_K$ for *k*= 0, 1, 2 ,3, 4 are the estimated parameters. While the own adjustment parameters, ${}_E\lambda_0$ and ${}_L\lambda_0$ are expected to be positive, the signs of the cross-adjustment parameters are uncertain. If the cross-adjustment parameters ${}_E\lambda_1$, ${}_E\lambda_2$, ${}_L\lambda_1$ and ${}_L\lambda_2$ are insignificantly different from zero then the model in (4.14) and(4.15) collapses to partial adjustment model defined in Equations 4.1 and 4.4.

$$D_{i,j,t} - D_{i,j,t-1} = \delta_j^{(1)}(D^*_{i,j,t} - D_{i,j,t-1}) \tag{4.1}$$

$$E_{i,j,t} - E_{i,j,t-1} = \delta_j^{(2)}(E^*_{i,j,t} - E_{i,j,t-1}) \tag{4.4}$$

where ${}_L\lambda_0 = \delta_j^{(1)}$, ${}_E\lambda_0 = \delta_j^{(2)}$, $\Delta YD = D_{i,j,t} - D_{i,j,t-1}$ and $\Delta YE = E_{i,j,t} - E_{i,j,t-1}$

Because of equation (4-14), any factor influencing the desired actual equity ratio must have an equal and offsetting influence across the two debt ratio, thus, in general terms, factors influencing the desired equity ratio should also appear as explanatory variables in the desired debt ratio, and vice versa. The desired or optimal equity and long-term debt ratios of a firm depend *linearly* on a common set of *variables*, X_{jit} for *j=1 to J*:

$$YE^{*}_{it} = {}_{E}\beta_0 + \sum_{j=1}^{J} {}_{E}\beta_j X_{jit} \tag{4.16}$$

$$YL^{*}_{it} = {}_{L}\beta_0 + \sum_{j=1}^{J} {}_{L}\beta_j X_{jit} \tag{4.17}$$

The variables X_{jit} are: *NDTS, PROF, TANG, GROWTH, BRISK, SIZE, FDC,* β_0 and β_j are estimated parameters. Then, substituting equations (4.16 and (4.17) into equations (4.14) and (4.15) and noting that we have:

$$\Delta YE_{it} = \frac{{}_{E}\lambda_0}{1+{}_{E}\lambda_{0\,E}\lambda_2}\left[{}_{E}\beta_0 + \sum_{j=1}^{J} {}_{E}\beta_j X_{jit} - YE_{i,t-1} + ({}_{E}\lambda_1 - {}_{E}\lambda_2)\Delta YL_{it} + {}_{E}\lambda_3 I1_{it} + {}_{E}\lambda_4 I2_{it} \right], \tag{4.18}$$

$$\Delta YL_{it} = \frac{{}_{L}\lambda_0}{1+{}_{L}\lambda_{0\,L}\lambda_2}\left[{}_{L}\beta_0 + \sum_{j=1}^{J} {}_{L}\beta_j X_{jit} - YL_{i,t-1} + ({}_{L}\lambda_1 - {}_{L}\lambda_2)\Delta YE_{it} + {}_{L}\lambda_3 I1_{it} + {}_{L}\lambda_4 I2_{it} \right], \tag{4.19}$$

Then, multiplying both sides by $[{}_{E}\lambda_0/(1+{}_{E}\lambda_{0\,E}\lambda_2)]^{-1}$ of equation (4.18) by and then adding $YE_{i,j,t}$ to both sides and similarly in (4.19) and by re-arranging above equations we obtain:

$$YE_{it} = {}_{E}\beta_0 + + \sum_{j=1}^{J} {}_{E}\beta_j X_{jit} - \frac{(1-{}_{E}\lambda_0 + {}_{E}\lambda_{0\,E}\lambda_2}{{}_{E}\lambda_0}\Delta YE_{it} + ({}_{E}\lambda_1 - {}_{E}\lambda_2)\Delta YL_{it} + {}_{E}\lambda_3 I1_{it} + {}_{E}\lambda_4 I2_{it} \tag{4.20}$$

$$YD_{it} = {}_{L}\beta_0 + + \sum_{j=1}^{J} {}_{L}\beta_j X_{jit} - \frac{(1-{}_{L}\lambda_0 + {}_{L}\lambda_{0\,L}\lambda_2}{{}_{L}\lambda_0}\Delta YE_{it} + ({}_{L}\lambda_1 - {}_{L}\lambda_2)\Delta YE_{it} + {}_{L}\lambda_3 I1_{it} + {}_{L}\lambda_4 I2_{it} \tag{4.21}$$

Thus regression estimates of above equations (4.20) and (4.21) provide direct estimates for the long-run equilibrium determinants of capital structure, β_j.

Estimation of the inter-related adjustment model

The estimation results of inter-related adjustment model are presented in Table 4.6. The null hypothesis of no cross-adjustment effects for Malaysia, Pakistan, and South Korea is not rejected, but it was rejected for India, Indonesia and Thailand[6]. The inter-related adjustments between the debt ratio and equity ratio found for these countries show that interaction between different financial decisions of a firm as suggested by also Jalilvand and Harris (1984) and Gatward and Sharpe (1996). While of the other countries, where no evidence of cross-adjustment was found, the results seem to suggest that debt and equity decisions have been made individually.

The coefficient of the adjustment mechanism, ΔYE in Eq. (4.14) is negative and significant for all countries except Indonesia and Malaysia, ΔYD is significantly negative for India and Thailand (p-value < 0.01). Thus, we can infer that firms in the former countries substituted more debt for equity during the liberalization period than in the latter countries. The coefficient of adjustment mechanism, ΔYE in Eq. (4.15) is negative for all countries except India, whereas ΔYD is significantly negative for all countries except Malaysia (though not significant). This finding appears to suggest that changes in the equity level of firms have a negative influence on debt level and vice versa. In summary, even though overall significance of the explanatory variables is high and the interrelated partial adjustment seems to explain the adjustment process of capital structure but *DW* test seems to suggest the model produces higher autocorrelation in the residuals compared to *unrestricted* dynamic adjustment model.

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[6] The chi-squared statistic was 51.00, 16.34 and 6.75 respectively.

Table 4.7

Estimation of Inter-related Adjustment Model of Debt and Equity Ratio

This table reports the results of the Augmented Interrelated Adjustment model used in Gatward and Sharpe (1996). Dependent variables are Debt and Equity ratios defined as total debt to total assets ratio and total common equity to total assets ratio. Other explanatory variables are defined earlier in Table 4.1. The standard errors are shown in parenthesis using the White correction for Heteroskedasticity.

	Country					
	India		Indonesia		Malaysia	
	Dependent variables		Dependent variables		Dependent variables	
	Debt	Equity	Debt	Equity	Debt	Equity
Adjustment mechanism						
Change in Equity ΔYE	0.1454 ^{a}	-0.0901 ^{b}	-0.3268 ^{a}	0.7207 ^{a}	-0.5089 ^{a}	0.5003 ^{a}
	(0.0395)	(0.0373)	(0.0678)	(0.0698)	(0.0629)	(0.0764)
Change in Debt ΔYD	-0.4268 ^{a}	-0.2580 ^{a}	-0.0955	0.3311 ^{a}	0.0469	-0.0637
	(0.0410)	(0.0359)	(0.0655)	(0.0722)	(0.0626)	(0.0768)
Long run variables						
NDTS	-0.1471	1.0142 ^{a}	-1.0435 ^{a}	0.6924 ^{a}	-0.2977	0.3055
	(0.2184)	(0.1986)	(0.2323)	(0.2475)	(0.3029)	(0.3697)
PROF	-0.2405 ^{a}	0.4800 ^{a}	-0.5091 ^{a}	0.4531 ^{a}	-0.4359 ^{a}	0.3266 ^{a}
	(0.0662)	(0.0602)	(0.0596)	(0.0635)	(0.0629)	(0.0768)
TANG	0.4276 ^{a}	-0.0701 ^{a}	0.1496 ^{a}	-0.0224	0.0208	0.0684 ^{c}
	(0.0290)	(0.0264)	(0.0375)	(0.0400)	(0.0263)	(0.0321)
GROWTH	-0.0170	0.0884 ^{a}	0.0183	-0.0195*	0.0489	-0.0115
	(0.0332)	(0.0302)	(0.0104)	(0.0111)	(0.0578)	(0.0705)
BRISK	-0.0762	-0.0632	0.2758 ^{a}	-0.2886 ^{a}	0.0770	-0.1300 ^{c}
	(0.0825)	(0.0750)	(0.0539)	(0.0574)	(0.0615)	(0.0705)
SIZE	0.0270	0.0076	0.0826 ^{a}	-0.0864 ^{a}	0.0571	-0.0922 ^{a}
	(0.0775)	(0.0704)	(0.0115)	(0.0122)	(0.0940)	(0.0110)
LIQUIDITY	-0.0249	0.0787 ^{c}	-0.0086 ^{b}	0.0131 ^{b}	-0.0372 ^{a}	0.0684 ^{a}
	(0.0522)	(0.0471)	(0.0052)	(0.0056)	(0.0093)	(0.0114)
INV	-0.0336 ^{b}	0.0432 ^{a}	-0.0974	0.1042 ^{a}	0.0739	-0.0486
	(0.0165)	(0.0150)	(0.0991)	(0.0105)	(0.0657)	(0.0802)
Adj. R^2	0.3952	0.4173	0.3546	0.3191	0.2220	0.1828
Wald Test	30.0415 ^{a}	0.0668	15.2402 ^{a}	110.6176 ^{a}	7.1520 ^{a}	214.3435 ^{a}
Joint Test	51.0001 ^{a}		16.1345 ^{b}		0.4764	
DW Test	0.5216 ^{a}	0.6917 ^{a}	0.8717 ^{a}	1.1065 ^{a}	1.2344 ^{a}	0.9471 ^{a}
J-B Test	0.0001	0.0001	0.0000	0.0002	0.0000	0.0001
N	1150	1150	766	766	992	992

^{a}, ^{b}, and ^{c} respectively denote statistical significance at a 1-, 5-, and 10-percent level, Wald test for the hypothesis that the given set regressors are jointly zero; *DW Test* is Durbin-Watson test for serial correlation in the residuals, *J-B Test* is Jarque-Berra Normality test for residuals.

Table 4.9 (continued...)

	Country					
	Pakistan		South Korea		Thailand	
	Dependent variables		Dependent variables		Dependent variables	
	Debt	Equity	Debt	Equity	Debt	Equity
Change in equity ΔYE	-0.4195 ^{a}	-0.0934 ^{a}	-0.4987 ^{a}	-0.4577 ^{a}	-0.2305 ^{b}	-0.3230 ^{b}
	(0.0767)	(0.0259)	(0.0485)	(0.0510)	(0.0403)	(0.0415)
Change in debt ΔYD	-0.0226	0.0296	-0.0385	0.0589	-0.1793 ^{b}	-0.0939 ^{b}
	(0.0358)	(0.0554)	(0.5036)	(0.0462)	(0.0395)	(0.0423)
Long run variables						
NDTS	-0.7730*	1.0803 ^{a}	-1.4394 ^{a}	0.9111 ^{a}	-1.1649 ^{b}	-0.1603
	(0.4687)	(0.3390)	(0.1641)	(0.1564)	(0.2203)	(0.2312)
PROFIT	-0.3391 ^{a}	0.5059 ^{a}	-0.1571 ^{a}	0.1194 ^{b}	-0.4043 ^{b}	0.4260 ^{b}
	(0.0956)	(0.0691)	(0.0589)	(0.0561)	(0.0586)	(0.0615)
TANG	0.3836 ^{a}	0.1733 ^{a}	-0.0148	0.1534 ^{a}	0.4996 ^{a}	-0.1359 ^{a}
	(0.0508)	(0.0367)	(0.0260)	(0.0246)	(0.0250)	(0.0263)
GROWTH	0.0208	-0.0302	0.1189 ^{a}	-0.0277 ^{a}	-0.0148	0.0723 ^{c}
	(0.0133)	(0.0968)	(0.0106)	(0.0101)	(0.0295)	(0.0396)
BRISK	-0.0767	0.0415	0.1775 ^{c}	-0.1910 ^{b}	0.0856	0.1436 ^{c}
	(0.0790)	(0.0571)	(0.0981)	(0.0935)	(0.0734)	(0.0770)
SIZE	-0.0424 ^{a}	-0.0669	0.0351	-0.0586	-0.0379	-0.0147
	(0.0136)	(0.0983)	(0.0583)	(0.0555)	(0.0661)	(0.0698)
FDC	-0.1089 ^{b}	0.1556*	-0.0588	0.0810 ^{a}	-0.0004	0.0043
	(0.0131)	(0.0951)	(0.0411)	(0.0391)	(0.0031)	(0.0032)
INV	-0.0120	0.0295	0.0167	0.0167	-0.0608 ^{a}	0.0753 ^{a}
	(0.0337)	(0.0244)	(0.0200)	(0.0200)	(0.0148)	(0.0156)
Adj. R^2	0.4631	0.3698	0.4688		0.4102	0.1569
Wald Test	12.3669 ^{b}	20.4892 ^{b}	6.4929 ^{c}	107.5425 ^{a}	52.3753 ^{b}	37.3586 ^{b}
Joint test	0.3191		0.4688		6.7583 ^{c}	
DW Test	0.7876 ^{a}	0.8336 ^{a}	0.6489 ^{a}	0.8032 ^{a}	0.5095 ^{a}	0.5442 ^{a}
J-B Test	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
N	403	403	1634	1634	1286	1286

Table 4.9
(concluded)

4.5 Goodness of Fit - Assessment of Adjustment Models

The most decisive assessment of the performance of the study's non-linear *unrestricted* dynamic adjustment model defined in Eq () vis-à-vis the rival constant and inter-related adjustment models comes from Table 4.8, which contains summary 'goodness of fit' test statistics. The overall explanatory power of the model indicated by *Adj.* R^2 is comparatively higher for *unrestricted* dynamic adjustment model than competing models. The results show that the non-linear specification with a time-varying adjustment mechanism has been better than the inter-related multivariate adjustment and constant adjustment speed models.

Table 4.8
Goodness of Fit Test Statistics for the Adjustment Models

This table compares 'goodness of fit' statistics for the Baseline *unrestricted* dynamic adjustment models of debt ratio as dependent variable against three rival dynamic partial adjustment models - (Gatward and Sharpe, 1996) (Miguel and Pindado, 2001) and Gaud et al. (2005) hereafter referred to as GS (1996); MP (2001) and GU (2005) respectively. Note that *Adj.* R^2measure for the equity ratio is not shown here.

	Adj. R^2			
Country	*Unrestricted* Dynamic Adjustment	Inter-related Adjustment	*Restricted* Dynamic Adjustment	
		GS(1996)	MP (2001)	GU(2005)
India	0.8155	0.3952	0.5173	0.7228
Indonesia	0.7523	0.3546	0.3878	0.7406
Malaysia	0.7420	0.2220	0.1487	0.4578
Pakistan	0.7086	0.4631	0.3253	0.6990
South Korea	0.7953	0.4688	0.6232	0.4216
Thailand	0.7641	0.4102	0.3891	0.4743

4.6. Conclusion

In this chapter, we investigated the impact of financial liberalization on the capital structures of the firms in Southeast Asian countries. The null hypotheses of no effect of the financial liberalization indicators on the speed of adjustment are rejected for most of the countries. The findings seem to suggest that the sequencing and order of financial liberalization does matter. In particular, the financial liberalization indicators are seen to have a significant effect on the speed of adjustment of debt and equity ratio. The empirical results suggest that firms in Pakistan, Indonesia and South Korea have been relatively 'faster' than firms in other Southeast Asian countries to attain optimal debt and equity ratios in response to banking sector and stock market liberalization.

In addition, contrary to the widely-held belief that firms adjust financial ratios to industry level, the results in this study indicate that industry factors are not significant in capital structure adjustments of the firms in the sample. The empirical results and explanatory power of dynamic *unrestricted* models confirm that the dynamic specification to study firms' capital structure decisions is superior to the three alternative specifications of the *restricted* dynamic adjustment model used in the recent literature. This study only focus on the influence of the domestic banking sector and stock markets liberalization in our work, this work can be further extended to the trade liberalization framework has been explored. Baggs (2002) shows that trade liberalization or falling domestic tariffs will produce competing influences on the amount of debt held by domestic firms. Falling domestic tariffs reduce protection for the domestic industry which increases the probability of bankruptcy. By increasing the expected marginal cost of bankruptcy without alerting the tax benefit of debt falling, domestic tariffs reduce the optimal level of debt.

The analysis of speed of adjustment of debt and equity ratio is extended in Chapter 5, by extending the comparison of the speeds of adjustment not only by classification of firms according to size and ownership but also to the international level by including South American and European countries. The economic rationale for making an international comparison is to identify the different patterns of liberalization and relate these to the movement in the speed of adjustments.

Chapter 5

SPEED OF ADJUSTMENT OF DEBT AND EQUITY RATIOS

5.1 Introduction

In this chapter, the dynamics of the speed of adjustment of debt and equity are discussed in detail. Specifically, the hypotheses regarding the difference between the speeds of adjustment of firms are tested using firm-specific characteristics. More specifically, it was found that firm specific characteristics such as size and ownership have significant effect on the speed of adjustment of debt ratio and equity ratio for some countries. It is argued that importance of these factors underlying the adjustment process of debt and equity ratio has not been investigated in previous studies.

5.2 What is Speed of Adjustment?

The duration of the adjustment process of financial ratios to their targets has received little attention since the earlier studies of Lev (1969), Blinder (1986), Peles and Schneller (1989), and Davis and Peles (1993). It has often been hypothesized that a firm desires some specific quantity of assets and liabilities which it seeks to target. Firms' adjustments to a given target vary depending on the industry and financial markets. In a perfect market, without transaction costs (Modigliani and Miller, 1958), firms should be able to adjust instantaneously to their selected targets, but the existence of various transaction costs can influence firms' adjustment behaviour. The acknowledgement of these costs in the literature has given rise to the notion of partial adjustment, and a firm's adjustment to its target in the presence of these costs has been referred to as speed of adjustment.

The main argument of this chapter is that the existence of adjustment costs may cause firms to respond differently and this adjustment behaviour has not been empirically explored. Consequently, the researcher's investigation into the adjustment speed is motivated by this gap in the literature. The lack of empirical work on a suitable methodology to study adjustment patterns can be associated with the low level of empirical work in the area. Two main problems may have given rise to this situation, namely, the selection of the variables and the parameterization of the adjustment speed coefficient (see Chapter 2). This problem is overcome in this study by using two dynamic adjustment models for debt and equity ratio individually using non-linear model. The relative performance of these non-linear models has already been indicated in Chapter 4. A key feature of the dynamic adjustment model is that it simultaneously endogenizes speed of adjustment and target debt and equity ratios.

The rest of the chapter is organized as follows. In Section 5.2, the country-level analysis evaluates the speed of adjustment assuming the constant adjustment speed across firms, in the spirit of Miguel and Pindado (2000) and Gaud et al. (2005). In section 5.3, evidence of time-variation in speeds of adjustment is presented in graphical form. Section 5.4 provides results of testing the hypotheses of no difference in the speed of adjustment of debt ratio and equity ratio taking into account firm size and ownership. The chapter concludes in Section 5.5.

5.2 Country-level Analysis

It has been argued that the adjustment speed coefficient captures the extent of the adjustment costs and the costs of being in disequilibrium, which are related to the extent of government interventions in the financial markets in a country at a certain time (Ozkan, 2001; Gaud et al., 2005). If the level of government interventions varies across countries (explained in Chapter 2), the adjustment costs might also vary across the countries. Being in disequilibrium, i.e., debt ratio higher than target debt ratio might happen if a firm has easier access to credit than other firms due to government-directed credit policies. For instance, in Indonesia, prior to liberalization, the government required banks to allocate at least 30% of their loan portfolios to export-related activities and 20% to small-scale enterprises (Nasution, 2003). Consequently, the debt ratio was 1.61 for export firms compared to 0.61 for non-export firms. This example suggests that government intervention can increase (decrease) the debt ratio, which implies that some firms might have a higher and faster speed of adjustment than others.

In the absence of such government interventions in financial markets, adjustment behaviour might be different. Davis and Peles (1993) argue that if there is a firm-specific equilibrium value for a debt ratio, firms will move towards equilibrium from an out-of-equilibrium state caused by government interventions. On the contrary, if there is no equilibrium value of a debt ratio, it will follow a random walk and the shocks to debt ratio will not be adjusted. If firms have target debt or equity ratios, then shocks to these targets will force firms to restore equilibrium values of debt and equity in the capital structure.

In order to ascertain whether the Southeast Asian firms in the current sample have benefited more or less from the different sequencing strategies of financial liberalization i.e. banking sector and stock markets liberalization, an attempt was made to compare the countries in the sample in respect of the speed of adjustment across emerging markets because of the similarity in financial markets and institutional settings. For this purpose, a sample of listed non-financial firms in Chile, Mexico, Greece, Turkey, Philippines and Taiwan, was selected, since these countries have also undergone similar experience of banking sector and stock market liberalization during the 1980s and 1990s, and therefore, serve as good examples for comparison. Information about the liberalization events relating to banking sector and stock markets for Chile, Mexico, Greece, Turkey, Philippines and Taiwan was used following the same procedure as in Chapter 3. For each country, the data set comprises the following number of firms and time periods: Chile, 304, 1991 to 2003; Greece, 240, 1991-2003; Mexico, 382, 1991-2003; Philippines, 226, 1991-2003; Taiwan, 300, 1991-2003; and Turkey, 176, 1991-2003; After removing the outliers and firms with missing information about variables for firm-level data, a final sample comprising 817 firms from the original sample of 1,628 was selected for comparison. the base-line partial adjustment models estimated in the subsequent section are:

$$\begin{aligned} D_{i,j,t} &= (1-\delta_j^{(1)})D_{i,j,t-1} + \beta_1 NDTS_{ijj,t} + \beta_2 PROFIT_{i,j,t} + \beta_3 TANG_{i,j,t} \\ &\quad + \beta_4 GROWTH_{i,j,t} + \beta_5 FDC_{i,j,t} + \beta_6 FCF_{i,j,t} + \beta_7 INV_{i,j,t} + \eta_{i,j,t} \end{aligned} \tag{4.7}$$

$$\begin{aligned} E_{i,j,t} &= (1-\delta_j^{(2)})E_{i,j,t-1} + \phi_1 NDTS_{ijj,t} + \phi_2 PROFIT_{i,j,t} + \phi_3 TANG_{i,j,t} \\ &\quad + \phi_4 GROWTH_{i,j,t} + \phi_5 FDC_{i,j,t} + \phi_6 FCF_{i,j,t} + \phi_7 INV_{i,j,t} + \kappa_{i,j,t} \end{aligned} \tag{4.8}$$

In the figures that follow, the size of the bubble indicates the magnitude of the speed of adjustment in each country at a particular time period. The researcher related the magnitude of the speed of adjustment debt ratio to a *year* when a country liberalized the interest rates, and the speed of adjustment equity ratio to a *year* of stock markets opening for each country to observe the lead and lag effect of liberalization on the adjustment speed.

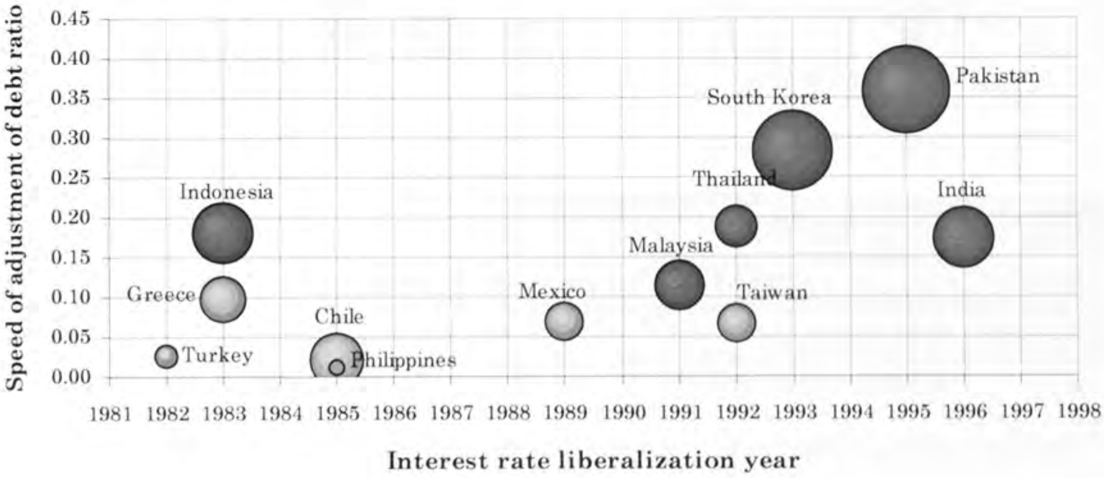

Fig 5.1 Interest rate Liberalization and Speed of Adjustment of Debt Ratio
This figure shows the position of 11 countries on the financial liberalization policy grid, which have initiated liberalization policies over the period of 1981-1998. The figure indicates the position of each country and the debt ratio (indicated by the size of bubble) for each country. The x-axis shows the years in which countries completely liberalized the interest rates and the y-axis shows the speed of adjustment of debt ratio. The sample countries are shown in red color.

Fig 5.1 shows the speed of adjustment of debt ratio at the time of full interest rate liberalization. The removal of restrictions on the interest rates on loans and deposits has been a precursor to the banking sector liberalization. It can be seen that the removal of interest rate restrictions led to a higher speed of adjustment of debt ratio for South Korea and Thailand during the 1990s, compared to Greece, Chile, Mexico, Indonesia, and the Philippines before 1990s. The mean total debt ratio was 24% for Mexico, 21% for Chile, 18% for Turkey, and 19% for Greece during 1991-1994 compared to 43% for South Korea and 35% for Thailand. Even the Southeast Asian countries, Indonesia and Malaysia, lifted the interest rate ceilings earlier (in the 1980s) compared to Pakistan (in the early 1990s) but the speed of adjustment has been lower for Indonesia, and Malaysia during 1991-1994 compared to Pakistan. Thus, the results show that the implementation of banking sector liberalization has caused a significant difference in the speed of adjustment of debt ratio across countries.

Fig 5.2 Stock Market Opening and Speed of Adjustment of Equity Ratio
This figure shows the position of 11 countries on the financial liberalization policy grid, which have initiated liberalization policies over the period of 1983-1994. The figure indicates the position of each country and the equity ratio (indicated by the size of bubble) for each country. The x-axis shows the years in which stock market was opened for foreign investment and the y-axis shows the adjustment speed of equity ratio. The sample countries are shown in red color.

Fig 5.2 shows the effect of stock market opening on the speed of adjustment of equity ratio. The estimated coefficients of the adjustment speed of equity ratio have been the lowest for Turkey and Philippines, and the highest for Pakistan and South Korea. The positions of these countries and the size of the adjustment coefficients indicate that stock market openings have led to higher speed of adjustment of equity ratio in those countries that opened stock market later in 1990s.

Fig 5.3 summarizes the overall influence of the banking sector and stock market liberalization on the speed of adjustment of debt ratio on a liberalization policy grid. A 45 degree line was used to show the distance from this line of both stock market and banking sector liberalization.

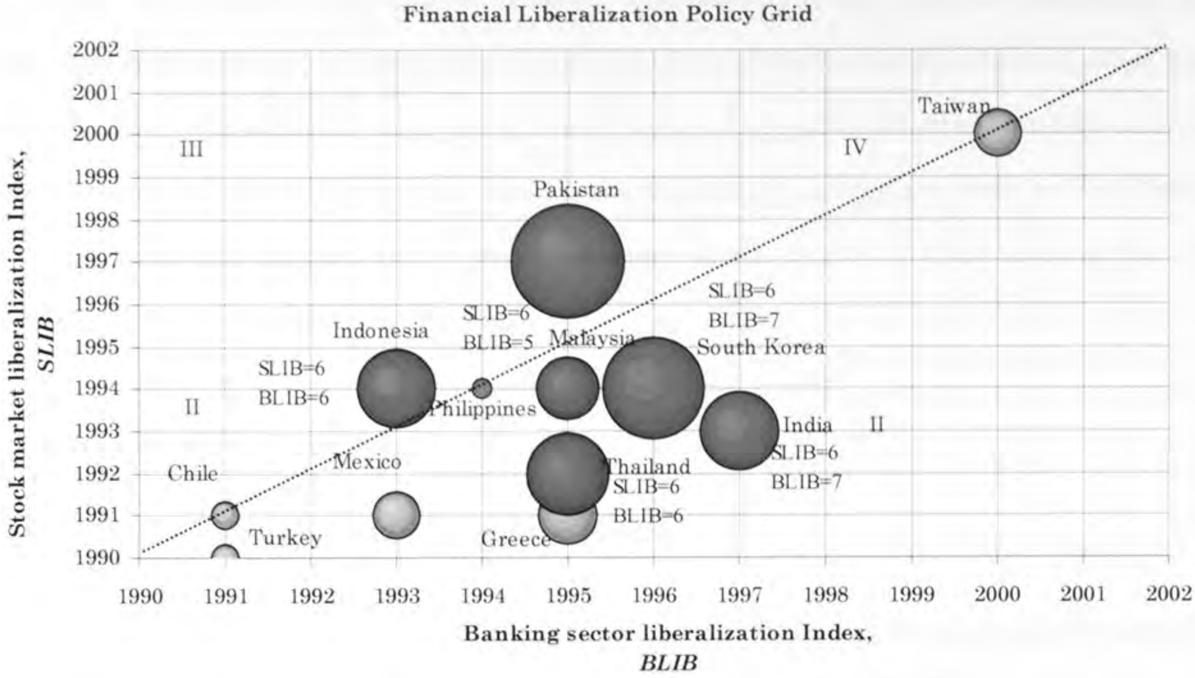

Fig 5.3 Financial Liberalization Sequencing and Speed of Adjustment of Debt Ratio
This figure shows the position of 11 countries on the financial liberalization policy grid, which have initiated liberalization policies over the period of 1991-2002. The figure indicates the position of each country and the debt ratio (indicated by the size of bubble) for each country. The x-axis shows banking sector liberalization years and the y-axis shows stock market liberalization years. The sample countries are shown in red colors.

A smaller distance shows that both the stock market and banking sector liberalization were completed in parallel fashion, whereas a larger distance from the line shows lead or lag in the stock market or the banking sector liberalization. The positions of Chile, Mexico, Turkey, and Philippines, (see quadrant I Fig 5.3) show simultaneous opening of stock markets and banking sector liberalization. This sequencing strategy has been referred to as 'comprehensive liberalization strategy' (Cho, 1986).

On the other hand, the positions of India, South Korea and Thailand (see quadrant II in Fig 5.3) show earlier opening of the stock markets and delay in banking sector reforms. Recall that in Chapter 3, *BLIB* =6, *BLIB*=7 for these countries in year 1997 It can be conjectured that in those countries, such as Thailand and South Korea, where stock market liberalization led the domestic banking sector liberalization, there has been a higher adjustment speed of debt ratio, whereas, in those countries where stock market or banking sector liberalization were completed simultaneously, such as Chile, Turkey, Indonesia, and Malaysia, the speed of adjustment of debt ratio has been relatively lower. The financial liberalization policy grid also highlights the difference in the sequence of stock markets and domestic banking sector liberalization, which has been opposite to the sequence suggested by the advocates of liberalization as indicated in Chapter 2. It appears that most countries have adopted the sequencing strategy indicated by Cho (1986), an observation that suggests that a well-functioning equity market is a pre-requisite for the success of domestic financial liberalization.

5.3 Firm-level Analysis

5.3.1 Time-varying Speeds of Adjustment

In the previous section, the researcher used the coefficients of adjustment speeds of the debt and equity ratios, which assume that adjustment speed is not time-varying and is similar across firms in a country. However, in this section, this assumption is relaxed and it is supposed that the speed of adjustment is not similar across firms, and varies over time. The time-varying speed of adjustment of debt and equity ratio for each firm in a country was calculated using Eq.4.9 and Eq.4.10 below:

$$\begin{aligned}\delta^{(1)}_{i,j,t} = \delta^{(1)}{}_{0,j} + \delta^{(1)}_{1} BLIB_{i,j,t} + \delta^{(1)}_{2} SLIB_{i,j,t} + \delta^{(1)}_{3} INST_{i,j,t} + \delta^{(1)}_{4} SIZE_{i,j,t} + \delta^{(1)}_{5} GROWTH_{i,j,t} \\ + \delta^{(1)}_{6} OWN1_{i,j,t} + \delta^{(1)}_{7} OWN2_{i,j,t} + \delta^{(1)}_{8} SIC1_{i,j,t} + \delta^{(1)}_{9} SIC2_{i,j,t} + \delta^{(1)}_{10} SIC3_{i,j,t} + \delta^{(1)}_{11} SIC4_{i,j,t}\end{aligned} \tag{4.9}$$

$$\begin{aligned}\delta^{(2)}_{i,j,t} = \delta^{(2)}_{0,j} + \delta^{(2)}_{1} BLIB_{i,j,t} + \delta^{(2)}_{2} SLIB_{i,j,t} + \delta^{(2)}_{3} INST_{i,j,t} + \delta^{(2)}_{4} SIZE_{i,j,t} + \delta^{(2)}_{5} GROWTH_{i,j,t} \\ + \delta^{(2)}_{6} OWN1_{i,j,t} + \delta^{(2)}_{7} OWN2_{i,j,t} + \delta^{(2)}_{8} SIC1_{i,j,t} + \delta^{(2)}_{9} SIC2_{i,j,t} + \delta^{(2)}_{10} SIC3_{i,j,t} + \delta^{(2)}_{11} SIC4_{i,j,t}\end{aligned} \tag{4.10}$$

First, we show the movements in the speed of adjustment of debt ratio and speed of adjustment of equity ratio respectively with reference to the liberalization regime of a country. Clearly, the plots for each country in Fig-5.4 show that year in which *BLIB* >5, there is greater tendency for the speed of adjustment of debt ratios to jump at a higher level in all countries (except India). For instance, in the case of Malaysia, the speed moves from 0.10 to more than 0.20 in the year of complete liberalization.

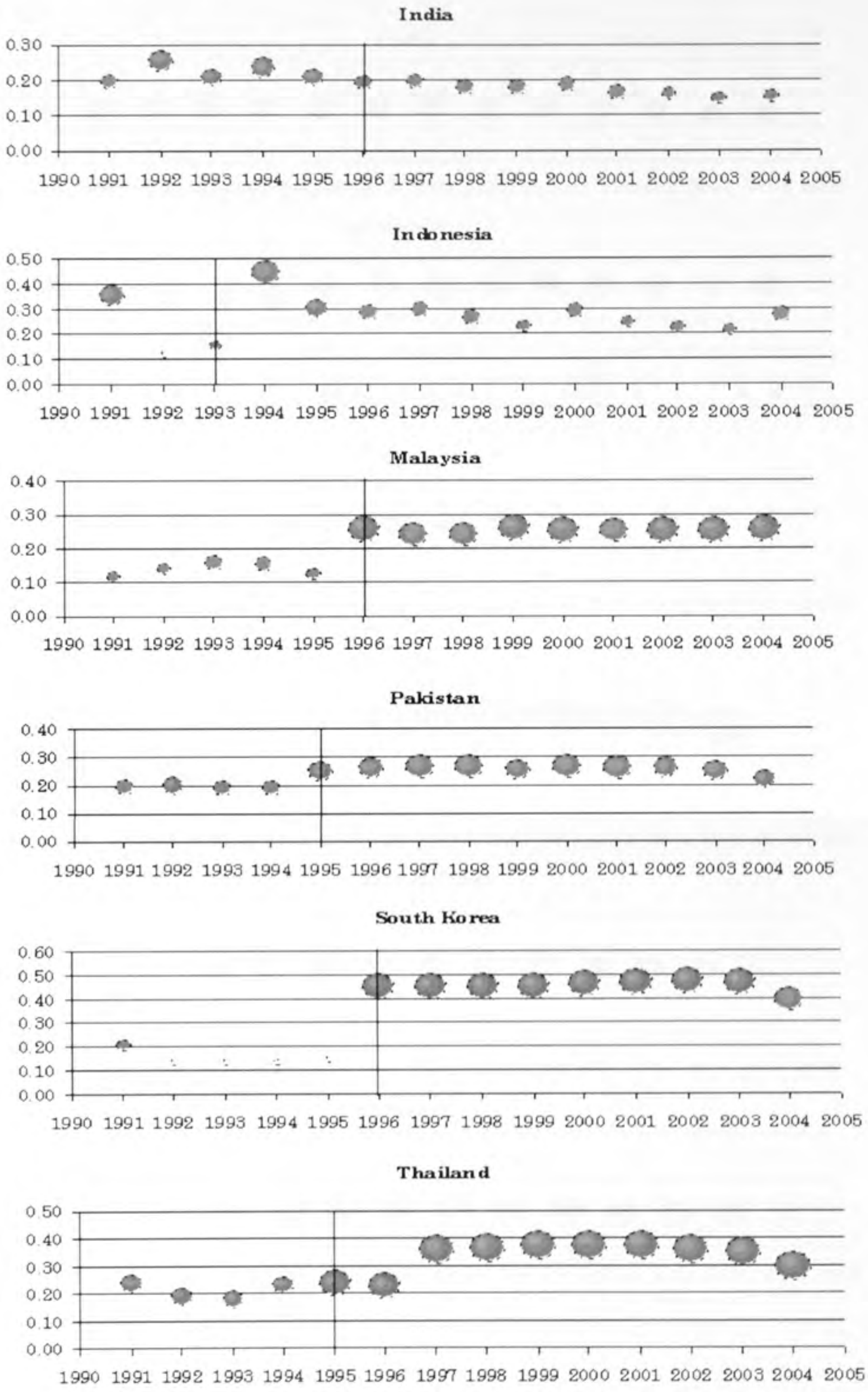

Fig-5.4 Movements in the Speed of Adjustment of Debt ratio

The figure shows the movements in the speed of adjustment of debt ratio for each country in the sample over the period 1991-2004. The x-axis shows the time period from 1991 to 2004 and y-axis shows the speed of adjustment of debt ratio obtained from *unrestricted* dynamic adjustment model for debt ratio. The straight line divided the period when *BLIB* < 5 (towards the left of line) and when *BLIB* >5 (towards the right of line).

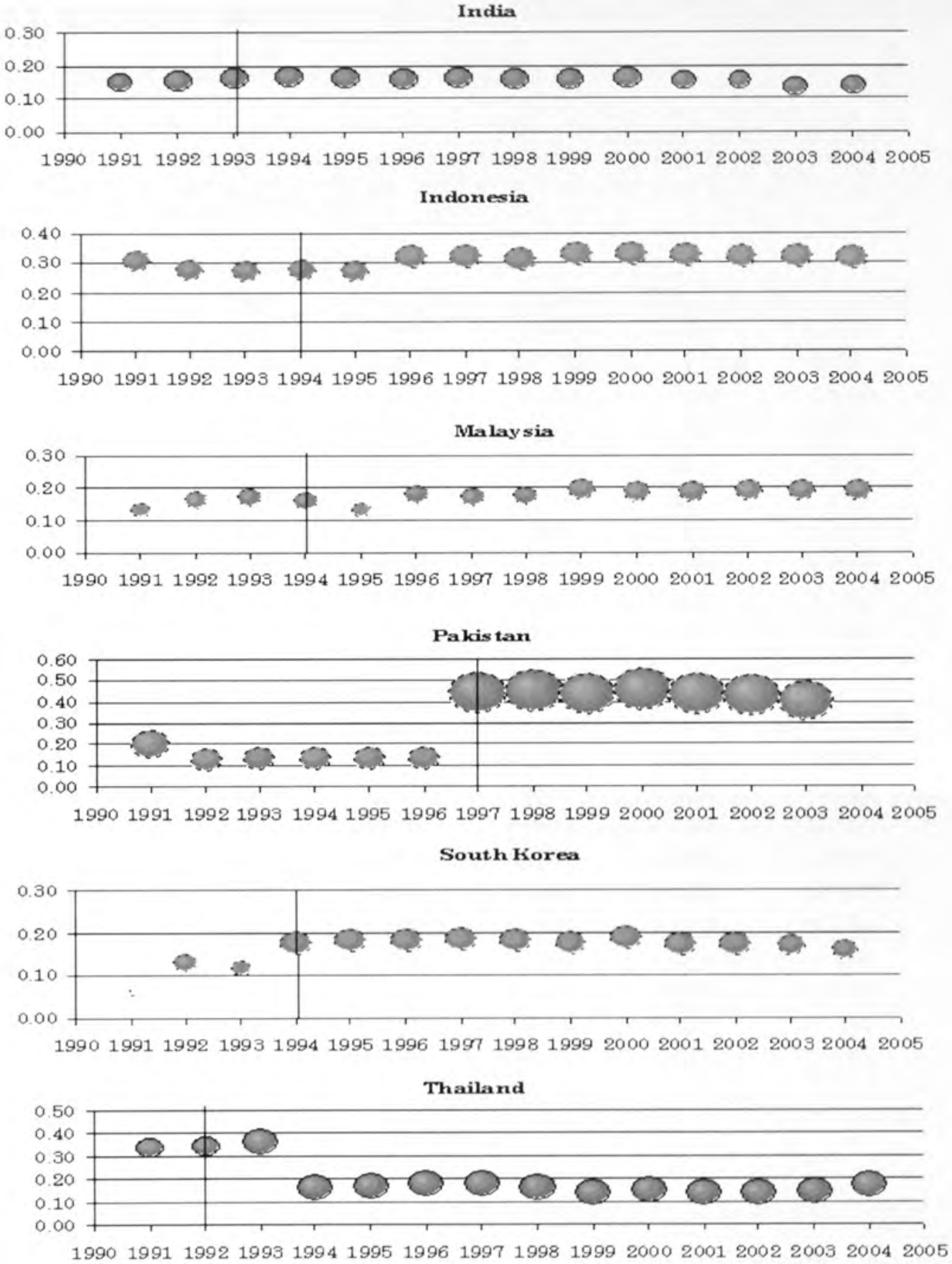

Fig-5.5 Movements in the Speed of Adjustment of Equity ratio

The figure shows the movements in the speed of adjustment of equity ratio for each country in the sample over the period 1991-2004. The x-axis shows the time period from 1991 to 2004 and y-axis shows the speed of adjustment of debt ratio obtained from *unrestricted* dynamic adjustment model for equity ratio. The straight line divided the period when *SLIB* < 5 (towards the left of line) and when *SLIB* >5 (towards the right of line).

On the other hand, movements of the speed of adjustment of equity ratio do not show such persistence except in the case of South Korea and Pakistan. The descriptive statistics of the time varying speed of adjustments are presented in the Table 5.1.

Table 5.1
Time-Varying Speeds of Adjustment of Debt and Equity Ratio

This table shows descriptive statistics for the time-varying speed of adjustment of debt ratio (Panel A) and equity ratio (Panel B) over the time period of 1991-2004.

Panel A- Speed of adjustment of debt ratio.

	India	Indonesia	Malaysia	Pakistan	South .Korea	Thailand
Mean	0.2357	0.3907	0.2325	0.3387	0.2717	0.2208
Std. Deviation	0.2284	0.1832	0.0929	0.1768	0.1129	0.1469
Skewness	-0.5756	0.9330	-0.2091	-0.7330	-0.4131	-0.6451
Kurtosis	4.1813^a	0.2901	0.5694	2.4657	3.4847^a	3.2189^a
Minimum	0.0281	0.0021	0.0039	0.0991	0.0017	0.0002
Maximum	0.8679	1.0500	0.4700	0.6437	0.5600	0.5598
Percentiles: 5	0.0988	0.2031	0.0685	0.0012	0.0713	0.0445
25	0.1241	0.2585	0.1632	0.1965	0.2030	0.1341
75	0.3647	0.5545	0.2976	0.4679	0.3489	0.3296
90	0.5471	0.6335	0.3503	0.5287	0.4109	0.3940

Panel B- Speed of adjustment of equity ratio

	India	Indonesia	Malaysia	Pakistan	South .Korea	Thailand
Mean	0.3907	0.3136	0.1785	0.5905	0.1169	0.1805
Std. Deviation	0.1832	0.0421	0.0587	0.3938	0.0690	0.1336
Skewness	0.9331	0.3260	-0.2432	-0.2481	-0.6461	2.4810
Kurtosis	3.2829^a	0.1560	0.1991	2.0880	4.8481^a	13.3631^a
Minimum	0.0021	0.2091	0.0015	0.0220	0.0019	0.0101
Maximum	1.0500	0.4385	0.3324	1.3319	0.3044	1.2810
Percentiles 5	0.2031	0.2517	0.0751	0.0992	0.0032	0.0283
25	0.2587	0.2845	0.1403	0.3964	0.0738	0.0961
75	0.5545	0.3370	0.2203	0.8482	0.1614	0.2327
90	0.6335	0.3783	0.2544	1.0604	0.1982	0.3194

$^{a, b, and c}$ shows significance at 1, 5 and 10 % level of significance

The mean speed of adjustment of debt ratio is the highest for Indonesia (0.3907) and the mean speed of adjustment of equity ratio is the highest for Pakistan (0.5905). There is evidence of positive (negative) skewness and significant kurtosis in both speeds of adjustment. Furthermore, there is also dispersion in both speeds across firms, indicated by the standard deviation, which varies from a low of 0.0929 for Malaysia, to a high of 0.2284 for India for the speed of adjustment of debt ratio, and from a low of 0.0587 for Malaysia, to a high of 0.3938 for Pakistan for the speed of adjustment of equity ratio. In the following section, the variation in the speeds of adjustment is examined by referring to firm-specific characteristics.

5.4.2 Firm Size and Speeds of Adjustment of Debt and Equity Ratio

In Chapter 4, we found that size have significant effect on the speed of adjustment of debt ratio and speed of adjustment of equity ratio for some countries. In this section, we explore this finding in more detail. Peles and Schneller (1989) suggest that firm size explains the difference in the speed of adjustment of various financial ratios. Larger firms have more resources and better access to capital markets than do smaller firms, which may allow them to attain the targeted ratio faster than small firms. On the other hand, smaller firms may have more flexibility and less bureaucracy than larger firms. This section examines the effect of firm size on the speed of adjustment using the classification of small and large firms. To this end, the researcher adopted parametric and non-parametric tests on the speed of adjustment of the debt and equity ratio respectively.

The non-parametric Wilcoxon-sign-rank statistic is used due to evidence of non-normality in the speed of adjustment of some countries. This test is similar to paired two-sample test and ideal to test for differences in the related samples because it does not require the assumption of normality. It is expected that the difference between the adjustment speeds of small and larger firms should have decreased in the post-liberalization period because the financial liberalization process reduces the directed credit allocation and the financing constraints of smaller firms, thereby potentially narrowing the difference between adjustment speeds. The median of sales was used to divide the firms into small and large firms and to test the following two hypotheses:

H1: there is no difference in the speed of adjustment of debt ratio of small and large firms in the post-liberalization period compared to the pre-liberalization period.

H2: there is no differential impact of domestic banking sector liberalization on the speed of adjustment of debt ratio of small and large firms.

Table 5.2
Paired Sample Test for Speed of Adjustment of Debt Ratio
(Small vs. Large Firms)

The table presents the results of the paired sample test for the difference in the adjustment speed of debt ratio of small and large firms in the pre and post banking sector liberalization period. The median of total assets (in US$) was used to classify firms into two groups - small and large. The *DIFF* row shows the difference between the adjustment speed of small and large firms. The *t*-values are for the parametric test for the related sample and *T values* are from *the* Wilcoxon non-parametric test using two-tailed test.

	Pre-liberalization		Post-liberalization			
Country	Mean	Std	Mean	Std	*t*-value	*T*-value
Malaysia						
Small firms	0.1525	0.0863	0.2803	0.0709	-22.096^{a}	-15.310‡^{a}
Large firms	0.2412	0.0902	0.3367	0.0905	-14.8401^{a}	-12.131‡^{a}
DIFF	-0.0878	0.1219	-0.0576	0.1073	-3.4071^{a}	-3.2770‡^{a}
South Korea						
Small firms	0.1203	0.0459	0.3387	0.0551	-60.8909^{a}	-17.9967‡^{a}
Large firms	0.2686	0.0993	0.4555	0.1146	-24.2741^{a}	-14.2741‡^{a}
DIFF	-0.1493	0.1093	-0.1207	0.12666	-3.1450^{a}	-2.4611‡^{a}
Thailand						
Small firms	0.2441	0.1787	0.4668	0.1683	-12.3440^{a}	-8.5420‡^{a}
Large firms	0.2011	0.1199	0.3687	0.1851	-10.9360^{a}	-8.4871‡^{a}
DIFF	0.0353	0.2064	0.1158	0.2384	-4.5750^{a}	-3.9906‡^{a}

† shows the mean rank was higher pre-liberalization, ‡ shows the mean rank was higher post-liberalization

$^{a,\ b,\ and\ c}$ shows 1, 5 and 10 % level of significance.

The paired sample test shows that H1 is rejected, i.e., large firms have a significantly higher speed of adjustment than small firms (p-value < 0.01), with the exception of Thailand. This result shows that banking sector reforms have been beneficial for the small firms in the latter country. The researcher found a significant differential impact of banking sector liberalization on the firms' adjustment speed of debt ratio for Malaysia and South Korea (p-value < 0.01), demonstrating that large firms have a higher speed of adjustment than small firms in the post-liberalization period, whereas, the opposite results emerged in respect of Thailand. The post-liberalization spread between the speed of adjustment of small and large firms indicated by *DIFF* has increased from 0.0358 and 0.1158 for Thailand. Similarly, the speed of adjustment of equity ratio was used to test the following two hypotheses:

H3: there is no difference in the speed of adjustment of equity ratios of the small and large firms in the post-liberalization period compared to the pre-liberalization period.

H4: there is no differential impact of stock market liberalization on the speed of adjustment of equity ratio of the small and large firms.

We should expect the large firms to have higher speed of adjustment, and the difference between the speeds of adjustment of small and large firms to decrease because stock markets liberalization increases the access to foreign capital markets for all firms in a country.

Table 5.3
Paired Sample Test for Speed of Adjustment of Equity Ratio
(Small vs. Large Firms)

The table presents the results of paired sample test for the difference in the speed of adjustment of equity ratio of smaller and larger firms in the pre and post stock market liberalization period. The *DIFF* row shows the difference between adjustment speed of small and large firms. The *t*-values are for the parametric test and *T values* are from *the* Wilcoxon non-parametric test using two-tailed test.

	Pre-liberalization		Post-liberalization			
Country	Mean	Std	Mean	Std	*t*-value	*T*-value
Malaysia						
Small firms	0.0374	0.0378	0.1087	0.0457	-17.7288^{a}	-11.4287‡^{a}
Large firms	0.0973	0.0503	0.1317	0.0595	-5.0947^{a}	-5.3920‡^{a}
DIFF	-0.0713	0.0601	-0.0288	0.0705	-5.5451^{a}	-5.0570‡^{a}
South Korea						
Small firms	0.1707	0.1244	0.3452	0.1627	-11.9830^{a}	-10.545‡^{a}
Large firms	0.1782	0.1021	0.3967	0.2534	-10.9141^{a}	-9.2135‡^{a}
DIFF	-0.0076	0.1708	-0.0568	0.2971	1.7061	-1.2891†
Thailand						
Small firms	0.3078	0.0752	0.0853	0.0423	19.8680^{a}	-6.0981†^{a}
Large firms	0.4540	0.0671	0.2936	0.1027	6.8601^{a}	-4.1301†^{a}
DIFF	-0.1394	0.1262	-0.1976	0.1263	1.8901	-1.8472†

† shows the mean rank was higher pre-liberalization, ‡ shows the mean rank was higher post-liberalization

$^{a, b, and c}$ shows 1, 5 and 10 % level of significance.

The large firms were found to have a significantly higher speed of adjustment of equity ratio than small firms (*p*-value <0.01) in all countries, and hence, H3 is rejected (see Table 5.4). These findings suggest that large firms have benefited more than smaller firms, and adjusted to the target level of equity. H4 was rejected only for Malaysia, where the difference between the speed of adjustment of small and large firms indicated by *DIFF*, has significantly decreased (*p*-value < 0.05). The post-liberalization spread between the adjustment speed of large and small firms indicated by *DIFF* was -0.0228 compared to -0.0713 in the pre-liberalization period.

5.4.3 Ownership and Speed of Adjustment of Debt and Equity Ratio

In Chapter 4, we found that ownership of firms have significant effect on the speed of adjustment of debt ratio and speed of adjustment of equity ratio for some countries. In this section, we explore this finding in more detail. The influence of firm ownership on the capital structure with reference to group affiliation has been well documented in the literature. The concentration of family ownership and the political association of firms also confer certain privileges e.g., low interest rate loans. Previous studies have shown that there is extensive family control in East Asian corporations (Claessens et al., 2000), and these firms have benefited from the monopoly rights as well as privatization deals undertaken by governments in some countries. For instance, the politically well-connected business groups in Southeast Asian countries have benefited from the deregulation and privatization. The deregulation in these sectors resulted in the transfer of monopoly rights and implicit guarantees on external borrowing from the state to the politically well-connected business groups.

The large business groups having closer ties with political parties and governments might have benefited from the government interventions in credit allocations. Therefore, we should expect a difference in the speed of adjustment of group-associated firms and the independent firms in Southeast Asian countries. Similarly, there might be a difference in the speed of adjustment of the foreign and domestic firms (Michel and Shaked, 1986; Lee and Kwok, 1988). In Chapter 4, it is hypothesized that foreign ownership will be negatively related to the speed of adjustment of debt ratio in developing countries due to tax effects, legal regime, and growth opportunities. Therefore, to test the influence of ownership on the speed of adjustment of both ratios, the following hypotheses were developed:

H5: there is no difference between the speed of adjustment of debt ratio of the group and non-group firms in the post-liberalization period compared to the pre-liberalization period.

H6: there is no difference between the speed of adjustment of debt ratio of the domestic and foreign firms in the post-liberalization period compared to the pre-liberalization period.

H7: there is no differential impact of banking sector liberalization on the speed of adjustment of debt ratio of the group and non-group firms.

H8: there is no differential impact of banking sector liberalization on the speed of adjustment of debt ratio of the domestic and foreign firms.

Table 5.4
Paired Sample Test for Speed of Adjustment of Debt Ratio (Group vs. Non-group Firms and Domestic vs. Foreign Firms)

This table shows the results of the paired sample test for the difference in the speed of adjustment of debt ratio of group vs. non-group and domestic vs. foreign firms in the pre and post banking sector liberalization period. *DIFF* denotes the difference between the speed of adjustment of the group vs. non-group and domestic vs. foreign firms. The *t*-values are for the parametric test and *T values* are from the Wilcoxon non-parametric test.

	Pre-liberalization		Post-liberalization			
Country	Mean	Std	Mean	Std	*t-value*	*T-value*
India						
Group	0.1576	0.0860	0.2671	0.0663	-17.5601^{a}	-1.8261‡^{a}
Non-group	0.2154	0.0995	0.3213	0.0819	17.9140^{a}	-1.6041‡
DIFF	-0.1094	0.1059	-0.1212	0.1165	-1.2981	-1.6041†
Domestic firms	0.4365	0.1478	0.1626	0.0945	14.8810^{a}	-6.9417†^{a}
Foreign firms	0.4261	0.1477	0.1896	0.0917	7.8210^{a}	-4.9171†^{a}
DIFF	-0.0233	0.1867	-0.0871	0.0821	1.8769^{c}	-0.6180†
Malaysia						
Group	0.1714	0.0328	0.1850	0.0239	-8.8941^{a}	-6.180‡^{a}
Non-group	0.1239	0.0516	0.1220	0.0328	-13.8833^{a}	-11.047‡^{a}
DIFF	-0.0071	0.0696	0.0138	0.0453	-1.9785^{b}	-1.8120‡^{a}
Domestic firms	0.0218	0.0396	0.0699	0.0048	-6.993^{a}	-4.1114‡^{a}
Foreign firms	0.1343	0.0388	0.1801	0.0153	-19.059^{a}	-12.973‡^{a}
DIFF	-0.1078	0.0491	-0.1187	0.0096	1.0278	-1.2650†
South Korea						
Group	0.1576	0.0860	0.2671	0.0663	-17.5601^{a}	-12.6064‡^{a}
Non-group	0.2154	0.0995	0.3213	0.0819	-17.9140^{a}	-14.0728‡^{a}
DIFF	-0.1094	0.1059	-0.1212	0.1165	-1.2981	-1. 013†
Domestic firms	0.1962	0.0974	0.2981	0.0762	-22.503^{a}	-17.731‡^{a}
Foreign firms	0.1303	0.1007	0.2242	0.0715	-4.2541^{a}	-3.6451‡^{a}
DIFF	-0.1352	0.0942	-0.0939	0.13244	-1.6590	-1.4771‡
Thailand						
Group	0.0976	0.1236	0.3055	0.1111	-8.6547^{a}	-5.7896‡^{a}
Non-group	0.0292	0.1404	0.2400	0.1146	-17.0993^{a}	-11.9541‡^{a}
DIFF	0.0957	0.1942	0.1177	0.1704	-0.6460	-0.6810†
Domestic firms	0.0223	0.1095	0.2435	0.1080	-16.5350^{a}	-9.8360‡^{a}
Foreign firms	0.0747	0.1694	0.2988	0.1160	-13.2195^{a}	-8.3860‡^{a}
DIFF	-0.0448	0.2023	-0.0634	0.1626	-0.7431	-0.7601†

† shows the mean rank was higher pre-liberalization, ‡ shows the mean rank was higher post-liberalization

$^{a, b, and c}$ shows 1, 5 and 10 % level of significance.

There has been a significant increase in the speed of adjustment of debt ratio of the firms associated with business groups (p-value <0.01) in the case of Malaysia and South Korea, and thus, H5 is rejected. These findings do not suggest that large group-associated firms have been disadvantaged in any way from liberalization. Likewise, H6 is rejected in all countries (except Thailand and Malaysia) i.e., the foreign firms have a higher speed of adjustment of debt ratio in all countries. H8 is not rejected. Similarly, the following hypotheses were developed to test the effect of ownership on the speed of adjustment of equity ratio.

H9: there is no difference between the adjustment speed of equity ratios of the group and non-group firms in the post-liberalization period compared to the pre-liberalization period.

H10: there is no difference between the adjustment speed of equity ratios of the domestic and foreign firms in the post-liberalization period compared to the pre-liberalization period.

H11: there is no differential impact of stock market liberalization on the adjustment speed of equity ratios of the group and non-group firms.

H12: there is no differential impact of stock market liberalization on the adjustment speed of equity ratios of the domestic and foreign firms.

Table 5.5
Paired Sample Test for Speed of Adjustment of Equity Ratio
(Group vs. Non-group Firms and Domestic vs. Foreign Firms)

This table shows the results of the paired sample test for the difference in the adjustment speed of equity ratio of group vs. non-group and domestic vs. foreign firms in the pre and post stock market liberalization period. *DIFF* shows the difference between the adjustment speed of group and. non-group and domestic and foreign firms. The *t*-values are for the parametric test and *T values* are from the Wilcoxon non-parametric test.

	Pre-liberalization		Post-liberalization			
Country	Mean	Std	Mean	Std	*t-value*	*T-value*
India						
Group	0.0734	0.0294	0.1915	0.0142	-11.8790^{a}	-2.0232‡^{b}
Non-group	0.0767	0.0702	0.1710	0.0174	-9.5140^{a}	-5.7095‡^{a}
DIFF	0.0136	0.0374	0.0142	0.0121	-0.0370	-0.1350‡
Domestic firms	0.0716	0.0260	0.1832	0.0216	-20.9221^{a}	-5.9055^{a}
Foreign firms	0.0980	0.1541	0.1572	0.0242	-14.1891^{a}	-1.6821‡^{c}
DIFF	-0.0218	0.1458	0.0154	0.0198	-0.7920	0.0511‡
Malaysia						
Group	0.1540	0.0445	0.1636	0.0671	-0.7950	-0.9331‡
Non-group	0.1460	0.0575	0.1602	0.0529	-2.7972^{b}	-3.0603‡^{a}
DIFF	0.0244	0.0733	-0.0056	0.0942	1.5943	-1.3421†
Domestic firms	0.1557	0.0500	0.1684	0.0450	-2.5702^{b}	-2.7812‡^{b}
Foreign firms	0.0799	0.0426	0.0545	0.0352	1.5229	-1.8514†
DIFF	0.0456	0.0752	0.1483	0.0688	-3.8903^{a}	-2.9372‡^{b}
South Korea						
Group	0.1592	0.0883	0.3586	0.1549	-12.9731^{a}	-9.3109‡^{a}
Non-group	0.1905	0.1257	0.4528	0.2904	-9.8791^{a}	-9.1628‡^{a}
DIFF	-0.0254	0.1368	-0.1047	0.3039	2.9501^{b}	-3.0810†^{a}
Domestic firms	0.1704	0.1115	0.3596	0.1572	-19.3040^{a}	-14.5071‡^{a}
Foreign firms	0.2475	0.1650	0.3974	0.1811	-3.0850^{a}	-2.2493‡^{a}
DIFF	-0.0904	0.2345	-0.0769	0.1877	-0.2251	-0.2150‡
Thailand						
Group	0.0476	0.0912	0.1469	0.1560	1.7371	-1.2741‡
Non-group	0.0849	0.1526	0.3308	0.2551	4.5371^{a}	-3.4901‡^{a}
DIFF	-0.0407	0.1742	-0.2788	0.4089	1.5441	-1.3761†

Domestic firms	0.0307	0.1277	0.2223	0.1154	6.167[a]	-3.3690†[a]
Foreign firms	0.1157	0.1344	0.4326	0.3195	3.654[a]	-3.2650†[a]
DIFF	-0.0850	0.2040	-0.2138	0.2595	1.427	-0.87091†

† shows the mean rank was higher pre-liberalization, ‡ shows the mean rank was higher post-liberalization

a, b, and c shows 1, 5 and 10 % level of significance.

There has been a significant increase in the speed of adjustment of the non-group firms except India (*p*-value <0.01). A significant increase was evident in the speed of adjustment of equity ratio of the domestic firms compared to the foreign firms in all countries (*p*-value <0.01) except South Korea and Thailand. On the contrary, there has been a significant decrease in the speed of adjustment of foreign firms in the case of Thailand (*p*-value <0.01). These findings indicate that the listed firms, whether group-owned and/or domestic, raised substantial equity finance in the post-liberalization period, a finding that confirms the 'market timing view' prediction,

H11 is rejected for South Korea, and H12 is rejected for Malaysia. The difference between the speeds of adjustment of equity ratios of group and non-group firms indicated by *DIFF* has increased significantly (*p*-value <0.01) for South Korea and Thailand. In sum, the central hypothesis of the chapter is supported by testing the above hypothesis that the adjustment speed of Southeast Asian firms has varied across firms and over time due to financial liberalization.

Table 5.7 and 5.8 demonstrate total liberalization effect can be divided into quantitative and qualitative effects for each country. These tables compare the predicated impact of each component of liberalization with actual impact on the speed of adjustment of debt and equity ratio of firms for each country. As predicated the price and resource allocation impact have been positive for most of the countries. The positive reputation impact of foreign bank entry appears to be at work only in Malaysia and South Korea. On the other hand, the stock market liberalization seems to have more information effect impact on the speed of adjustment of equity for those countries that allowed foreign portfolio investment indirectly through launch of first country funds and later on this effect might have intensified due to issuance of DR such as in the case of India and Malaysia.

Table 5.6

Impacts of Banking Sector Liberalization Measures of Speed of Adjustment of Debt Ratio

Banking sector reform component	Theoretical impact on lending	Impact on adjustment speed of debt ratio	Actual impact
Interest rate liberalization	Increase in lending and deposit rates, liberalization of deposit rates would reduce disintermediation and increase in the pool of savings, will increase in lending (price impact) (Bandiera et al, 2000)	Positive	Positive impact in India, Indonesia, Malaysia, Pakistan, and Thailand.
Reduced reserve requirements	Increase in resources available for lending by formal financial sector (quantitative impact) (Bandiera et al, 2000)	Positive	Positive impact in India, Indonesia, Pakistan, South Korea and Thailand.
Removal of priority loans	Increase in lending to households or less favoured sector under directed credit regime, relocation within the business sector (resource relocation impact) (Bandiera et al, 2000)	Positive	Positive impact in India, Pakistan, South Korea and Thailand.
Privatization of banks	Decrease in control of government over allocation of credit, leading to more competition among banks for potential clients. Banks would not be able to charge higher interest rates resulting due to more competition (quantitative impact) (Cetorelli and Gambera, 2001)	Positive/negative depending upon the number of privatization programmes of state owned banks.	Positive impact in Indonesia, South Korea and Thailand.
Foreign bank entry	Foreign banks entry may improve the quality and availability of financial services in the domestic financial market and enhance a country's access to international capital market (Levine, 1996). Foreign banks may only concentrate on multinational firms and local entrepreneurs may receive less access to financial services (Stiglitz, 1993) (quantitative and reputation impact)	Positive/negative depending upon number of foreign banks presence in the country.	Positive impact in Malaysia, and South Korea.
Scope of banking services	An increase in the scope of banking service would induce a more competitive environment which may lead to a move to increase risk taking in lending (Bandiera et al, 2000)	Positive	Positive impact in Pakistan, and South Korea.
Prudential regulations	Enforcement of bank capital adequacy ratio would induce banks to reduce their lending which may have both beneficial and detrimental effects (quantitative impact)Chiuri et al, 2002)	Positive /Negative	Positive impact in India, Pakistan, and South Korea.

Table 5.7
Impacts of Stock Market Liberalization Measures on Speed of Adjustment of Equity Ratio

Banking sector reform component	Theoretical impact on equity finance	Impact on adjustment speed of equity ratio	Actual impact
Stock market opening	Opening markets hastens the development of equity market; long-run economic growth, and reduces the external cost of finance (Information impact) (Kim and Singal, 2000).	Positive	Positive impact in India, Indonesia, and Malaysia.
Incentives to foreign investor	An increase in the limit of investment in domestic securities by foreigners will increase equity issuance due to high level of demand and supply (quantitative impact) (Glen and Pinto , 1994)	Positive	Positive impact in Pakistan, South Korea and Thailand.
First Depository Receipt	The depository receipts increase visibility, and provide a highly liquid secondary market (relocation impact)	Direct Positive via impact on cost of equity capital	Positive impact in India Malaysia, and Thailand.
First country fund	The introduction of a country fund drives up the prices of local companies and reduces the cost of capital (Errunza et al, 1998). When stock prices are high compared to the replacement cost of capital, entrepreneurs will be more likely to finance expansion by issuing new shares (quantitative impact) (Mauro, 2003)	The impact is ambiguous depending upon the number of funds.	Positive impact in India, Indonesia, and Malaysia.
First cross listing on a foreign stock market	The cross listing advantages include an enlarged investor base, increased visibility, a highly liquid secondary market and the opportunity to raise capital (relocation impact) (Edison and Warnock, 2003)	The impact is ambiguous depending upon the actual number of the firms which are listed and raised capital.	None
Increase in US $ equity capital flows	An increase in US $ equity flows would expand the investment opportunity set for investors and result in increased purchases (Demand impact/Quantitative impact) (Edison and Warnock, 2003).	The impact is ambiguous because of reserve requirements imposed by governments.	Positive impact in India, Malaysia, and Thailand.
Privatization of State owned enterprises	Listing of large privatized companies provides a substantial impact on trading liquidity, increases investment opportunities for local investors, and market deepening (Supply impact/Quantitative impact) (Levine, 19969)	The impact is ambiguous because the actual implementation of the privatization programme contributes to build confidence, leading to investment and trading.	Positive impact in Malaysia, Pakistan and Thailand.

5.5 Conclusion

This chapter has explored in detail the speed of adjustment of firms. The total speed of adjustment of a firm can be explained by firm size, growth opportunities and ownership and the effects of these variants have been tested systematically in hypotheses. There is stronger evidence of a quantitative price and allocation effect on the speed of adjustment of debt ratio in most of the countries that liberalized their banking sectors in the 1990s (India, South Korea and Pakistan).

On the other hand, there is also some evidence of an information effect (created by the launch of country funds and incentives to foreign investors), and a supply effect (generated by the privatization of state owned firms) on the speed of adjustment of equity ratio in some countries that opened their stock markets earlier (Malaysia and Thailand). The study has attempted to associate each stock market liberalization component with the equity adjustment pattern to infer a quantitative or relocation impact in each country, but this effort might appear more arbitrary given the continuous and reversible process of stock market liberalization and multiple channels of impact of the banking sector liberalization programme. Nevertheless, it provides us with some useful results related to the policy outcomes in the Southeast Asian countries.

Despite the novelty of these early results, there are obvious limitations and generalizations across countries can not be made. Firstly, the reversible nature of the liberalization process and other macro-economic differences across countries might have also contributed to sudden unexpected changes. Secondly, the analyses do not consider the trade liberalization impact at the firm-level, which might further shed light on the speed of adjustment process. Thirdly, the analyses have included only few firm-related factors, these being ownership, group association and size, and there might also be other influences that have contributed the difference in the adjustment processes across countries.

We take a more pragmatic vision of liberalization and analyze it further in Chapter 6 by simulating the speed of adjustment to track future outcomes of the liberalization policy for these countries. This forecast analyses will provide glimpse into the likely outcomes of these liberalization policies given the rise and fall of their popularity in the 1990s. If the moral of the liberalization story is, 'all that glitters is not gold' and it could lead to financial crisis evidenced in recent times, then extrapolation into future can promise some earning warning signals to alert policy makers not to have ' great expectations' from the future.

Chapter 6

FORECASTING SPEEDS OF ADJUSTMENT OF DEBT AND EQUITY RATIOS

6.1 Introduction

The main aim of this chapter is not only to evaluate the predictive ability of the partial adjustment model but also to generate a forecast from the model to develop an early warning system (EWS) of capital structure imbalance in the sample countries, by observing the path of both speeds of adjustment, i.e., the speed of adjustment of debt and the speed of adjustment of equity ratios, respectively. At first, it seems that there is no formal link between any theory that suggest speed of adjustment should be able to forecast the debt ratio an equity ratio but our motivation in this chapter is to combine the two stream of literature - the adjustment process of financial ratios (see e.g., Gallizo and Salvador, 2003; Davis and Peles, 1993; Lee and Wu, 1988) and forecasting of financial ratios (Aksu et al, 1996). This framework in motivated in some respect by the corporate finance literature associated with the use of financial ratios for predicting important events such as bankruptcy, financial distress, and shifts in risk and profitability (Altaman, 1968; Ohlson, 1980). Ohlson (1980) point out that bankruptcy models should be modified to use the trends or volatility of ratios or forecast as inputs. Applying this logic to our research, it therefore remains an empirical question whether using forecast of speed of adjustment will provide useful measure of future capital structure ratios. In this regard, it is important to highlight that although a faster speed of adjustment might be a better situation for firms in a country but it does not suggest that a slow speed of adjustment will be a bad situation for firms, if firms have already reached optimal debt and equity ratio in a country, then, a slower speed of adjustment may be an irrelevant, and adjustment might not be needed.

The main contribution of this chapter is twofold. Firstly, the trends of the speed of adjustment of debt and equity ratio have economic significance because they show how much of the gap between optimal debt ratio and equity ratio and observed debt/equity ratios has disappeared due to liberalization. If financial liberalization policies were well-planned and effectively implemented by governments, the gap between optimal debt/equity ratios and observed debt ratio and equity ratio should have disappeared, and financial liberalization policy would have been a better choice for the future. Secondly, the magnitude of the simulated speed of adjustment of debt/equity ratio can identify the persistence or otherwise in the adjustment behaviour of the firms. Section 6.2 discusses out-of-sample forecasts and predicted performance statistics for the speed of adjustment of debt/equity ratio. Section 6.3 explains the simulation procedure in detail, and discusses the simulation results. Section 6.4 concludes the chapter.

6.2 Out-of-sample Forecasting

Good out-of-sample forecasting performance is assumed to provide support for the theory, and a 'seal of approval' to the estimated empirical model (Carruth et al, 1998). Most of the previous studies (see e.g., Miguel and Pindado, 2003) have used partial adjustment models for capital structure but did not test the accuracy of its prediction.

6.2.1 Methodology

Out-of-sample forecasting procedure is adopted in this chapter with the division of the historical data being placed into a *fit period* and a *test period.* The period of 1991-2000 was designated as a *fit period* and the period of 2000-2004 was designated as a *test period* reserved for out-of-sample forecasting. Forecasts of the speed of adjustment of debt ratio and the speed of adjustment of equity ratio were obtained using one-step forecasting method in Eviews in the following way. First, we estimated the coefficients in the equations (4.9) and (4.10) using the data over the sample period 1991-2000.

$$
\begin{aligned}
&D_{i,j,t} = (1-\delta^{(1)}_{i,j,t})D_{i,j,t} + \delta^{(1)}_{i,j,t}D^{*}_{i,j,t} \\
&\text{where } D^{*}_{i,j,t} = \beta_{0,j} + \beta_1 NDTS_{i,j,t} + \beta_2 PROFIT_{i,j,t} + \beta_3 TANG_{i,j,t} + \beta_4 GROWTH_{i,j,t} + \\
&\qquad + \beta_5 FDC_{i,j,t} + \beta_6 FCF_{i,j,t} + \beta_7 INV_{i,j,t} + \beta_8 BRISK_{i,j,t} + \beta_9 ROE_{i,j,t} + \varepsilon_{i,j,t} \\
&\delta^{(1)}_{i,j,t} = \delta^{(1)}{}_{0,j} + \delta^{(1)}_1 BLIB_{i,j,t} + \delta^{(1)}_2 SLIB_{i,j,t} + \delta^{(1)}_3 INST_{i,j,t} + \delta^{(1)}_4 GROWTH_{i,j,t} + \delta^{(1)}_5 SIZE_{i,j,t} \\
&\qquad + \delta^{(1)}_6 OWN1_{i,j,t} + \delta^{(1)}_7 OWN2_{i,j,t} + \delta^{(1)}_8 SIC1_{i,j,t} + \delta^{(1)}_9 SIC2_{i,j,t} + \delta^{(1)}_{10} SIC3_{i,j,t} + \delta^{(1)}_{11} SIC4_{i,j,t}
\end{aligned}
\tag{4.9}
$$

$$
\begin{aligned}
&E_{i,j,t} = (1-\delta^{(2)}_{i,j,t})E_{i,j,t} + \delta^{(2)}_{i,j,t}E^{*}_{i,j,t} \\
&\text{where} E^{*}_{i,j,t} = \phi_{0,j} + \phi_1 NDTS_{i,j,t} + \phi_2 PROFIT_{i,j,t} + \phi_3 TANG_{i,j,t} + \phi_4 GROWTH_{i,j,t} + \\
&\qquad + \phi_5 FDC_{i,j,t} + \phi_6 FCF_{i,j,t} + \phi_7 INV_{i,j,t} + \phi_8 BRISK_{i,j,t} + \phi_9 ROE_{i,j,t} + e_{i,j,t} \\
&\delta^{(2)}_{i,j,t} = \delta^{(2)}_{0,j} + \delta^{(2)}_1 BLIB_{i,j,t} + \delta^{(2)}_2 SLIB_{i,j,t} + \delta^{(2)}_3 INST_{i,j,t} + \delta^{(2)}_4 GROWTH_{i,j,t} + \delta^{(2)}_5 SIZE_{i,j,t} \\
&\qquad + \delta^{(2)}_6 OWN1_{i,j,t} + \delta^{(2)}_7 OWN2_{i,j,t} + \delta^{(2)}_8 SIC1_{i,j,t} + \delta^{(2)}_9 SIC2_{i,j,t} + \delta^{(2)}_{10} SIC3_{i,j,t} + \delta^{(2)}_{11} SIC4_{i,j,t}
\end{aligned}
\tag{4.10}
$$

The final year in the *fit period* i.e., year 2000, was taken as the forecasting origin denoted by *T*. The number of time periods between this forecasting origin *T* and the longest-term forecast period is referred to as lead time or forecasting horizon, here, we have four forecasting horizons *T+1, T+2, T+3* and *T+4* corresponding to years 2001,2002, 2003 and 2004 in the *test period*. The forecast for these four horizons was generated using the coefficient estimates obtained up to 2000 in a single step. Thus, if *s* is the first observation in the forecast sample, Eviews will compute one-step forecast for horizon *T+1*, using the equation:

$$\hat{\delta}^{(1)}_{s,j/T+1} = \bar{\gamma}_{0,J} + \bar{\gamma}_1 BLIB_{s,j,t} + \bar{\gamma}_2 SIZE_{s,j,t} + \bar{\gamma}_3 GROWTH_{s,j,t}$$

$$\hat{\delta}^{(2)}_{s,j/T+1} = \bar{\gamma}_{0,J} + \gamma_1 SLIB_{s,j,t} + \bar{\gamma}_2 SIZE_{s,j,t} + \bar{\gamma}_3 GROWTH_{s,j,t}$$

The forecast uncertainty for both speed of adjustment of debt ratio and the speed of adjustment of equity ratio were also established by using the confidence bands of ±2 standard error (SE). The magnitude of confidence bands indicates the degree of uncertainty in the forecasts. The graphical plots of actual and forecast (predicted) values for both speeds of adjustment for the four years, i.e., 2001-2004 together with ±2 standard error (SE) are shown and discussed in Section 6.1.2. To assess the out-of-sample forecasting ability of the model, the researcher relied on three forecast error metrics, RMSE, MAPE, and Theil index. The smaller the forecast error the better the forecasting ability of the model. The limitation of the MSE metric is that it is scale dependent, and squaring the error increases the sensitivity to minute changes (Aksu et al, 1996). In addition, squaring the errors, hampers outlier independence of the error metric. Therefore, the mean absolute percentage error (MAPE) metric, which relative to RMSE metric, has more scale independence, outlier independence, and stability properties (Meese and Rogoff, 1983), is reported. Furthermore, according to Mentzer and Kahn (1995), the majority of firms use the MAPE to measure forecast accuracy. However, despite its advantage, one problem with the MAPE metric is that when the actual value is near zero, extremely large percentage errors (outliers) could result, and therefore to prevent such cases from distorting the comparison, following Aksu et al (1996), a percentage error exceeding 3.0 was truncated at this level. The researcher also reports Theil's inequality coefficient U^*, which lies between 0 and 1, with $U^*=0$, meaning a perfect forecast and $U^*=1$ implying a total lack of forecasting ability (Lin and Chen, 1998). In brief, the Theil U statistic allows a comparison with a random walk forecast of no change. So a forecast equal to 1, implies that the model is unable to beat the random walk of a no change forecasts. These forecast error statistics for speed of adjustment of debt ratio $\delta_{j,t}^{(1)}$ and speed of adjustment of equity ratio $\delta_{j,t}^{(2)}$ were computed as follows and are discussed in Section 6.1.3.

Forecast error statistics for speed of adjustment of debt ratio, $\delta_{j,t}^{(1)}$:

$$\text{Root Mean Squared Error} = \sqrt{\sum_{t=T+1}^{T+h} (\delta_{j,t}^{(1)} - \hat{\delta}_{j,t}^{(1)})^2 / h} \qquad (6.1)$$

$$\text{Mean Absolute Percentage Error} = 100 \quad x \sum_{t=T+1}^{T+h} \left| \frac{\delta_{j,t}^{(1)} - \hat{\delta}_{j,t}^{(1)}}{\delta_{j,t}} \right| / h \qquad (6.2)$$

$$\text{Theil Inequality Coefficient} = \frac{\sqrt{\sum_{t=T+1}^{T+h} (\delta_{j,t}^{(1)} - \hat{\delta}_{j,t}^{(1)})^2 / h}}{\sqrt{\sum_{t=T+1}^{T+h} \hat{\delta}_{j,t}^{(1)^2} / h} + \sqrt{\sum_{t=T+1}^{T+h} \delta_{j,t}^{(1)^2} / h}} \qquad (6.3)$$

Forecast error statistics speed of adjustment of equity ratio, $\delta_{j,t}^{(2)}$:

$$\text{Root Mean Squared Error} = \sqrt{\sum_{t=T+1}^{T+h} (\delta_{j,t}^{(2)} - \hat{\delta}_{j,t}^{(2)})^2 / h} \tag{6.4}$$

$$\text{Mean Absolute Percentage Error} = 100 \ x \sum_{t=T+1}^{T+h} \left| \frac{\delta_{j,t}^{(2)} - \hat{\delta}_{j,t}^{(2)}}{\delta_{j,t}^{(2)}} \right| / h \tag{6.5}$$

$$\text{Theil Inequality Coefficient} = \frac{\sqrt{\sum_{t=T+1}^{T+h} (\delta_{j,t}^{(2)} - \hat{\delta}_{j,t}^{(2)})^2 / h}}{\sqrt{\sum_{t=T+1}^{T+h} \hat{\delta}_{j,t}^{(2)^2} / h} + \sqrt{\sum_{t=T+1}^{T+h} \delta_{j,t}^{(2)^2} / h}} \tag{6.6}$$

Where $h=2,3,4$

Tashman (2000) suggests that in a usual software implementation of fixed origin forecasting, the evaluation of forecast i.e., summary forecast error measures such as RMSE and MAPE are computed by averaging forecast errors across lead times which might not be a good idea. Such measures might, in this study, produce good (bad) forecast performance for some countries or years depending upon the macro-economic shocks during that period. Therefore, besides these conventional measures, the researcher also reports RSE (root square error) and APE (absolute prediction error) for the individual years for each country.

Lastly, before discussing the results, it is important to draw attention to the shortcoming of the fixed origin forecasting used here (compared to popular rolling origin techniques) which might influence out-of-sample forecasting performance. It is suspected that the forecasts generated from a fixed origin forecasting might be susceptible to macro-economic shocks such as currency crisis unique to some countries at a particular forecasting horizon. In this case, the choice of year 2000 *(T)* as the forecasting origin might be less effective because it is already known that the Asian financial crisis resulted in the restructuring of firms' capital structure. Therefore, the forecasting for the latter turbulent period using relatively stable period estimates, might produce higher forecast errors for some countries at a particular forecasting horizon compared to other countries. The results are discussed with these caveats as follows.

6.2.2 Performance of Out-of-sample Forecasts

Plots

The plots in Fig 6.1 show that forecasts and actual series of the speed of adjustment of debt ratio are within their ±2 standard error (SE) bands for Indonesia, Malaysia and Thailand, whereas, for Pakistan and South Korea, the actual realization of the speed of adjustment of debt ratio tends to move outside the lower bound of the forecast uncertainty at the end of the forecasting horizons. In general, the out-of-sample forecast seems to capture variation in the actual series of the speed of adjustment of debt ratio in the shorter horizon *T+1* for Indonesia, whereas, for Pakistan and South Korea the out-of-sample forecast appears to capture much more of the variation in the actual series at a longer lead time or forecasting horizon of *T+2,* and *T+3.* The out-of-sample forecast for Malaysia seems to remain flatter and closer to the actual speed of adjustment at *T+1, T+2,* and *T+3* before it drifts away from the actual in *T+4.* The forecast speed of adjustment of debt ratio for Pakistan and Thailand (see Fig 6.1 c and f) has been closer to the actual speed of adjustment, only in the immediate forecast horizons of *T+1* and *T+2.* But later on, the forecast speed of adjustment curve is upwards for Pakistan and downwards for Thailand, indicating that the forecasts do not capture the variations in the actual speed of adjustment of debt ratio in these countries.

It is interesting to observe that the gap between the forecast and actual speed of adjustment of debt ratio for these countries might suggest a turning point in the series of speed of adjustment of debt ratio. We can speculate that these turning points might be the outcome of significant changes in the economic direction of these countries reflected in the growth of the firms, but we can not be sure as to which factors might have contributed these turning points. For instance, the gap between the forecast and actual series for India and South Korea increased in the shorter lead time *T+1* compared with other countries. The gap between the forecast and actual series for Thailand increased to a longer lead time *T+3* up to 4% per annum compared to just 1% for South

Korea, India and Indonesia in the same period. These unusual rises in the speed of adjustment seem to suggest turning points.

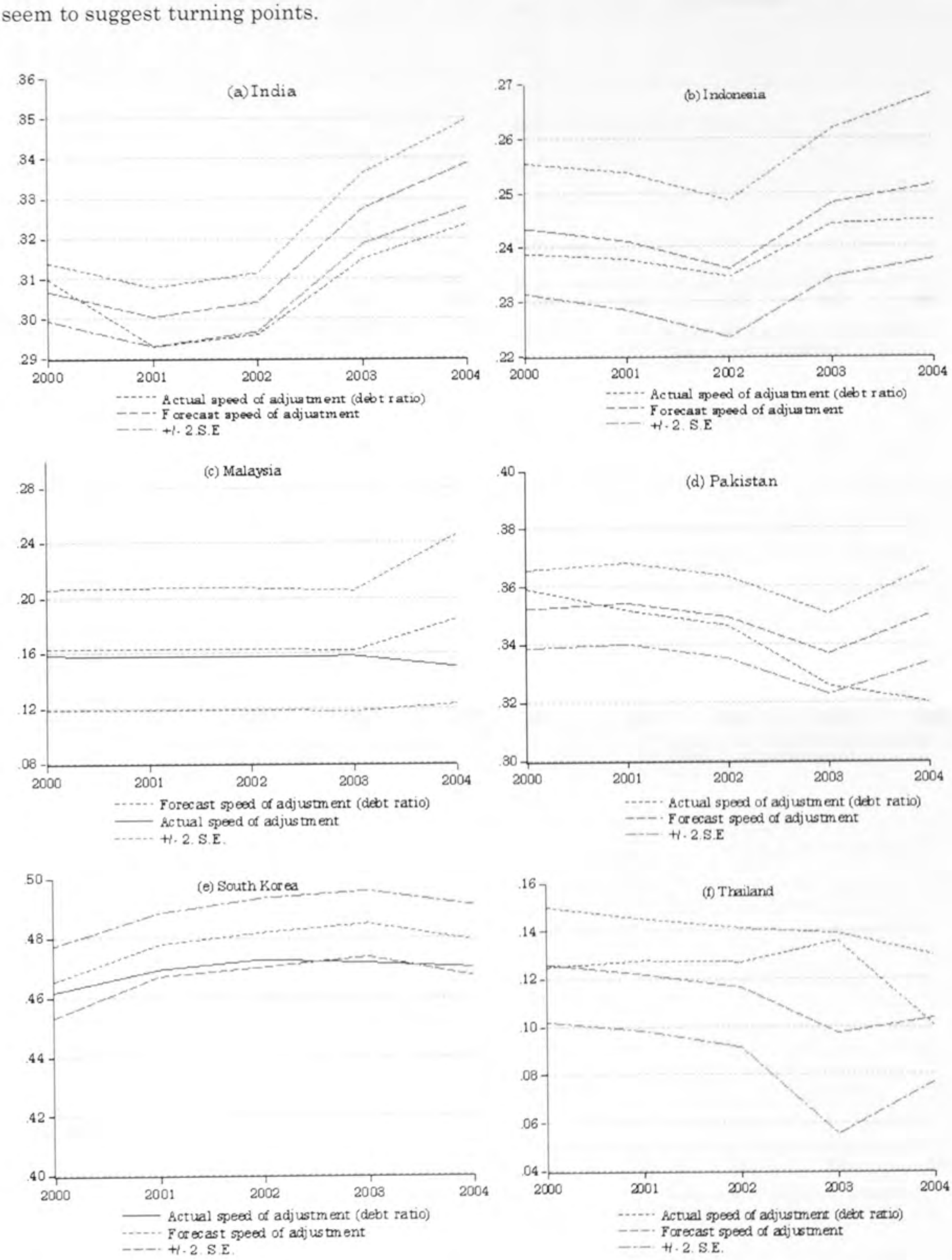

Fig 6.1 Out-of-sample Forecast (Debt Ratio)
This figure shows the plots of actual and forecast speed of adjustment over 2000-2004.

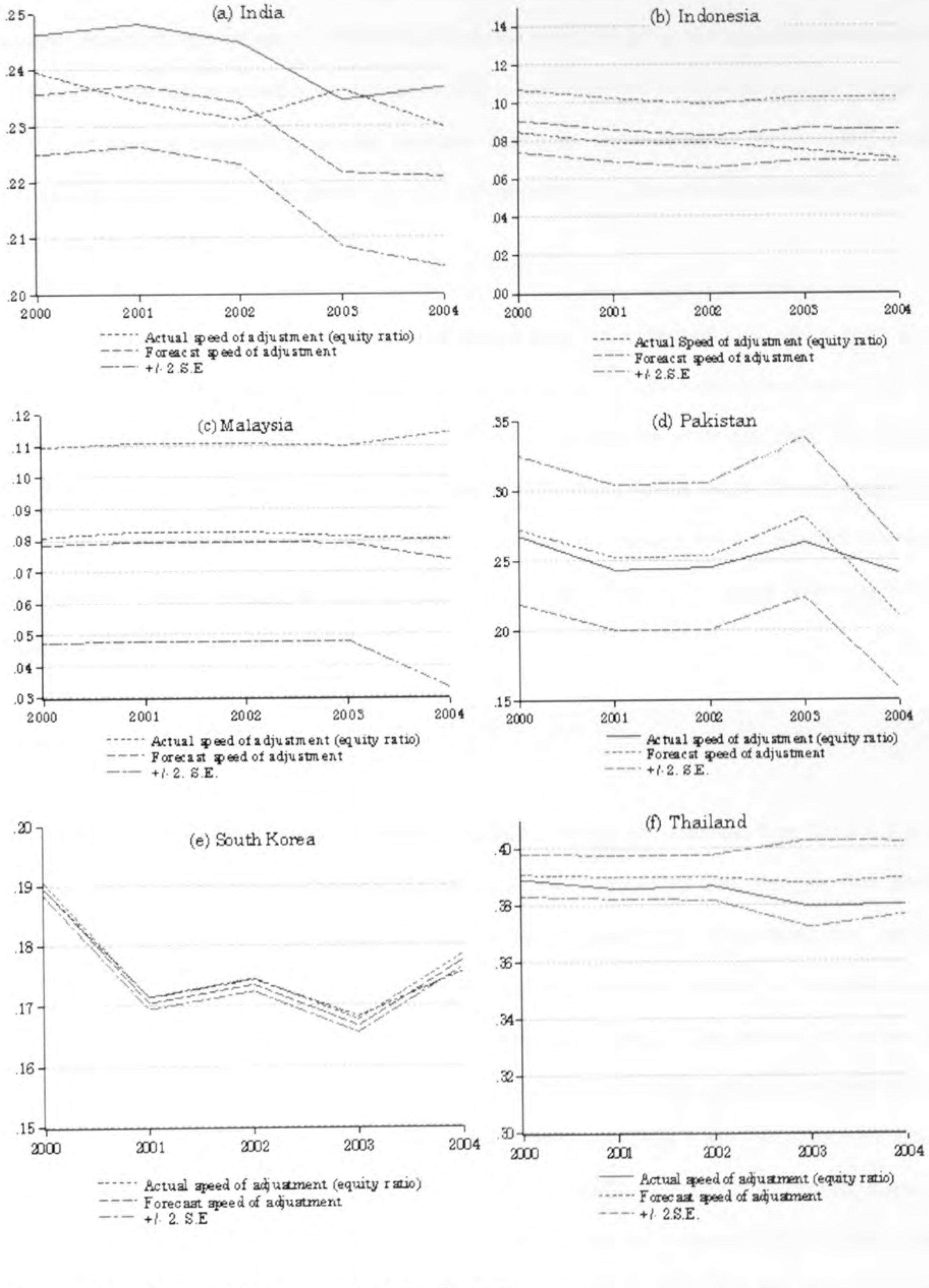

Fig 6.2 Out-of-sample Forecast (Equity Ratio)

This figure shows the plots of actual and forecast speed of adjustment over 2000-2004.

Similarly Fig 6.2 shows the out-of-sample forecast for the speed of adjustment of equity ratio. The forecast speed of adjustment of equity ratio for India seems to go in the opposite direction to the variation in the actual speed of adjustment. This is also reflected in wide ±2 standard error (SE) bands, suggesting uncertainty in the forecast. However, for Indonesia, the forecast speed of adjustment seems to track the actual speed of adjustment of equity ratio before the end of the out-of-sample forecast horizon.

The difference between the forecast and the actual speed of adjustment of equity ratio is very minimal for Malaysia, Pakistan, South Korea, and Thailand. It is interesting to observe that these forecasts track the variation in the actual speed of adjustment of equity ratio for Malaysia, Pakistan and South Korea. It seems that the equilibrating forces might be at work due to management control (Davis and Peles, 1993). Therefore, estimating the adjustment rate due to management control might be useful in future research, when assigning responsibility for observed differences across firms.

Forecast Accuracy Metrics

The forecast accuracy metrics are reported in Table 6.1 which are obtained from Eq 6.1, 6.2, 6.3 , 6.4, 6.5 and 6.6 for the four forecasting horizons *T+1, T+2, T+3* and *T+4* for the speed of adjustment of debt and equity ratios for each country respectively. In general, the individual measures of forecasting accuracy do not collectively give consistent results i.e., across measures, which is an acceptable outcome treated in the forecasting literature. The increase in the level of *U* reflects the movement of forecast away from the actual for these countries which was also observed in the plots. For instance, for Malaysia, *U,* increases from 0.5831 to 0.6366 for a longer forecast horizon *T+4* (see Fig 6.1 c). This pattern is similar for Pakistan, South Korea and Thailand for a longer forecast horizon *T+4.* It seems that the forecasts at a shorter forecast horizon *T+1* for Malaysia, South Korea are relatively good, indicated by the lower RMSE associated with lower *U* and MAPE. There is a reversal in forecast accuracy in the longer forecast horizon *T+4* as forecast accuracy deteriorates, indicated by the higher RMSE associated with higher values of *U*.

Table 6.1
Forecast Error Statistics-I

The table presents the forecast error statistics used to evaluate the out-of-sample forecast at four distinct forecast horizons for each country. These error metrics are Root Mean Square Error; Mean absolute Prediction error (MAPEs) and Theil coefficient of inequality indicated by *U*-statistic. The last row of each panel shows the 4-year average forecast for each country.

Panel A: Speed of adjustment of debt ratio

	Country					
	India	Indonesia	Malaysia	Pakistan	South Korea	Thailand
2001						
RMSE	0.1651	0.1705	0.1155	0.2504	0.3378	0.0818
MAPE	3.0000	0.9656	1.6444	0.9637	0.3965	0.9786
U	0.4224	0.4147	0.4201	0.4125	0.4233	0.3902
2002						
RMSE	0.1666	0.1947	0.1334	0.2872	0.3917	0.0930
MAPE	3.0000	0.6437	1.0962	0.6425	0.2643	0.6524
U	0.4762	0.5152	0.5241	0.5136	0.5283	0.4882
2003						
RMSE	0.1526	0.2093	0.1411	0.3003	0.4169	0.0896
MAPE	3.0000	0.4828	0.8222	0.4819	0.1982	0.4893
U	0.4904	0.5790	0.5831	0.5691	0.5887	0.5202
2004						
RMSE	0.1395	0.2184	0.1527	0.3003	0.4301	0.0802
MAPE	3.0000	0.3862	0.6577	0.4819	0.1586	1.6864
U	0.4961	0.6226	0.6366	0.5691	0.6285	0.4498
Forecast 4-year avg.	0.3177	0.2466	0.1681	0.3476	0.4809	0.1096

Panel B: Speed of adjustment of equity ratio

	Country					
	India	Indonesia	Malaysia	Pakistan	South Korea	Thailand
2001						
RMSE	0.1677	0.0605	0.0561	0.1781	0.1205	0.2754
MAPE	0.8373	3.0000	1.5264	0.8611	0.0073	0.2124
U	0.4133	0.4105	0.4128	0.3951	0.3837	0.4143
2002						
RMSE	0.1924	0.0685	0.0647	0.2060	0.1404	0.3180
MAPE	0.5582	2.3449	1.0176	0.5741	0.0048	0.1416
U	0.5145	0.5085	0.5154	0.4986	0.4887	0.5177
2003						
RMSE	0.2000	0.0732	0.0686	0.2270	0.1474	0.3367
MAPE	0.4186	1.7586	0.7632	0.4305	0.0036	0.1062
U	0.5684	0.5716	0.5744	0.5702	0.5461	0.5769
2004						
RMSE	0.2043	0.0758	0.0697	0.2236	0.1533	0.3011
MAPE	0.3349	1.4069	0.6105	0.3444	0.0029	0.5718
U	0.6063	0.6135	0.6101	0.5979	0.5910	0.4763
Forecast 4-year Avg.	0.2284	0.0542	0.0778	0.2487	0.1720	0.3889

The shifts in forecast accuracy indicate that either changes in the economy or changes in the levels of variables might have pernicious effects on forecast accuracy in the longer forecast horizons.

Table 6.2 shows the RSE (root square error) and APE (absolute prediction error) for both speeds of adjustment of debt ratio and equity ratio for each country over the four forecasting horizons. In general, the RSE exhibits a stable pattern similar to the RMSE for speed of adjustment of debt/equity ratio for all countries. On the other hand, the computed APE shows variations in the forecast error for the speed of adjustment of debt/equity ratio for all countries. The APE shows variations in the speed of adjustment of debt ratio for India, which was not observed using MAPE that remained constantly higher capped at 3, for the four forecasting horizons (see Table 6.1 Panel A). The APE for the speed of adjustment of debt ratio has increased for Pakistan and South Korea, contrary to decrease suggested by MAPE reported earlier. Thailand is an exceptional case because both the APE and RSE are higher compared to other countries, thereby demonstrating significant uncertainty and volatility in the forecast of the speed of adjustment of debt ratio at *T+2* and *T+3* forecasting horizons. This result seems to support the earlier suspicion that events during the forecasting horizons might produce large forecast errors for some countries compared to others, due to variability in macro- economic shocks across countries.

Similarly, the APE shows increases in forecast errors for the speed of adjustment of equity ratio, contrary to the decrease shown by the MAPE (see Table 6.1 Panel B) for India, Indonesia, Pakistan and South Korea. In particular, for Indonesia and Pakistan, the APE shows a relatively high forecast error at forecasting horizon *T+3* and *T+4*. In sum, it can not be stated that the out-of-sample forecasts obtained here are better using just one non-linear model, unless a comparison is made between these forecasts and those obtained from other competing models such as ARIMA, suggested by Aksu et al. (1996). In addition, in the implementation of out-of-sample forecasting, restrictions on the length of the *fit period* and the *test period* might also have left a few observations that were needed to carry out a meaningful forecasting.

Table 6.2 Forecast Error Statistics-II

The table presents the forecast error statistics used to evaluate the out-of-sample forecast at five distinct forecast horizons for each country. These error metrics are Mean Square Error and Absolute Prediction error (APE), where h shows the forecasting horizons.

		Speed of adjustment		Speed of adjustment		Speed of adjustment		Speed of adjustment	
		Debt ratio		*Equity ratio*		*Debt ratio*		*Equity ratio*	
India	h	Actual	Forecast	Actual	Forecast	RSE	APE	RSE	APE
	2001	0.2930	0.3003	0.2343	0.2372	0.0074	0.0251	0.0030	0.0127
	2002	0.2959	0.3041	0.2310	0.2340	0.0082	0.0276	0.0030	0.0130
	2003	0.3147	0.3274	0.2377	0.2215	0.0126	0.0401	0.0162	0.0681
	2004	0.3234	0.3387	0.2346	0.2208	0.0153	0.0472	0.0138	0.0588
Indonesia									
	2001	0.2378	0.2411	0.0786	0.0855	0.0033	0.0139	0.0069	0.0876
	2002	0.2345	0.2360	0.0785	0.0821	0.0014	0.0061	0.0036	0.0461
	2003	0.2442	0.2481	0.0744	0.0860	0.0039	0.0158	0.0115	0.1551
	2004	0.2450	0.2531	0.0700	0.0853	0.0081	0.0331	0.0153	0.2185
Malaysia									
	2001	0.1577	0.1631	0.0827	0.0794	0.0054	0.0341	0.0033	0.0402
	2002	0.1577	0.1632	0.0826	0.0793	0.0055	0.0349	0.0033	0.0402
	2003	0.1581	0.1617	0.0811	0.0790	0.0036	0.0230	0.0021	0.0262
	2004	0.1500	0.1845	0.0800	0.0735	0.0345	0.2303	0.0065	0.0811
Pakistan									
	2001	0.3516	0.3541	0.2427	0.2519	0.0025	0.0071	0.0092	0.0378
	2002	0.3464	0.3494	0.2445	0.2527	0.0030	0.0085	0.0082	0.0337
	2003	0.3257	0.3367	0.2624	0.2809	0.0110	0.0337	0.0185	0.0705
	2004	0.3200	0.3501	0.2500	0.2094	0.0301	0.0942	0.0406	0.1623
South Korea									
	2001	0.4693	0.4777	0.1714	0.1705	0.0085	0.0180	0.0010	0.0057
	2002	0.4726	0.4818	0.1744	0.1735	0.0092	0.0195	0.0009	0.0049
	2003	0.4716	0.4848	0.1682	0.1666	0.0132	0.0281	0.0016	0.0092
	2004	0.4700	0.4791	0.1756	0.1774	0.0091	0.0194	0.0018	0.0104
Thailand									
	2001	0.1275	0.1216	0.3862	0.3896	0.0059	0.0461	0.0034	0.0088
	2002	0.1268	0.1163	0.3872	0.3895	0.0105	0.0828	0.0023	0.0060
	2003	0.1357	0.0971	0.3792	0.3873	0.0386	0.2845	0.0081	0.0214
	2004	0.1000	0.1034	0.3800	0.3893	0.0034	0.0345	0.0093	0.0243

6.3 Simulation of Speed of Adjustment of Debt and Equity Ratio

To the best of researcher's knowledge, only one study Gatward and Sharpe (1996) have used dynamic simulation methodology to gain better understanding of the adjustment process for sample of Australian firms. Thus, this study makes a new contribution by using dynamic simulation methodology for the Southeast Asian countries. This section has two purposes, the first being to establish the fact that speed of adjustment explains the difference between the actual and optimal level of debt and equity ratios observed in pre-post liberalization respectively. The second purpose is to use a simulated speed of adjustment of debt and equity ratio to investigate whether future corporate events or capital structure adjustments will be different from those in the recent past. This second purpose has sound economic importance. If the simulated speed of adjustment does (not) follow the recent trend of adjustment, then information contained in the recent period variables will be (not be) useful to make future predictions, and future capital structure adjustment will be less (more) volatile. The researcher believes that disequilibrium of ratios and simulation for a future period would provide an early warning for a country to address the corporate financing imbalances in an uncertain future.

6.3.1 Simulation Methodology

This section focuses on the simulation of the speed of adjustment of debt and equity ratio. A dynamic solution and stochastic simulation was used to generate a simulated (extrapolative) forecast of the speed of adjustment of debt and equity ratios for each country respectively. A key feature of this type of forecast is that it assumes that future changes in exogenous variables affecting the future optimal debt or equity ratio, can be forecast by observing the historical trend of the firm-specific explanatory variables. It should be noted that at any point in time in future, firms may not have attained the optimal ratio due to some reasons but this study's specification still indicates the optimal behaviour of the firm i.e. an equilibrium relationship given the adjustment costs (Heshmati, 2001). Thus, with these assumptions, the researcher obtained a 5-year forecast [i.e. 2005-2010] of the debt and equity adjustment speed as illustrated below.

To obtain a stochastic simulation of the speed of adjustment of debt and equity ratios for each country from 2005 to 2010, Equations (4.9) and (4.10) were estimated using the sample period 1991-2004 and the coefficients were retained. To obtain the futures values of the target debt ratio in (4.9) and target equity ratio in (4.10) for the period 2005-2010, we need future values of the right hand side variables in both equations (4.9) and (4.10) to get these target values. For this purpose, we assumed that these right hand variables follow their historical trend[1], and their future values from 2005-2010 can be obtained using one-step ahead forecast procedure as described above. Then, we used these forecast values together with retained coefficients from the equations to extrapolate or simulate speed of adjustments.

We used model object in EVIEWS 5.1 for this purpose. The stochastic simulation was preferred over deterministic simulation for the extrapolative type because the models are non-linear in variables but linear in parameters. Another advantage of stochastic simulation is that it provides some measure of the uncertainty in the results by adding error bounds to prediction. If the future realization of the adjustment speed lies within these error bounds, the forecast efficiency is reliable. The model object in Eviews uses Gauss-Seidel algorithm for solving system of equations. The system of equations is given by:

$$
\begin{aligned}
& D_{i,j,t} = (1-\delta^{(1)}_{i,j,t})D_{i,j,t} + \delta^{(1)}_{i,j,t}D^{*}_{i,j,t} \\
& \text{where } D^{*}_{i,j,t} = \beta_{0,j} + \beta_1 NDTS_{i,j,t} + \beta_2 PROFIT_{i,j,t} + \beta_3 TANG_{i,j,t} + \beta_4 GROWTH_{i,j,t} + \\
& \qquad\qquad + \beta_5 FDC_{i,j,t} + \beta_6 FCF_{i,j,t} + \beta_7 INV_{i,j,t} + \beta_8 BRISK_{i,j,t} + \beta_9 ROE_{i,j,t} + \varepsilon_{i,j,t} \\
& \quad \delta^{(1)}_{i,j,t} = \delta^{(1)}{}_{0,j} + \delta^{(1)}_1 BLIB_{i,j,t} + \delta^{(1)}_2 SLIB_{i,j,t} + \delta^{(1)}_3 INST_{i,j,t} + \delta^{(1)}_4 GROWTH_{i,j,t} + \delta^{(1)}_5 SIZE_{i,j,t}
\end{aligned}
$$

$$
\begin{aligned}
& E_{i,j,t} = (1-\delta^{(2)}_{i,j,t})E_{i,j,t} + \delta^{(2)}_{i,j,t}E^{*}_{i,j,t} \\
& \text{where } E^{*}_{i,j,t} = \phi_{0,j} + \phi_1 NDTS_{i,j,t} + \phi_2 PROFIT_{i,j,t} + \phi_3 TANG_{i,j,t} + \phi_4 GROWTH_{i,j,t} + \\
& \qquad\qquad + \phi_5 FDC_{i,j,t} + \phi_6 FCF_{i,j,t} + \phi_7 INV_{i,j,t} + \phi_8 BRISK_{i,j,t} + \phi_9 ROE_{i,j,t} + e_{i,j,t} \\
& \delta^{(2)}_{i,j,t} = \delta^{(2)}_{0,j} + \delta^{(2)}_1 BLIB_{i,j,t} + \delta^{(2)}_2 SLIB_{i,j,t} + \delta^{(2)}_3 INST_{i,j,t} + \delta^{(2)}_4 GROWTH_{i,j,t} + \delta^{(2)}_5 SIZE_{i,j,t}
\end{aligned}
$$

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[1] We use regression of the right side variables on a constant and a trend variable.

Where both are the endogenous variables and other variables on the right side are exogenous variables. Eviews solves the equations in the order they appear in the model. At each iteration, each equation in the model is solved for the value of its associated endogenous variables for a single period. The computation is serial as each component of the new iterate depends upon all previously computed components. For example, for the debt ratio, at each step, given the current values $D^{*(k)}, \delta^{(1)(k)}$ we solve for $D^{*(k+1)}, \delta^{(1)(k+1)}$ in equations (4.9).

$$D^{*(k+1)} = f(NDTS^{(k+1)}, PROFIT^{(k+1)}, TANG^{(k+1)}, GROWTH^{(k+1)}, FDC^{(k+1)}, FCF^{(k+1)}, INV^{(k+1)}, BRISK^{(k+1)}, ROE^{(k+1)})$$
$$\delta^{(1)(k+1)} = g(BLIB^{(k+1)}, SIZE^{(k+1)}, GROWTH^{(k+1)})$$

where *(k+1)* values of the variables are obtained from the one-step ahead forecast. A similar procedure was adopted for speed of adjustment of equity ratio in Eq. (4.10). The resulting simulated forecasts of the speed of adjustments besides the actual mean debt and equity adjustment speed and ±2 standard error (SE) bounds are shown below for each country.The error bands are useful because these can detect forecast uncertainty at each step ahead. The simulated speed of adjustment of debt and equity ratios are shown in the shaded areas in the plots in Fig 6.3. In general, the plots in Fig 6.3 support the claim that the non-linear model and choice of variables within the model, provide a closer match between stochastic simulated speed and actual speed of adjustment of debt and equity ratio. However, there are some caveats in the strict interpretation of the simulation forecast for 2005-2010. First, a small number of yearly observations is used; secondly, the number of variables used to forecast might be collinear. The simulation results for all the countries in the sample – India, Indonesia, Malaysia, Pakistan, South Korea and Thailand, are discussed with these caveats.

6.3.2 Simulated Forecast of Speed of Adjustment of Debt Ratio

In this section, two sets of plots for each country are considered: one showing the optimal and observed debt in the upper panel, and the other showing the actual and simulated forecast speed of adjustment indicated by the shaded region of the 'forecast period' in the lower panel.

The observed debt ratio was higher than the optimal debt ratio for India, (see upper panel Fig 6.3 a), which might be due to more reliance on the external finance. The firms' debt ratio decreased at a faster pace during 1995-1999. The stable pattern in the speed of adjustment of debt ratio (see lower panel Fig 6.3 a) reflects this trend. The observed debt ratio has remained near to the optimal level of debt ratio in the post-liberalization period which is also corroborated by a less variable speed of adjustment (see lower panel). The simulation results show that the speed of adjustment would be near to 30% per annum during the period 2005 -2010. In the case of Indonesia and Malaysia, even though the observed debt ratio has been lesser than the optimal debt ratio in both pre- and post-liberalization periods, it followed an increasing trend until 1998 (see upper panel Fig 6.3 b). The critical level of debt after the Asian financial crisis might have led to a downward movement of the curve from 1999 onwards for Indonesia. The simulated speed of adjustment of debt ratio for both countries suggests the pattern will remain fairly stable (see upper panel Fig 6.3 c).

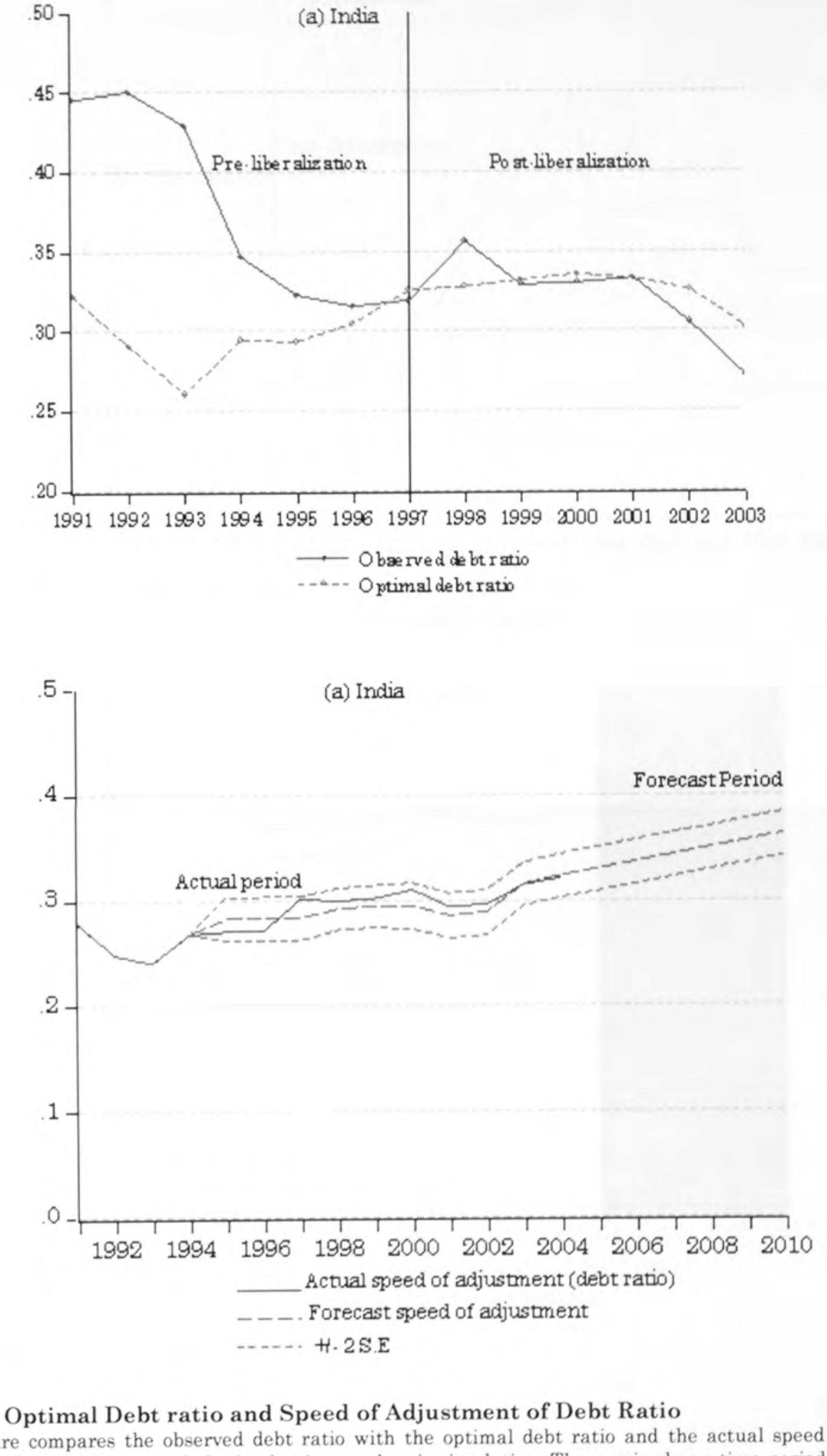
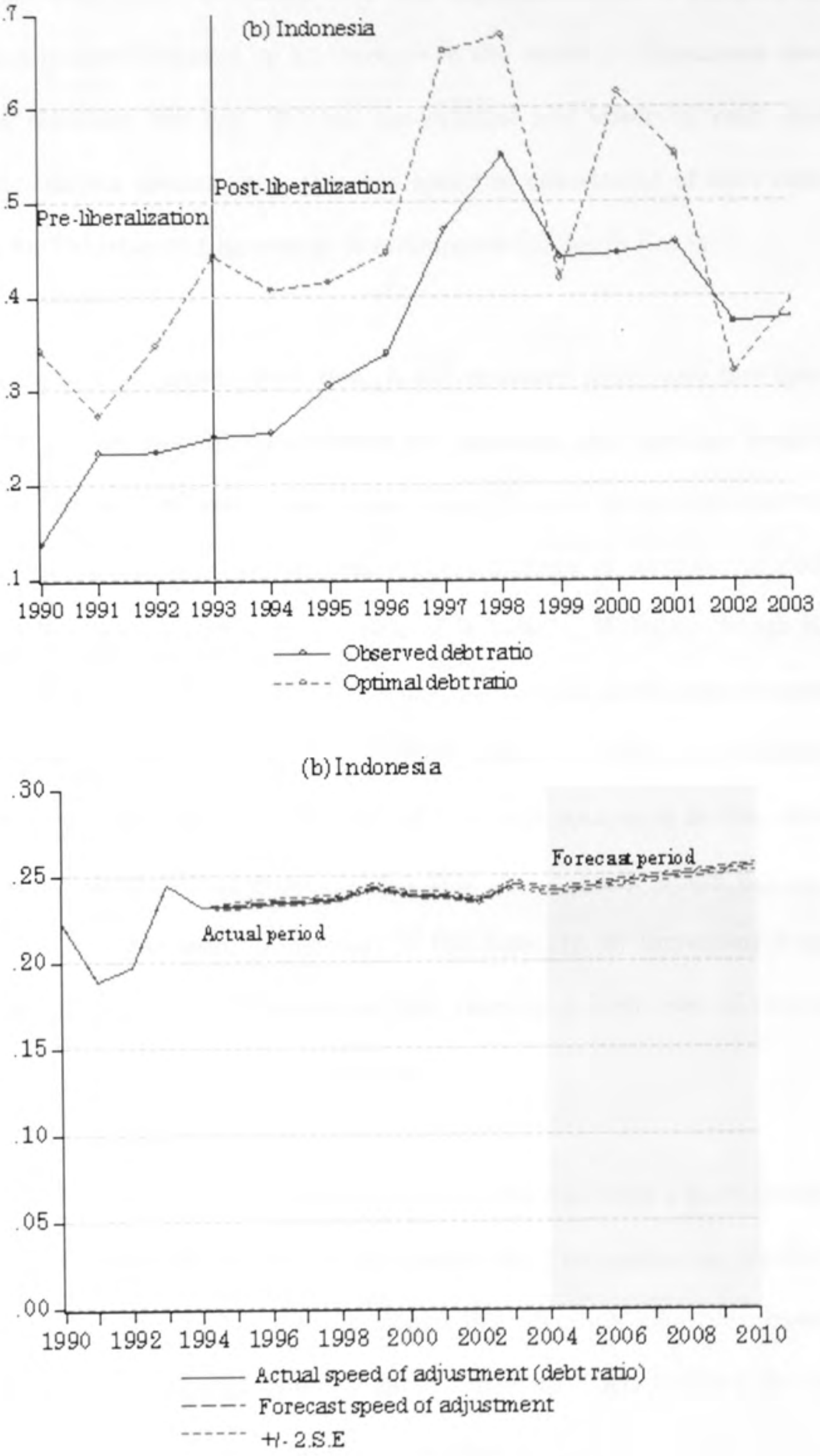


Fig 6.3 Optimal Debt ratio and Speed of Adjustment of Debt Ratio

The figure compares the observed debt ratio with the optimal debt ratio and the actual speed of adjustment with the forecast of adjustment speed obtained using stochastic simulation. The x-axis shows time periods and the y-axis optimal debt ratio, observed debt ratio, actual speed of adjustment of debt ratio, future forecast speed of adjustment and +/- 2.S.E.



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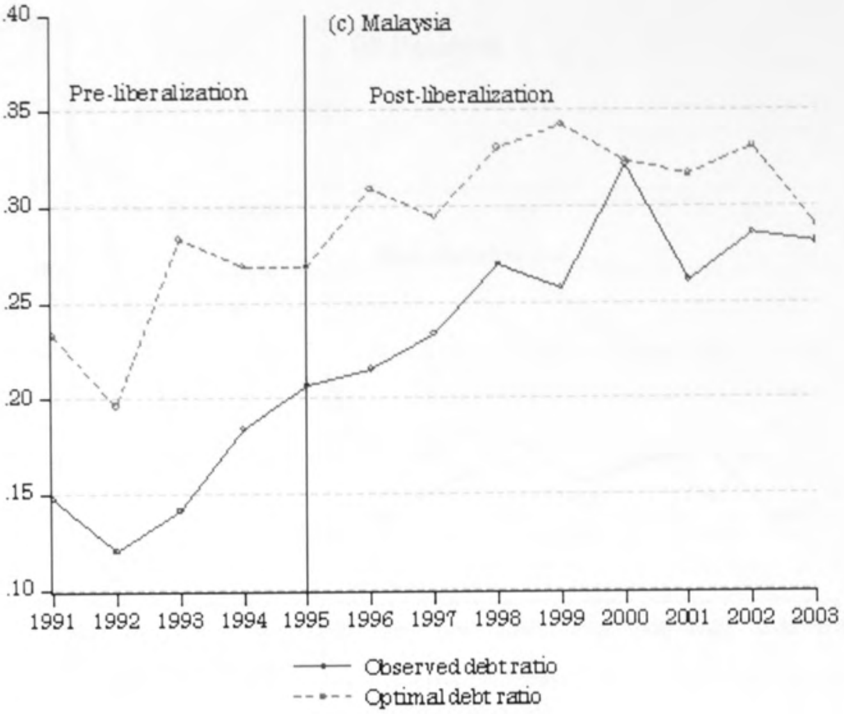
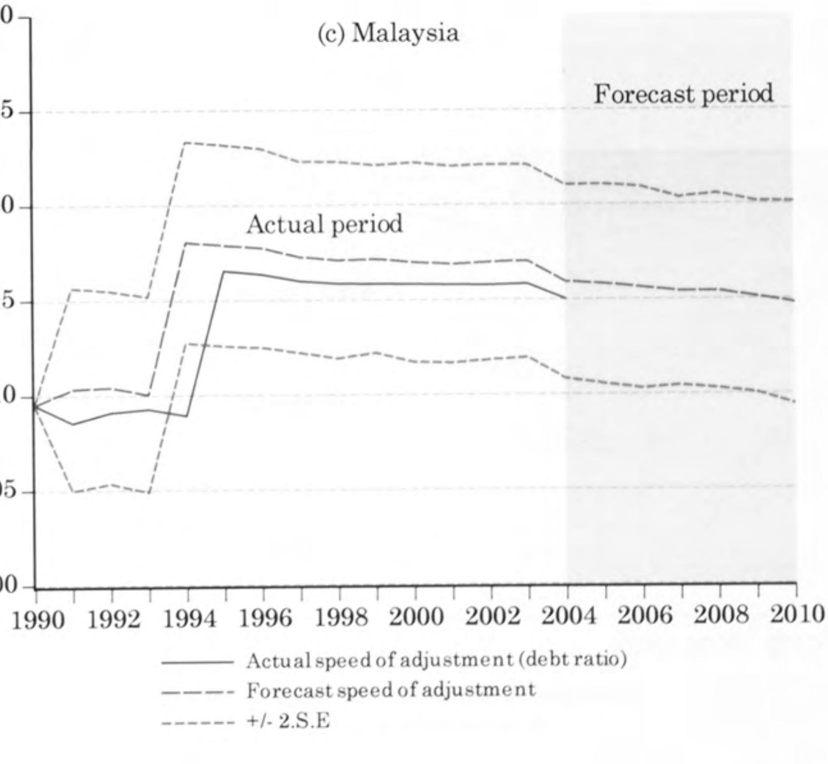
The observed debt ratio has been higher than the optimal debt ratio in the pre-liberalization period for Pakistan and South Korea (see upper panel Fig 6.3 d and e). The gap between the optimal and observed ratio decreased with the implementation of banking sector reforms for Pakistan, which is also indicated by an increase in the speed of adjustment (see lower panel Fig 6.3 d). On the contrary, the gap between the optimal and observed ratio increased for South Korea. The simulation results show that the speed of adjustment of debt ratio would decrease monotonically for Pakistan but no change is anticipated for South Korea

Unlike Indonesia and Malaysia, even though the observed debt ratio has been lower than the optimal level in the pre-liberalization period for Thailand, this gap has been reduced near the liberalization of the banking sector (see upper panel Fig 6.3 f) and the observed debt increased considerably in the post-liberalization period. This pattern of increase in debt ratio has been similar to what has been observed in the case of Indonesia, Malaysia, South Korea in the post-liberalization period. However, unlike other countries, the plot shows that the speed of adjustment has remained near to the maximum of 1, which seems to reflect considerably faster speed of adjustment to target debt ratio in the case of Thailand compared to the other countries. The simulation results, on the other hand, predict that this pattern would become faster and firm might over-adjust in anticipation of recovery in the economy, by increasing firm-level borrowing. However, wider standard error bands show that there is a high level of uncertainty about this pace of adjustment in the firms' financing policy.

In sum, these findings support the argument that there has been a slow speed of adjustment in most Southeast Asian countries due to adjustment costs. The simulation results further point out that even though fully-fledged domestic financial liberalization measures have been adopted by these countries, the speed of adjustment of debt ratio still reflects the fact that their governments still rely on the latent measures of financial repression.





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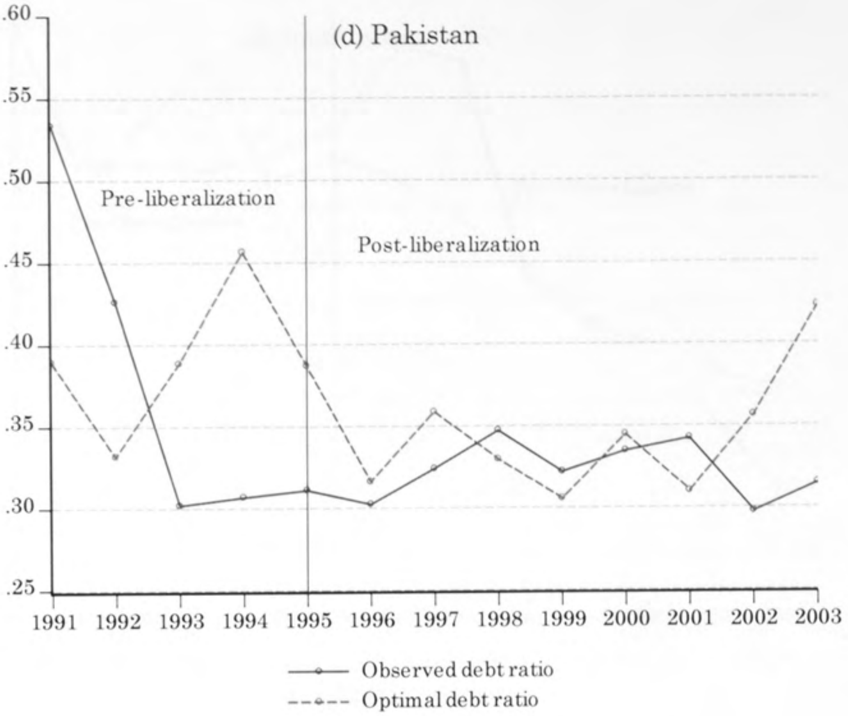

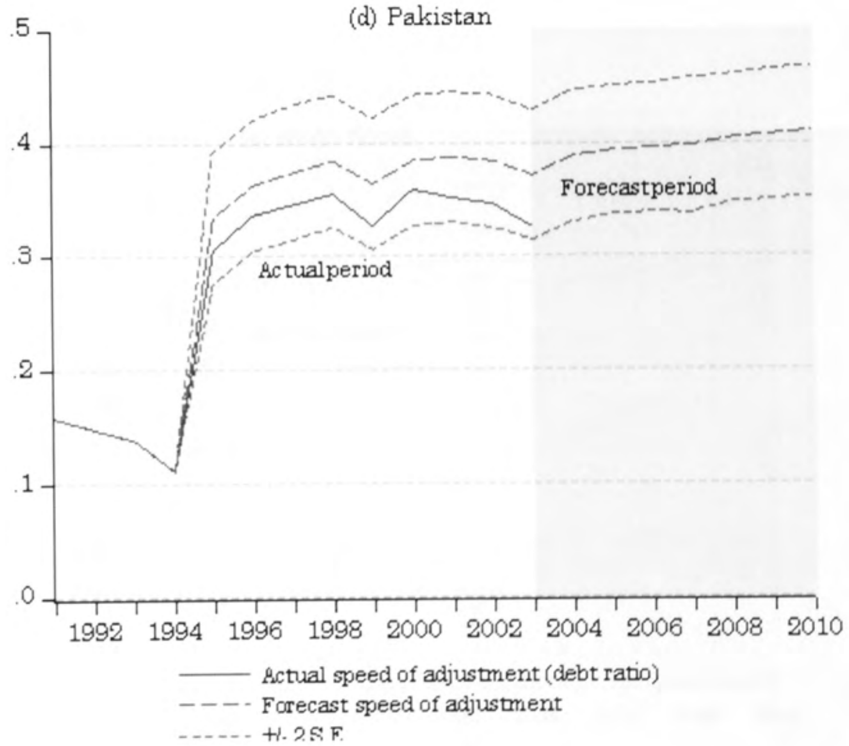

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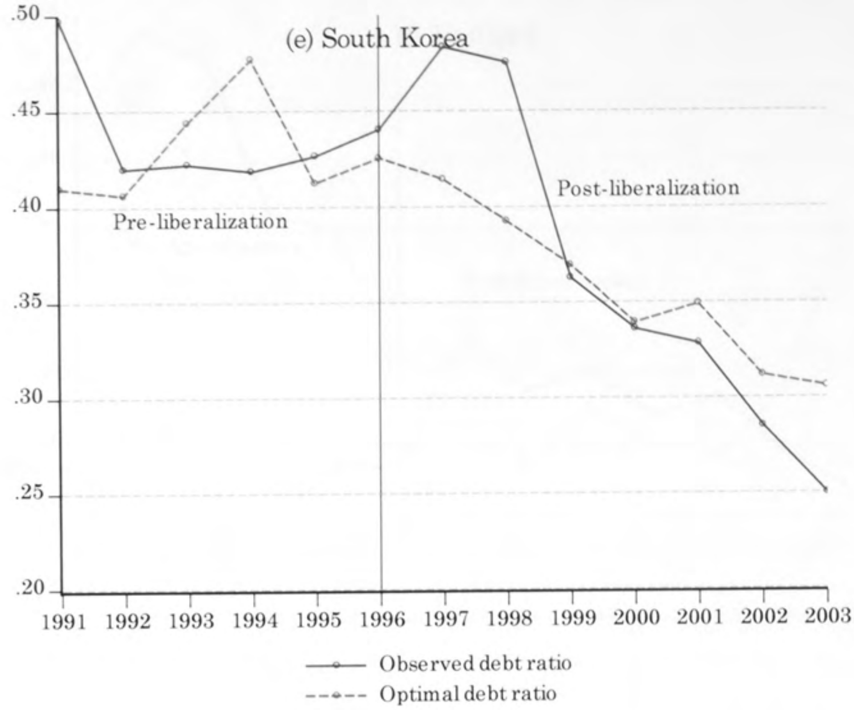

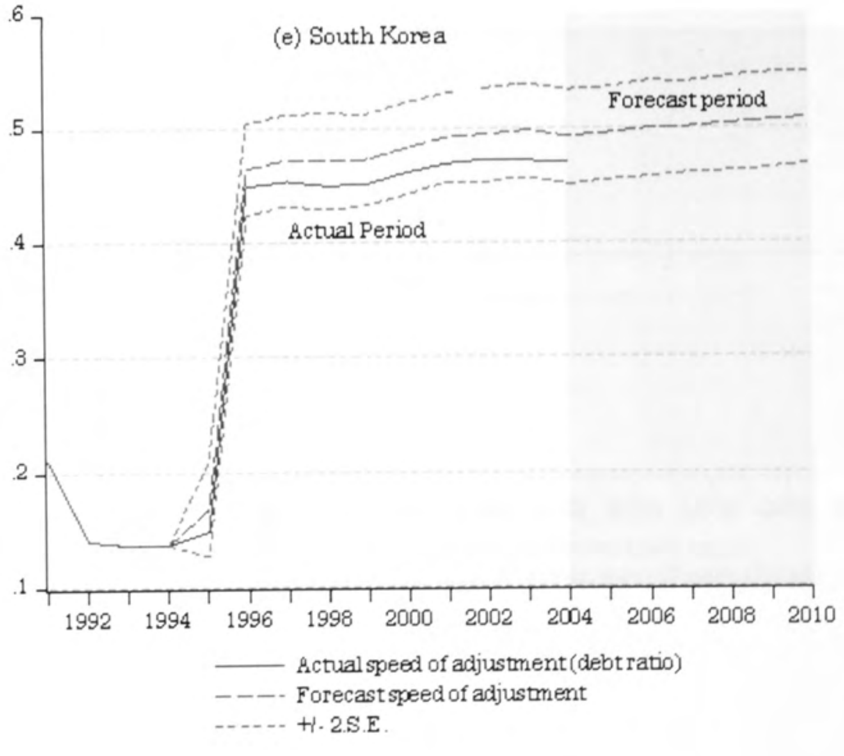

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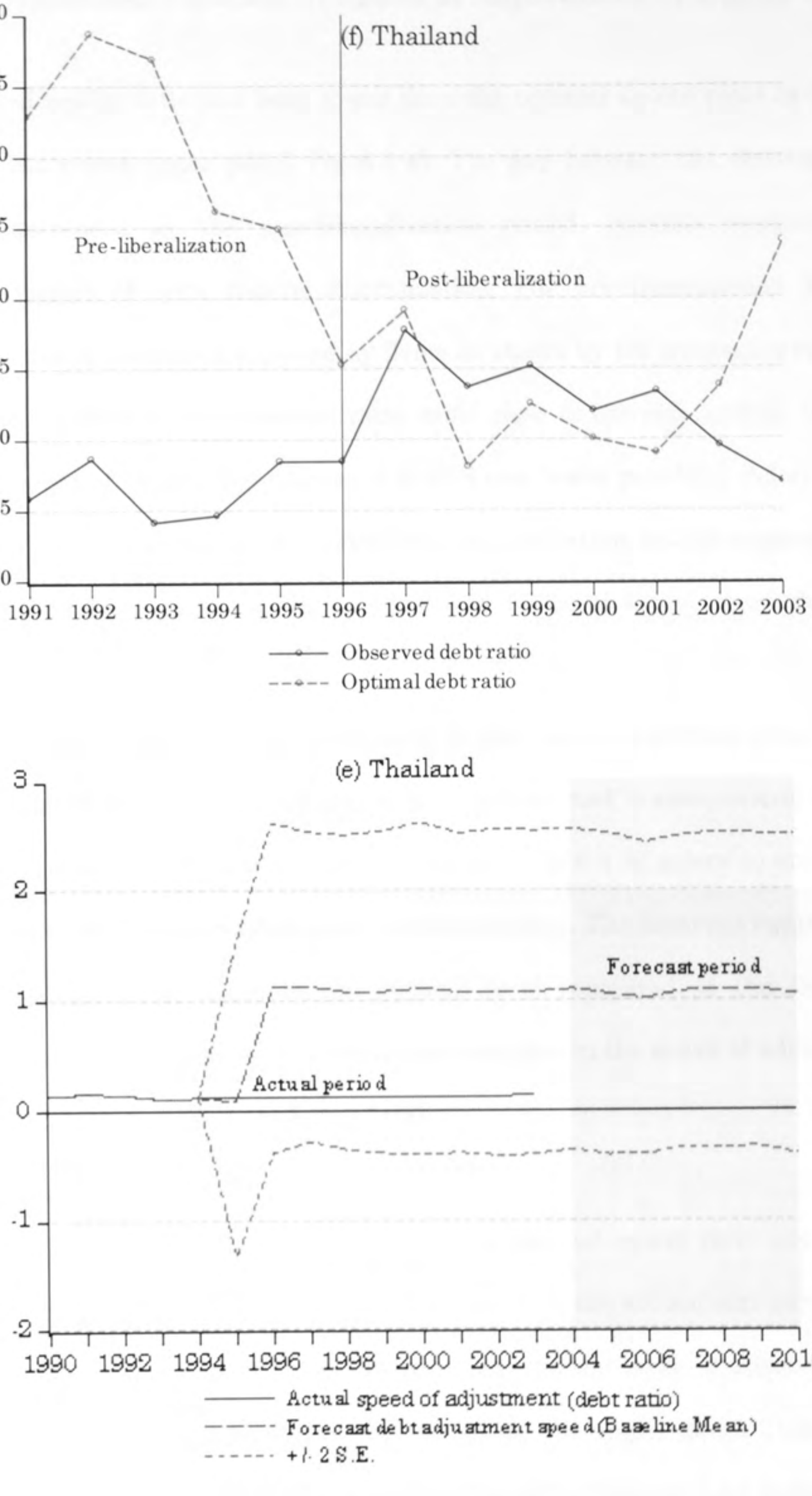

Fig 6.3 (concluded)

6.3.3 Simulated Forecast of Speed of Adjustment of Equity Ratio

The observed equity ratio has been lower than the optimal equity ratio in the pre-liberalization period for India (see upper panel Fig 6.4 a). The gap between the observed and optimal level gradually decreased in the post-liberalization period, possibly suggesting the short-term temporary impact of stock market liberalization. The pre-liberalization disequilibrium in the equity ratio might have been adjusted by firms as shown by the increasing speed of adjustment of equity ratio. As soon as the observed ratio came close to optimal level in the post-liberalization period, the speed of adjustment decreased to 25% (see lower panel Fig 6.4 a). The observed equity ratio drifted away from the optimal level and the simulation results suggest that this trend will continue in the future and the speed of adjustment will be 25 % per annum during 2005-2010.

The observed equity ratio has been unusually higher than the optimal ratio (see upper panel Fig 6.4 b and c) in the pre-liberalization period for Indonesia and to some extent, Malaysia. The higher speed of adjustment for Indonesia (see lower panel Fig 6.4 b) seems to suggest that firms were active in new equity issuance after stock market opening. The observed equity ratio of the firms in Malaysia has been very close to the optimal level compared to the Indonesian firms. The simulation results show a predicted continuous increase in the speed of adjustment of equity ratio for former firms, compared to the latter firms.

The observed equity ratio has been lower than the optimal equity ratio (see upper panel Fig6.4d) for Pakistan. This situation was completely reversed in the subsequent periods and the observed equity ratio increased by more than 10% from the optimal level. It appears that the firms have tried to correct earlier disequilibrium by increasing the equity ratio. This finding supports the earlier result of a higher adjustment speed coefficient in Chapter 5 for Pakistan corresponding to privatizations[2]. The simulation results suggest that the speed of adjustment will decline rapidly from its current level to 20% per annum.

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[2] The over-subscription was higher for the privatized firms in the cement, fuel and energy, auto and allied and chemical sectors.

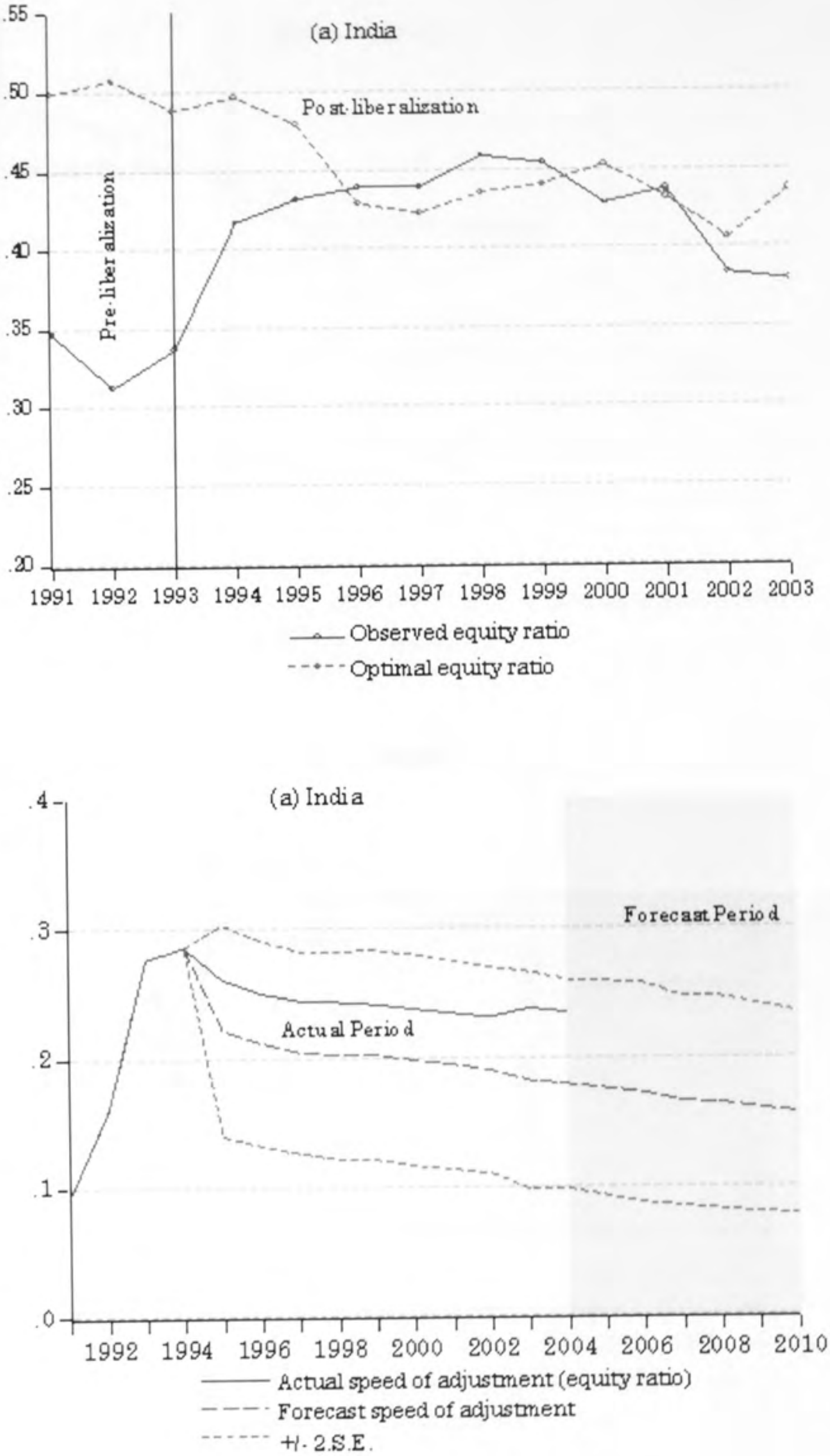
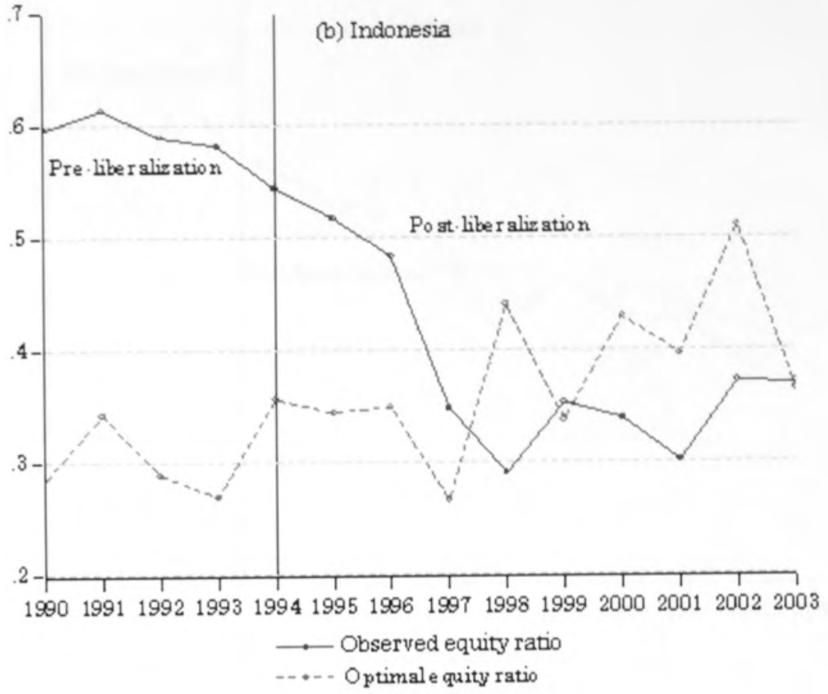
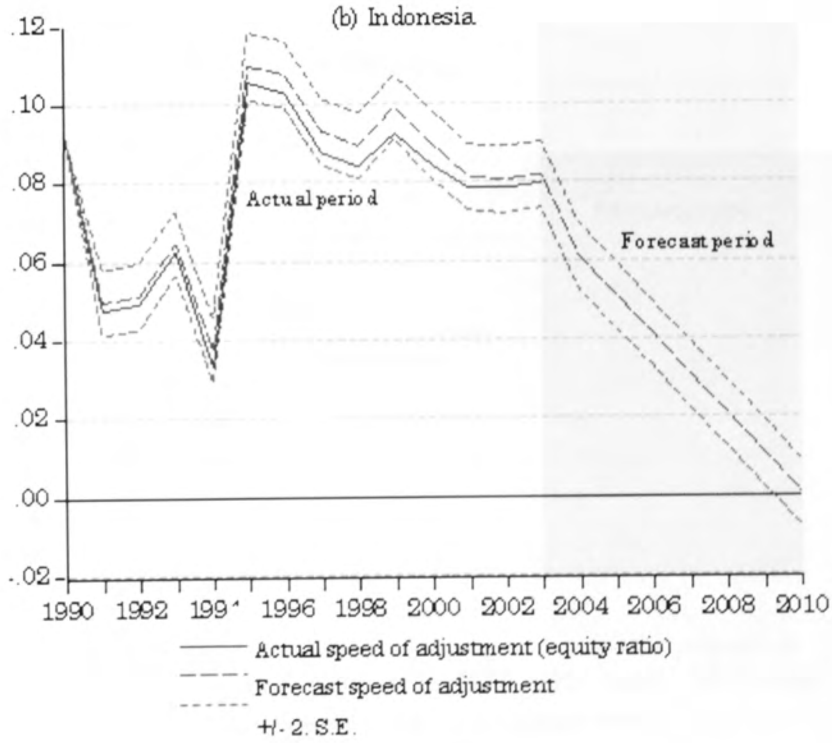


Fig 6.4 Optimal Equity Ratio and Speed of Adjustment of Equity Ratio

The figure compares the observed equity ratio with the optimal equity ratio and the actual speed of adjustment with the forecast of adjustment speed obtained using stochastic simulation. The x-axis shows time periods and the y-axis optimal equity ratio, observed equity ratio, actual speed of adjustment and future forecast speed of adjustment and +/- 2.S.E.





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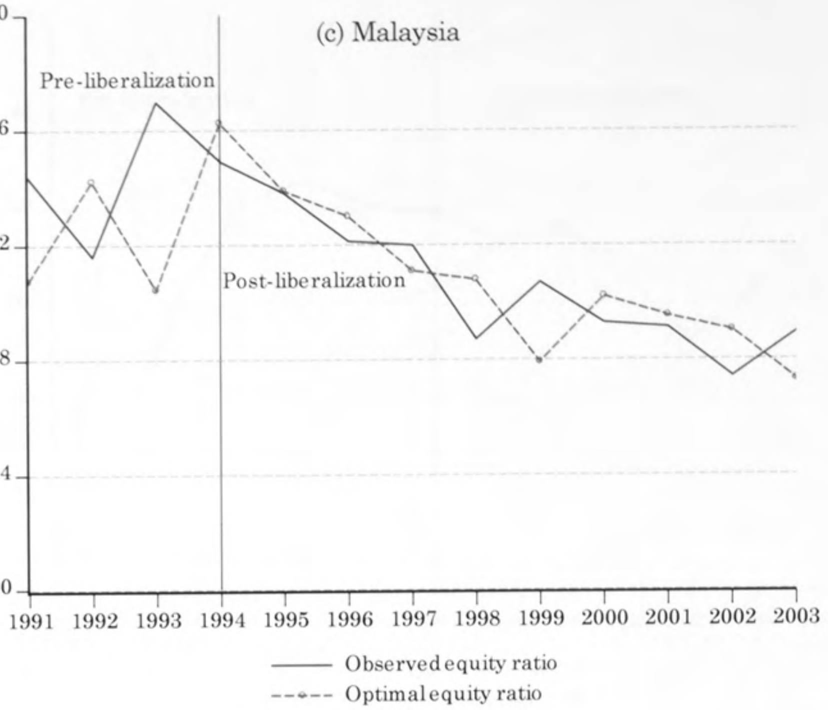

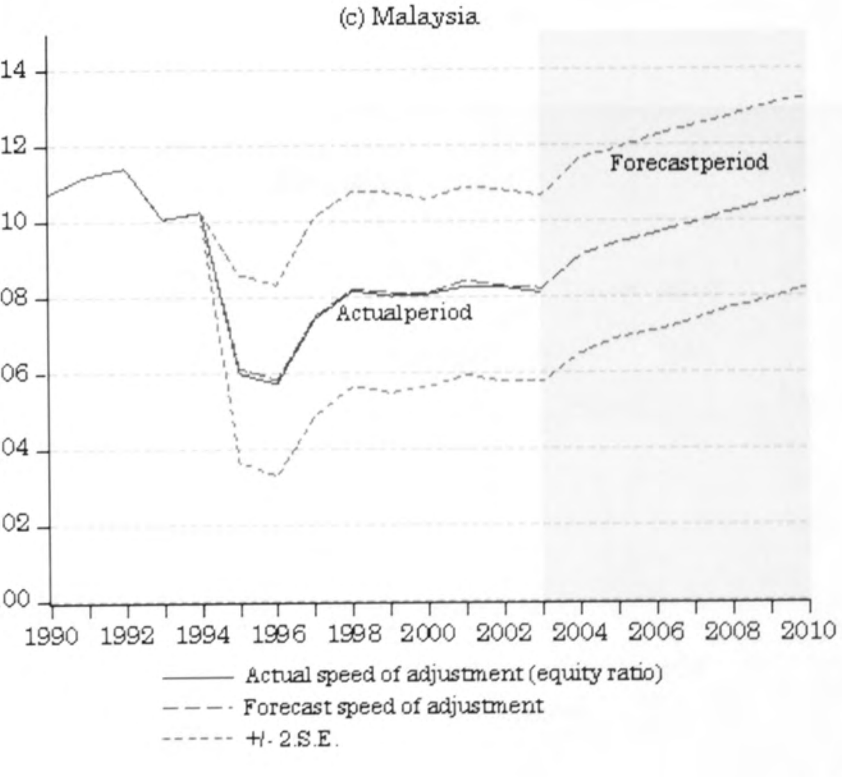

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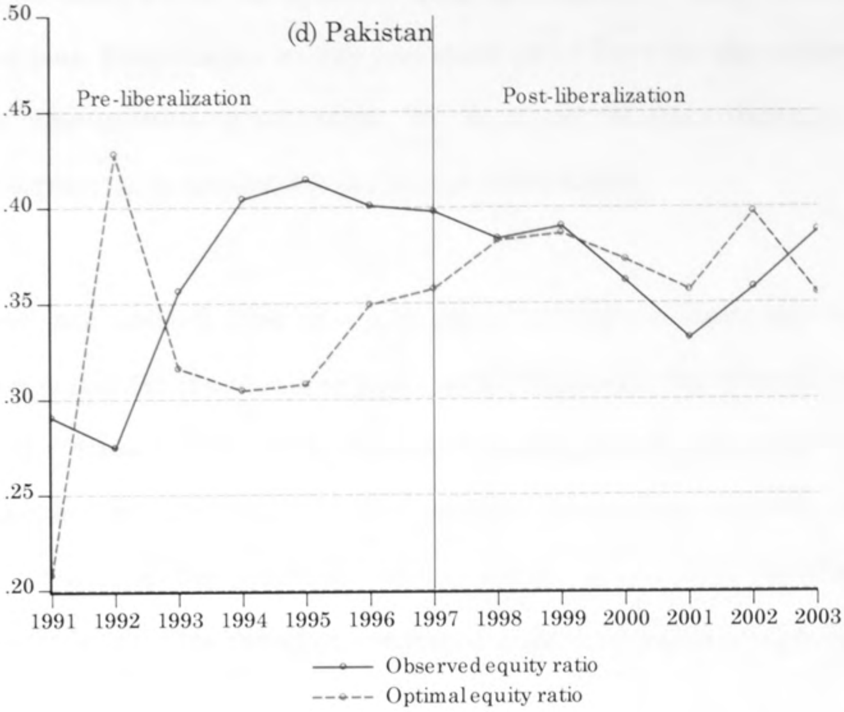


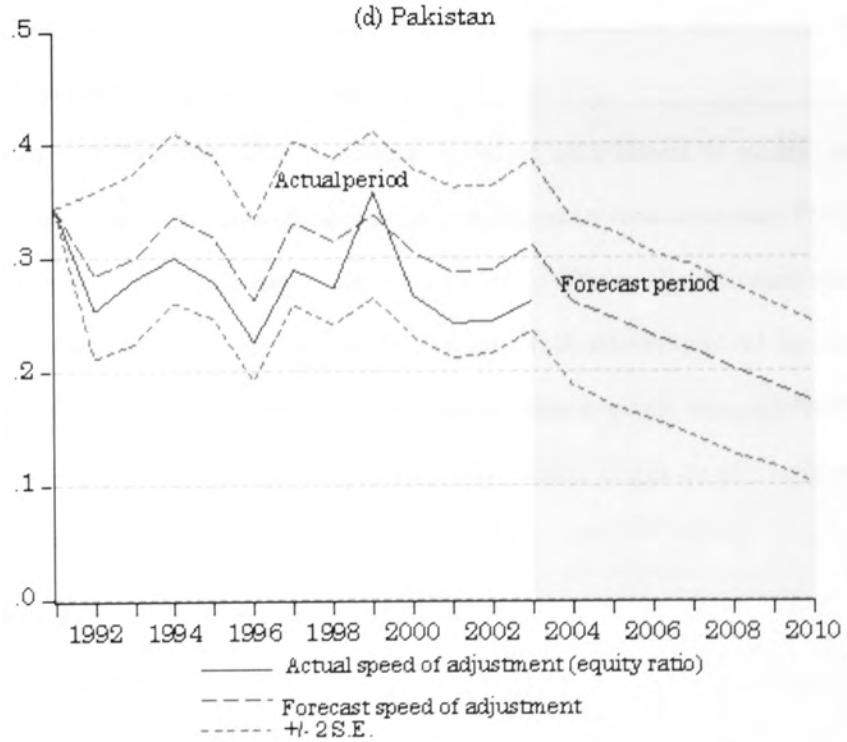
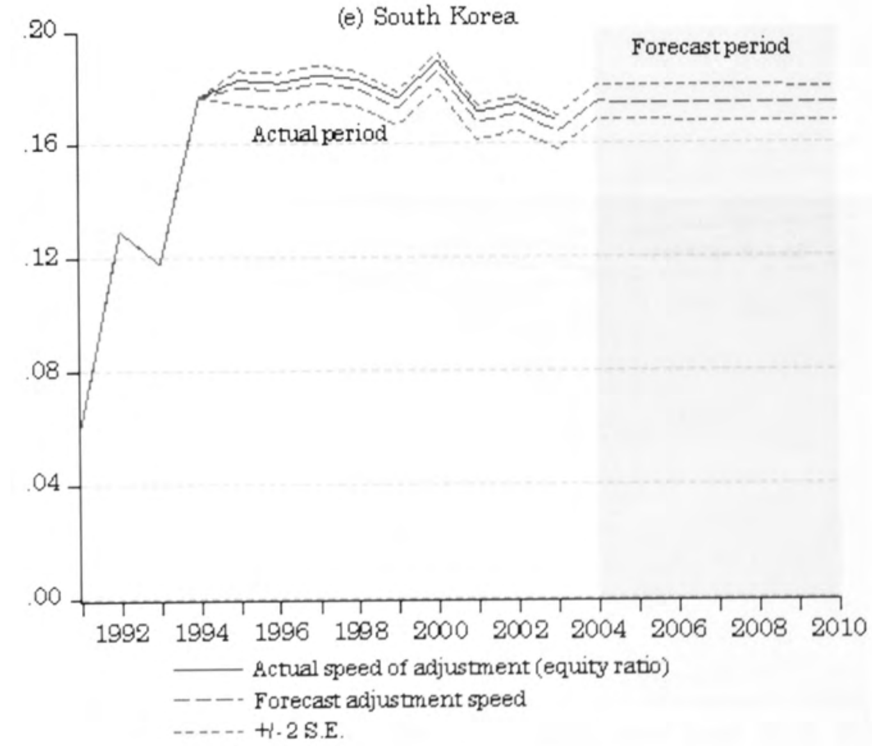


Fig 6.4(continued...)

In contrast, for South Korea, the observed equity ratio has been higher than the optimal level in both pre and post- liberalization periods (see upper panel Fig 6.4e). this pattern is quite unusual compared to other countries in our sample. We can expect the equity issuance to increase and the speed of adjustment to be around 15% per annum in the future.

The observed and optimal level of equity ratio has been unexpectedly similar in the pre-liberalization period for Thailand (see upper panel Fig 6.4 f). The observed equity ratio drifted away from the optimal level in the post-liberalization period, and a gap of almost 20% has remained between the observed and the optimal ratio during 1994 and 1996, indicating increased stock market financing. The simulated speed of adjustment will be higher than 40% per annum which corresponds to the increasing gap between the observed and optimal equity ratio.

In sum, the simulation result for the speed of adjustment of debt ratio suggests that signals of corporate over-borrowing will be more frequent for Thailand than other countries. The above graphical exposition suggests that stock market financing is less predictable and less progressive in Indonesia and Pakistan. The simulated speed of adjustment of equity ratio for the next five years suggests more uncertain stock market conditions in Indonesia and Pakistan. The reversal of the stock market financing boom as seen during the 1990s is not expected and bleak signs of stock market progress can be seen by the falling speed of adjustment of equity ratio in these two countries. It is tempting to speculate that among other possible reasons for the uncertainty about future financing patterns in these countries, one reason might be the lack of integration of these countries with world financial markets.



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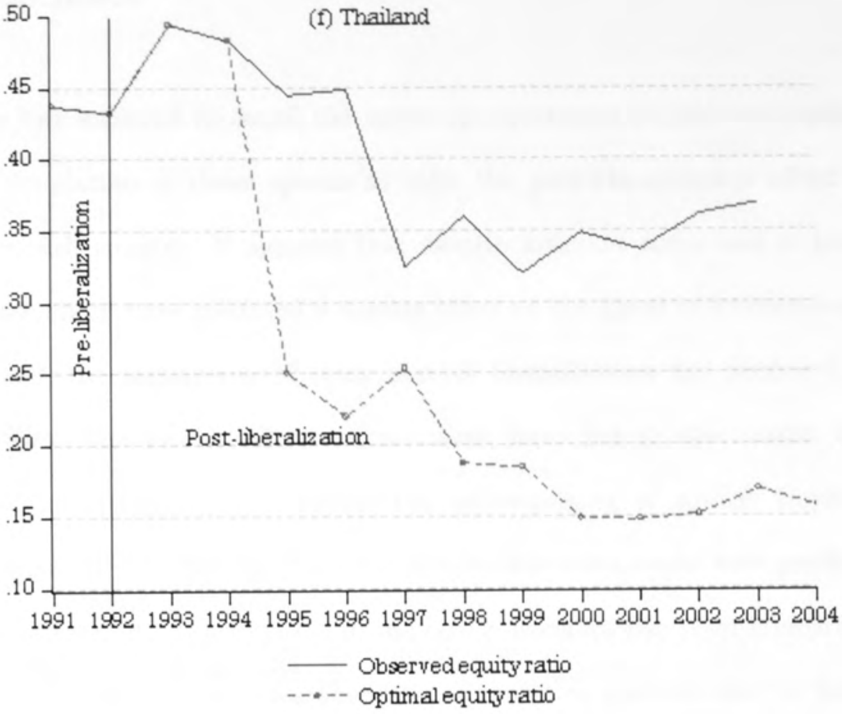

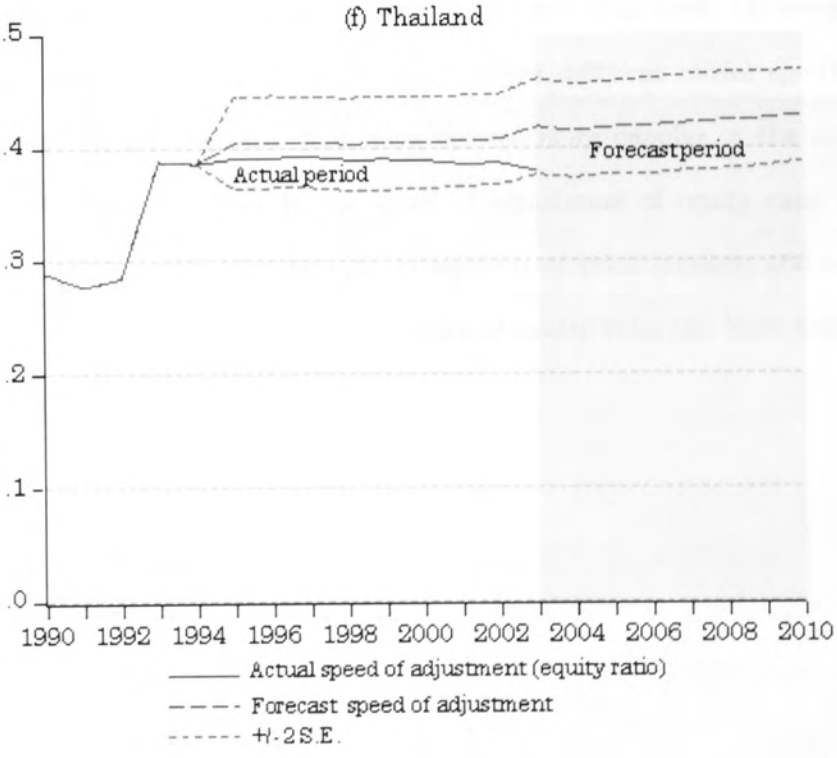

Fig 6.4 (concluded)

6.4. Conclusion

This chapter has explored in detail the speed of adjustment of debt and equity ratios and has produced a simulation of these speeds to infer the post-liberalization effect on the corporate financing for each country. It appears that despite different sequences of liberalization of the banking sector, these have produced a similar effect on the speed of adjustment of debt ratio. On the other hand, the sequencing of stock market liberalization has produced great differences across countries. The pre-liberalization measures have led to spectacular differences in the magnitude of adjustment, in particular, the under-pricing of equity. However, in the post-liberalization period, DR issuance and cross listings measures might have produced differences in the speed of adjustment. The increase in the equity issuance has been interpreted as confirming the market timing view. The researcher argues that this analysis can be further extended in future work along several dimension, of which three will be of greater significance: (1) disaggregating total debt ratio series into short-term and long term; (2) using rolling forecast origin, and (3) comparison of forecast accuracy across different model specifications like the Kalman filter and Neural Network that have become more popular in the current forecasting literature The observed difference in the speed of adjustment of equity ratio has been further explored in Chapter 7, which considers the integration of stock markets and examines whether the volatile and less predictable adjustment speed of equity ratio has been due to differences in the stock market integration.

Chapter 7

INTEGRATION OF SOUTHEAST ASIAN STOCK MARKETS

7.1. Introduction

The majority of the studies on stock markets integration have focused on the developed countries[1]. Notwithstanding, the fact that these countries have more liquid markets and have a modern infrastructure, Asian stock markets have also developed to some extent due to capital account liberalization and institutional reforms. The increase in private equity capital flows in most of the Asian countries has been associated with capital account liberalization, which allows for the free movement of private capital across national borders. These private capital flows benefit the borrowers and consumers in the recipient countries as well as bringing portfolio diversification advantage to international investors. Theoretically, greater financial openness due to capital account liberalization should allow more opportunities for risk sharing across national borders i.e., it should reduce stock market segmentation and increase integration of stock markets within the world markets.

The motivation for re-examining stock market integration of Southeast Asian stock markets lies in the fact that in Chapter 5, the speed of adjustment of equity ratio was found to be different across these countries, a scenario which the researcher suspects might be due to the lack of, or difference in the level of, integration of these markets with the world markets, and with the Southeast Asian markets. Previous studies have examined stock returns co-movement before and after the transmission of global shocks that simultaneously affected the Pacific-Basin countries (Cheung, 1997; Arshanapalli et al, 1995), but these efforts (Chan et al, 1992; De Fusco et al, 1996;

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[1] See Bessler and Yang (2003); Chelley-Steeley and Steeley (1999); Bekaert and Harvey (1995); Chan et al. (1992); Chan et al. (1992); King et al. (1994); King et al. (1994); Hamao et al. (1990); Eun and Shim (1989);

Ghosh et al., 1999) do not explore the time-varying integration of stock markets with either world markets or regional markets, and this factor could possibly explain the variations in the speed of adjustment of the equity ratio. The empirical results on the stock markets integration for Southeast Asian countries are relatively inconsistent and blurred.

The measurement of the stock markets co-movement is not simple. Previous studies have used techniques that distinguish the segmentation of stock markets from integration by examining either stock returns or volatilities. Except for Chelley-Steeley and Steeley (1999), the possible influence of the economic policy shifts e.g., reforms in domestic financial systems, trade liberalization, macro-economic stabilization programmes, and large scale privatization on country's stock markets co-movements (Bekaert et al, 2002) has been ignored. Some studies have explored the impact of external trade on stock returns co-movements in Pacific-Basin countries but only with large economies such as the US and Japan (Chen and Zhang, 1997; Johnson and Soenen, 2002). These studies have completely ignored regional trade, and the composition of the stock market index, both of which might also cause interdependence among markets.

The main contribution of this chapter lies in using different methodologies to examine the impact of stock market liberalization events on gradual integration and adjustment speeds. It is argued that a combination of methodologies will not only overcome the limitations of previous studies but also isolate the impact of the increase in private equity capital flows and stock markets liberalization events from external trade linkages on stock markets integration. The focus is on gradual co-movements in stock returns for the sample countries with the three largest regional markets (Japan, Singapore and Hong Kong) and two developed markets (the US and the UK) over a longer time period of 13 years. There is an attempt to explain co-movements in stock returns with reference to external trade for each country within the region, instead of for the developed countries. In addition, the study also examines the stock market liberalization events to identify channels of global and regional influence on stock returns co-movements. Using these methodologies, it becomes possible to answer three inter-related questions. Firstly, there is the question of whether the stock market integration is time varying. Secondly, we can ask how important are economic co-movements such as bilateral trade flows, in explaining time-varying stock return co-movements? And thirdly, what are the main channels in explaining time-varying global and regional integration?

The rest of the chapter is organized as follows. Section 7.2 discusses the channels of integration of stock markets with particular reference to Asian countries. Section 7.3 explicates methodologies and data used for the analysis. Section 7.4 reports results on the integration or interdependence among Asian markets. Section 7.5 discusses return and volatility spillover effects estimated through TARCH models, and Section 7.6 concludes and provides a shortlist of implications for portfolio diversification and the cost of equity capital.

7.2 Stock Markets Co-movements and Integration

There are two strands of literature on the transmission mechanism of stock price movement across stock markets. The first strand argues that economic factors are the most relevant and critical in explaining the phenomenon of co-movement or correlation among the stock markets (Pagano, 1993). Each country's stock market behaves over time in a manner that reflects more or less sensitivity to these common sources of information (economic factors). These common sources of information could be affected by global shocks, such as changes in the world interest rates, oil prices, commodity prices or global risk aversion (Forbes and Chin, 2003).

Another offshoot of this argument that economic integration drives the stock market integration suggests that the similarities in the industrial composition of national stock indexes are major source of co-movement among international stock markets (Roll, 1992). The countries with more similar industrial composition tend to have more highly correlated stock market returns. However, opinions vary over this line of argument about whether industry factors are more important than country factors (Serra, 2000; Griffin and Karolyi, 1998; Heston and Rouwenhorst, 1994; Errunza, 1994).

The second strand argues that stock market liberalization offers foreign investors the benefits of portfolio diversification in previously closed and segmented markets, and thus, integrates the previously segmented markets across the world. It has been argued that most of the Asian stock markets would have offered higher returns to international investors because these markets have higher returns, low exposure to world factors, and little integration due to segmentation (Harvey, 1993). Bhamra (2005) adds that the influence of stock market integration is conditional on the size of the recipient country's economy. The degree of co-movement of stock market returns increases only if the liberalizing country has a smaller economy - otherwise it decreases. The size of a national economy, rather than capital reform policy, matters in the transmission of price effect from one market to another. The empirical evidence related to the two strands of literature is given below.

Johnson and Soenen (2002) use macro-economic variables to explain the stock market co-movement of twelve Asia and Pacific stock markets with Japan from 1988-1998. They find that the stock markets of Malaysia, and Singapore are highly integrated with the Japanese stock market. However, the stock markets of India, Indonesia and South Korea show less co-movement with Japan. Many other studies have examined the integration between large East Asian stock markets with US and Western developed markets, and they do not find evidence of integration with the US stock market or with the regional markets before the Asian financial crisis in 1997 (see Chan et al., 1992; De Fusco et al., 1996; Hang and Cheung, 1995; and Ghosh et al., 1999; and Yang et al., 2003). By contrast, very few studies (see e.g., Arshanapalli et al., 1995; Masih and Masih, 1997, 1999, and 2001; Chung and Liu, 1994) reported more than one co-integrating vector among several major East Asian markets and developed markets respectively.

Using external trade flow measures, Chen and Zhang (1997) find that the stock markets return correlation is related to the degree of economic integration in Pacific-Basin countries. Forbes and Chinn (2003) find a relationship between real variables and financial market returns in the five largest countries and 40 smaller countries. They show that in the second half of the 1990s, after controlling for global and sectoral shocks, trade linkages are a significant determinant of co-movements in stock and bond markets, more so than linkage through foreign direct investment and other financial flows.

Kim and Rogers (1995) and Ng (2000) depart significantly from the above studies in terms of methodology and explicit attention to the stock market liberalization. Using spillover methodology as in previous studies (see e.g., Engle et al, 1990; 1993; King et al, 1990),_Kim and Rogers (1995) used the GARCH-in-Mean to investigate volatility spillover effects from Japan and the US on the Korean stock market after market liberalization. Using a dummy variable to reflect the liberalized regime of the Korean stock market, they show that volatility spillover effects from Japan are stronger than the US using open-close return, but the opposite is true for close-open returns after liberalization. Ng (2000) used the GARCH estimation and found that local information variables have a different influence on the mean and volatility spillover effects from the US and Japan to six Pacific-Basin countries. The results show that an increase in trade with Japan and the US has a negative effect on mean spillover effects for Malaysia, South Korea and Thailand. The exchange rate changes and issuance of DR have a negative effect on the volatility spillover effect.

There are two major shortcomings of previous studies. Firstly, Japan might not be an appropriate proxy for regional factors (Yang et al., 2003). Secondly, in most of the studies, the time period ends before the Asian financial crisis. Yang et al. (2003) show that these markets have become more integrated with developed markets after the Asian financial crisis. Recent studies (see e.g. Chelley-Steeley, 2004; Barari, 2004) have used estimation techniques to uncover gradual patterns of integration. These empirical studies raise the important question of whether the integration of Asian stock markets is time- varying. For instance, Chelley-Steeley (2004) used contemporaneous cross-correlations and a smooth transition logistic model to gauge regional and global integration for the Asia Pacific region, finding that South Korea has the largest pace of integration. South Korea and Thailand have a high speed of integration with developed markets. In the present study it is argued that the time period and selection of countries in modelling stock market integration is crucial to iron out differences in empirical results.

7.3 Sample, Time Period and Methodology

7.3.1 Sample

The dataset is comprised of weekly stock prices from *Datastream* for the six stock indices – India BSE 100 National Index, Indonesia Jakarta SE composite, Malaysia Kuala Lumpur Composite, Pakistan Karachi SE 100 Index, Korea SE Composite and Thailand Bangkok SET. The data cover the period from January 1987 to 31 December 2004, yielding 783 total observations in local currency and US$. This period includes the Asian and Russian financial crisis and post-crisis period. The stock returns are measured in local currency as well as in US$. It is argued that this sample consists of small and large stock markets measured in terms of stock market capitalization to GDP ratio, for instance, this ratio varies from a high of 140% for Malaysia to a low of 9.38% for Pakistan in 2000. Thus, the selected sample avoids bias by including not only the larger stock markets of the Pacific Basin. Unlike previous research, this study does not only consider developed markets such as those in the US and UK. Rather, in order to capture the impact of global factors, the *MSCI All Country World Index* is used as a global benchmark, since this index represents 80% of the world market capitalization in both developed and emerging markets. The *MSCI All Asia and Pacific Index* is used for regional benchmarks (Barari, 2004).

7.3.2 Estimation Methodology

Previous studies have used different estimation methodologies to track down stock market integration. The common techniques have involved the tracking of correlations between stock markets over time, Vector Auto Regressive (VAR), Granger causality, Error Correction Models (ECM) and co-integration techniques to explore the existence of long-run equilibrium relations among a group of stock markets (see Taylor and Tonks, 1989; Kasa, 1992; Malliaris and Urrutia, 1992). However, it has been argued these methodologies only capture short-term temporal causality (Masih and Masih, 2001).

This study has adopted three different methodologies to triangulate the evidence of stock market integration. Firstly, simple correlation coefficients between stock market returns from 1990-2004 were calculated. This simple correlation analysis has also been done in recent studies (Jansen and Barben, 2005; Click and Palmer, 2005; Chelley-Steeley, 2004). Secondly, the technique of Barari (2004) has been used to calculate regional and global stock market integration scores to find evidence of the gradual integration of a stock market in the sample with regional markets and the world index. Barari (2004) based this technique on the work of Akdogan (1996). The stock market integration scores were obtained in the following manner. Firstly, stock returns were calculated on the *i*th country stock market denoted by R_i and a global benchmark index (here the *MSCI World* Index was used) R_g, then Equation (7.1) was estimated:

$$R_i = \alpha_i + \beta_{ir} U_r + \beta_{ig} R_g + \varepsilon_i \tag{7.1}$$

where ε_i is a random error term, $E(\varepsilon_i) = 0$.The standard assumptions about the distribution of the error term hold. U_r, is the residual from estimating the following Equation (7.2) is stochastic regressor, and so its coefficient might be biased.

$$R_r = \alpha_r + \beta_r R_g + U_r \tag{7.2}$$

where R_r represents the rate of return on the *r*th regional index (here the *MSCI All Asia and Pacific index* was used). Then, taking the variance of both sides of Eq. (7.1) and dividing both sides by *Var* (R_i),

$$Var(R_i) = \beta^2{}_{ir} Var(U_r) + \beta^2{}_{ig} Var(R_g) + Var(\varepsilon_i) \tag{7.3}$$

$$\frac{Var(R_i)}{Var(R_i)} = \frac{\beta^2{}_{ir} Var(U_r)}{Var(R_i)} + \frac{\beta^2{}_{ig} Var(R_g)}{Var(R_i)} + \frac{Var(\varepsilon_i)}{Var(R_i)} \tag{7.4}$$

The risk associated with *i*th country portfolio was then decomposed into three components as follows:

$$a_i + b_i + c_i = 1 \qquad (7.5)$$

where $a_i = \beta^2{}_{ir}\ \mathrm{var}(U_r)/\mathrm{var}(R_i)$; $b_i = \beta^2{}_{ig}\ \mathrm{var}(R_g)/\mathrm{var}(R_i)$ and $c_i = \mathrm{var}(\varepsilon_i)/\mathrm{var}(R_i)$.

According to Barari (2004), a_i measures the *i*th country's stock market contribution to regional systematic risk (that is uncorrelated with global systematic risk), b_i measures the *i*th country's stock market contribution to global systematic risk, and c_i measures the country's unsystematic risk. Thus, a_i is the relative measure of regional integration, and b_i is the relative measure of global integration. Regional integration scores a_i and global integration scores b_i were obtained for each country over the period 1990-2004. The researcher is mindful of the aggregation constraints inherent in this methodology because individual returns of the sample countries are included in the regional indexes, and regional indexes combine to form the global index. Hence, these integration scores should be interpreted with these obvious caveats.

Thirdly, the TARCH specification has been employed to investigate the impact of stock market liberalization events on stock markets co-movements as in Ng (2000). Ng (2000) estimated a time-varying spillover model, whereby mean return and volatility parameters were modified by linking them to liberalization events such as Depository Receipts (DR) listings and launch of Country Funds (see Chapter 8 for further discussion on the DR). This parameterization approach was adopted in the TARCH estimation because it allows for the identification of those liberalization measures that have led to more integration with the world and the region. It is believed that the combination of these three methodologies rather than the use of just one methodology is appropriate for gauging stock markets integration in a time-varying framework.

7.4. Empirical Analysis and Discussion

7.4.1 Bivariate Correlations

The section discusses yearly correlations between weekly returns of stock markets to track comovement of stock markets' returns. The examination of the correlation coefficients allows one to focus on the inter-dependence between the markets. Solnik and Longin (1995, p.3-4) suggest that covariance/correlation matrix is one of the inputs for the computation of a trading portfolio and knowledge of its behaviour, stability, and predictability is crucial. Previous studies such as Abdalla and Murinde (1997) reported correlation coefficients over the period 1980-1994, Yang et al, (2003) focused on the Asian financial crisis and Chelley-Steeley (2004) reported recent correlations over the period 1990-2002. Here, in this section, we attempt to discover relatively longer period compared to Chelley-Steeley (2004).

This period covers the following time periods: (a) pre-break (b) post-break, (c) financial crisis (1 July 1997-30 August 1998). The crisis period is further sub-divided into: (d) transition period (1 Oct 1998 – 30 June 1999), (e) post-crisis period (July 1999 – 31 Dec 2001), and (f) stock markets renaissance period (1 Jan 2002 – 31 Dec 2004). The pre-post break periods are defined using net equity capital flows break dates reported by Bekaert et al. (2003), who used the techniques of Bai et al. (1998) and Bai and Perron (1998) to find single and multiple break points of three series (net equity flows as a proportion of local market capitalization, log returns, and the log of dividend yield). These break dates were generated because structural changes could cause permanent or at least long-lasting changes in the data-generating process which can complicate empirical analysis of emerging markets during the liberalization period. According to Bekaert et al. (2002), events in Southeast Asia indicate that the integration process might have halted and reversed, and hence, these multiple dates in a time series of net capital flows uncover such dynamics. Bekaert et al (2002) computed median break dates and 90% confidence interval for three series. In this study, only median break dates, which show how investment barriers have changed (see Table 7.1 Column I), were used.

Table 7.1
Net Equity Capital Flow Median Break Dates

This table provides median dates using the Univariate test, Trivariate test, Quadravariate test and Quintravariate test calculated in Bekaert et al. (2002) Appendix Table 2

Country	Dates Univariate test	Dates Trivariate test	Dates Quadravariate test	Dates Quintravariate test
Indonesia	Dec 1995	Jun 1997	Jun 1997	Jun 1997
India	May 1993	Apr 1993	May 1992	May 1993
Malaysia	Feb 1994	Jul 1996	Jul 1996	Aug 1996
Pakistan	Dec 1996	Dec 1996	Dec 1996	Aug 1997
South Korea	Jan 1996	Jan 1996	Sep 1995	Apr 1996
Thailand	Jan 1996	Jun 1996	Jun 1996	Jun 1996

The correlation coefficients for each sample country are reported in the Appendix to this chapter (to save the space). Here, first, we highlight some of the main features of the stock markets correlations over the sample period, and then present the results of test for equality of correlation coefficients over the entire sample period using Snedecor and Cochran (1980).

Pre-break period

The results show that stock markets returns were not correlated with regional markets, and relative to the world in the case of India (see Appendix 7-A)[2]. For Malaysia, the stock market returns were more correlated than any other market in the sample with the US, the World Index and regional markets. The magnitude of the correlation was significantly positive relative to the World Index and regional markets (p-value <0.05 and <0.01). For Pakistan, the correlations of stock returns with developed and regional markets were found to be higher only in 1990. For South Korea and Thailand, the correlation coefficient was higher in magnitude relative to the World Index and regional markets (p-value <0.05, 0.01) during 1990-1992.

Post-break period (until June 1997)

The stock returns correlation with regional and developed markets remained significant for Indonesia and Malaysia (p-value <0.05). During this period, a noticeable decrease was found in the size of correlations with the World Index and regional markets in the case of Pakistan. In the

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[2] The stock market was opened to foreign investors in 1990 in India compared to 1986 in Malaysia and foreign investors were provided with further incentives to invest in 1992.

case of South Korea, the size of the correlation coefficient with the World Index increased from r=0.0642 in 1996 to r=0.3565 (p-value <0.01). The size of correlations with the World Index and regional markets decreased for Thailand. The reversal of stock returns correlations from a high level to a low level prior to the Asian financial crisis for Thailand might be due to the reversal of capital flows[3].

Financial crisis (July 1997 - 30 August 1998)

It was found that the magnitude of correlation coefficients coefficient with the World Index and regional markets increased for Indonesia, Malaysia, South Korea (p-value <0.01). Most strikingly, in Thailand, the magnitude of correlation relative to all markets increased significantly relative to the World Index and regional markets (p-value <0.01). The researcher did not perform any causality tests to infer the direction of transmission of the regional shocks to these markets individually, but it can be conjectured that there might be uni-directional or bi-directional transmission of such shocks. Caporale et al. (2005) found slight evidence of contagion from Thailand, Hong Kong, Taiwan and the Philippines to other countries, and from Korea to Malaysia and Indonesia. This study's findings of an increase in the magnitude of correlation coefficients between the pairs - Korea and Malaysia, Thailand and Malaysia, and Thailand and Korea, seem to bear out these directions of transmission[4].

Transition period (1 July1998 – 30 June 1999)

During this period, there was an increase in the size of the correlation coefficients relative to the World Index and regional markets for India, Indonesia and South Korea. On the other hand, there was a decrease in the size of the coefficient relative to the World Index and regional markets for Malaysia, and Thailand. The size of correlation coefficients increased with regional markets for Pakistan (not significant).

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[3] The holdings of Emerging Market Assets decreased from US$ 9.8 bill to US$ 2.2 bill (Kaminsky et al, 2001).

[4] The studies show that the behaviour of mutual funds and contagion may be linked because funds generate cross-country spillover or because mutual funds engage in feedback trading.

Post crisis period (July 1999 - 31 Dec 2001)

In the post crisis period, the size of correlation coefficients of stock returns with the World Index and regional markets increased for India (indicated by arrows), whereas, for Indonesia no such increase was found. There was an increase in the size of correlation coefficients with the World Index and the regional markets of Indonesia, Korea and Thailand Malaysia (p-value <0.01). These results seem to suggest an increase in global integration. There was an increase in the size of the coefficient with the World Index for South Korea and regional markets (p-value <0.01) but not for Thailand. The researcher also examined the correlations of stock returns beyond 2001 (1 Jan 2002 – 31 Dec 2004) and observed more regional co-movement of stock returns for India, Indonesia, and South Korea. Pakistan's stock market showed a lack of correlation with regional and developed markets. The results regarding the correlation between some pairs of countries are different from earlier studies due to the sample periods involved.

The results of the test for equality of correlation coefficients are presented in Table 7.2. The null hypothesis of a constant stock returns correlation of South Korea and Thailand with the developed and regional markets is rejected significantly (p-value <0.01). For Indonesia and India, the null hypothesis of no change in correlation coefficient with the World and developed markets is rejected; but null was not rejected for the stock return correlations with Malaysia and Pakistan, suggesting that correlations have remained constant. Pakistan appears to be an interesting case, as the null hypothesis of no change in correlation is not rejected (except in relation to Japan). These results confirm the prediction of previous studies that inter-dependencies across markets change over time.

Table 7.2

Test of the Equality of the Correlation Coefficients ,1991-2004

The data for the six stock indices – India BSE 100 National Index, Indonesia Jakarta SE composite, Malaysia Kuala Lumpur Composite, Pakistan Karachi SE 100 Index, Korea SE Composite and Thailand Bangkok SET, *MSCI AC World Index, MSCI Asia & Pacific*, Japan, Hong Kong and Singapore was obtained from *Datastream* over the period 1990-2004. This table presents the results of the test of equality of correlation coefficients. These coefficients were obtained for each sample country for each year from 1991 till 2004, with other sample countries, *MSCI AC World Index, MSCI Asia & Pacific Index,* Japan, Singapore, and Hong Kong. We use Snedecor and Cochran (1980) test to test the equality of the correlation over the entire sample period. To obtain the test statistics, we first, converted the yearly correlation coefficients, r to z values, recording also the terms $w_i = n_i - 3$ for each value of z. The test of significance is based on the quantity:

$$\sum_{i=1}^{k} w_i(z_i - \bar{z}_w)^2 = \sum_{i=1}^{k} w_i z_i^2 - \left(\sum_{i=1}^{k} w_i z_i\right)^2 \Big/ \sum_{i=1}^{k} w_i \text{ which is distributed as } \chi^2 \text{ with } (k\text{-}1) \text{ df, where, } w_i = n_i - 3 .$$

	Developed markets				Regional markets							
	US	UK	WORLD	ASIA	JP	SG	HK	ID	PAK	KOR	MAL	THL
India	26.2881^{b}	21.1584^{c}	36.9076^{a}	34.4844^{a}	35.3141^{a}	58.2181^{a}	40.3553^{a}	23.4188c	19.1350	34.7307^{a}	16.3010	21.1328^{c}
Indonesia	US 30.7975^{a}	UK 28.7747^{b}	WORLD 25.3848^{b}	ASIA 24.0171^{b}	JP 19.4273	SG 27.0486^{b}	HK 26.3554^{b}	IND 23.5256c	PAK 14.0836	KOR 29.3122^{a}	MAL 18.1246	THL 23.6529^{c}
Malaysia	US 14.7000	UK 19.7445	WORLD 36.5031^{a}	ASIA 28.4241^{b}	JP 40.9936^{a}	SG 57.3967^{a}	HK 21.8149^{b}	IND 18.3086	PAK 15.3709	KOR 19.0884	ID 18.5257	THL 11.7703
Pakistan	US 5.6350	UK 9.8171	WORLD 16.0069	ASIA 17.8772	JP 24.3690^{b}	SG 20.5387	HK 16.2402	IND 12.0427	ID 14.7059	KOR 20.1882	MAL 13.1733	THL 19.2795
S. Korea	US 32.5213^{a}	UK 11.549	WORLD 47.1846^{a}	ASIA 69.7668^{a}	JP 59.4651^{a}	SG 40.8537^{a}	HK 42.8172^{a}	IND 29.3277^{a}	PAK 20.1747	MAL 18.8950	INDO 35.4602^{a}	THL 23.5694^{a}
Thailand	US 26.9377^{b}	UK 28.8699^{b}	WORLD 36.6306^{a}	ASIA 45.0094^{a}	JP 41.1211^{a}	SG 47.0663^{a}	HK 34.3392^{a}	IND 23.3440^{b}	PAK 19.2986	MAL 14.8930	INDO 22.5608^{c}	KOR 23.5653^{c}

^{a}, ^{b}, and ^{c} respectively denote statistical significance at a 1-, 5-, and 10-percent level . countries and Indexes are abbreviated as follows: MSCI AC World Index (WORLD); MSCI Asia and Pacific Index (ASIA); Japan (JP), Singapore (SG), Hong Kong (HK), India (IN), Indonesia (ID), Malaysia (MA), Pakistan (PAK), South Korea (KOR) and Thailand (THL).

Although these results reveal the interesting patterns of changes in the co-movement of stock markets returns, but simple correlation measures may not be useful assessments of integration if they only indicate synchronicity between markets rather than integration (Harvey, 1995). This researcher argues that correlations may provide as a rough measure of integration, which might provide preliminary evidence towards stronger (weaker) global and regional integration for these countries. However, Errunza and Miller (2000) put a careful note that, in general global capital markets are neither completely integrated not totally segmented and indeed there is evidence of intermediate case, as we can infer for Indonesia and Malaysia. We look at integration of market from another angle to draw evidence of integration using economic factors as main source of influence on stock return co-movements, and this is done in the next section.

7.4.2 Economic Integration and Stock Markets Co-movements

A possible explanation for strong regional integration compared to lower integration with the developed market US and UK markets as observed in the previous section, might be due to regional trade and composition of the stock market index[5]. The argument that regional trade influences stock market integration is explained as follows: If a country's *A* trade balance indicates that a major portion of its exports is to a single country *B*, then the stock market of country *A* will be more sensitive to the trading partner or importing country *B*. Similarly, when economic agents of country *A*, acquire more imports from country *B*, the stock market of country *B* does well, and thus, greater import dependence on country *A* from country *B* would be associated with greater integration between stock markets. The trading activities link the cash flows of the trading partners and make their equity markets more correlated. Moreover, it has been argued that differences in the inflation rates, interest rates, GDP growth rates, bi-lateral exchange rates and size of stock markets might also influence the degree of co-movements between stock markets (Forbes and Chinn, 2003).

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[5] Bekaert and Harvey (1995) argue that even if a financial market is perfectly integrated with the world market it may still exhibit a "lower or negative correlation [with world market] because its industry mix is much different from the average world mix. See Collins and Abrahamson (2004) for an illustration of this argument.

To examine the economic factors on stock return co-movements, the researcher used Johnson and Soenen (2003) pooled regression model defined in Equation. (7.6):

$$r_{i,j} = \alpha_i + Trade_{i,j} + \Delta EXR_{i,j} + DGDP_{i,j} + DINT_{i,j} + MV_{i,j} + e_{i,j} \tag{7.6}$$

where $r_{i,j}$ is the stock returns correlation of market *i* (where *i*=India, Indonesia, Malaysia, Pakistan, Korea and Thailand) and country *j* (where *j*=Japan, Singapore and Hong Kong). $Trade_{i,j}$ is defined as the average of exports from country *j* to country *i*, as percentage of *j's* total exports, imports of country *j* from country *i* as a percentage of country *j's* total imports, exports from country *i* to country *j* as percentage of *i's* total exports, and imports of country *i* from country *j* as a percentage of country *i's* total imports (see Johnson and Soenen, 2000, p.96). $\Delta EXR_{i,j}$ is the change in the bilateral exchange rate; $DGDP_{i,j}$ is the differential in GDP growth rates; $DINT_{i,j}$ is the differential interest rate and $MV_{i,j}$ is the ratio of stock market capitalization in the country *j* to stock market capitalization in country *i*. The correlation coefficients $r_{i,j}$ are bounded variables i.e., $-1 \leq r_{i,j} \leq +1$, therefore prior to estimation, these are transformed into z-value using the equation: z=1/2[log(1+r)-log(1-r)].

The data for each country *i* and *j* on exports and imports (US$), real GDP growth rate, interest rates, stock market capitalization was obtained from the *IMF Direction of Trades and International Financial Statistics.* The trade statistics (not reported) show that Korea, Thailand, and Malaysia are three major trading partners with Japan, while India, Indonesia and Pakistan trade least with Japan. It is worth pointing out that Malaysia appears to be main trading partner with Singapore; and Hong Kong does not seem to have major trading relationship with any of our sample countries. Indonesia's exports to Japan, Singapore and Hong Kong as percentage of Indonesia's total exports are the highest; and India and Pakistan's exports to three countries, as percentage of their total exports, are the lowest respectively. Thus, we should expect that stock returns correlations in the case of Korea, Thailand and Malaysia should be positively related to trade with Japan.

Other economic variables such as interest rate differential, real GDP growth differential and Bi-lateral exchange rate changes also vary across countries and over time, e.g., on average India, Indonesia and Pakistan has the highest interest rate differential with Japan and Singapore, whereas, Malaysia has the lowest interest rate differential respectively. During the period of 1990-1996, growth of the sample countries viz. a viz. Japan was higher compared to Singapore and Hong Kong that can be explained by recession of early 1990s in Japan. The gap between real GDP growth rates of countries seem to have marginally narrowed in the later period of 2000-2002. The economic slow down in Malaysia, South Korea and Thailand after the Asian financial crisis might have contributed to this narrowing of gap. Finally, the bi-lateral exchange rate between Japan and three countries (India, Indonesia, and Malaysia) and between Hong Kong and two countries (Korea and Indonesia) show most changes over time. Thus, it can be predicted that greater divergence in real growth rates, interest rates and currency valuation are likely to be associated with less correlations across these countries. Johnson and Soenen (2003) argue that greater volatility in the bi-lateral exchange rates could impose economic costs on the firms in the countries, and increase uncertainty about future changes might reduce the economic and stock market integration between countries. There was no evidence of multi-collinearity among variables. The results are reported for each bi-lateral partner separately.

Table 7.3 presents the results of the pooled regression. The model explains more than one-third of the variation in stock returns correlations between the sample stock markets and Singapore, and Hong Kong respectively. We find that a higher share of trade with Singapore has a very significant positive effect on stock market co-movements (*p*-value <0.01) and greater exchanges in bi-lateral exchange rates with Singapore, interest rates differential contributes significantly to less co-movements (*p-value* <0.01). The larger size of stock markets in Singapore and Hong Kong leads to less co-movements. Johnson and Soenen (2003, p.91) explains that as some the emerging markets are significantly smaller due to bad economic policy and lack of transparency, it would be unlikely for these markets to move in tandem. Noticeably in the case of Japan, we found that convergence in interest rates leads to more stock markets co-movements.

Table 7.3
Economic factors and Regional Stock Markets Integration

This table presents the estimates of the Model in Eq. (7.6).

$$r_{i,j} = \alpha_i + Trade_{i,j} + \Delta EXR_{i,j} + DGDP_{i,j} + DINT_{i,j} + MV_{i,j} + e_{i,j}$$

The dependent variable is the correlation coefficient between country i and country j stock returns. These correlation coefficients $r_{i,j}$ were transformed into z-value using the equation: z=1/2[log(1+r)-log(1-r)] where $r_{i,j}$ is the stock returns correlation of market i (where i=India, Indonesia, Malaysia, Pakistan, Korea and Thailand) and country j (where j=Japan, Singapore and Hong Kong). The explanatory variables are: $Trade_{i,j}$ defined as the average of exports from country j to country i , as percentage of j's total exports, imports of country j from country i as a percentage of country j's total imports, exports from country i to country j as percentage of i's total exports, and imports of country i from country j as a percentage of country i's total imports. $\Delta EXR_{i,j}$ is the yearly changes in the bilateral exchange rates; $DGDP_{i,j}$ is the differential in GDP growth rates; $DINT_{i,j}$ is the differential interest rate and $MV_{i,j}$ the log of the ratio of stock market capitalization in the country j to stock market capitalization in country i. DW, Durbin Watson test for serial correlation. White period standard errors are shown in parenthesis.

	Bi-lateral Trade Partners j		
Variables	Japan	Singapore	Hong Kong
$Trade_{i,j}$	1.0690	1.9474 ^{a}	1.1797
	(1.1451)	(0.7778)	(1.0307)
$\Delta EXR_{i,j}$	0.3603 ^{c}	-0.7176 ^{a}	0.2080 ^{a}
	(0.1966)	(0.2381)	(0.0697)
$DGDP_{i,j}$	0.0012	-0.0133	-0.0092
	(0.0066)	(0.0131)	(0.0072)
$DINT_{i,j}$	0.0132 ^{c}	-0.0381 ^{c}	-0.0089
	(0.0078)	(0.0202)	(0.0122)
$MV_{i,j}$	-0.1945	-0.4465 ^{c}	-0.2958 ^{c}
	(0.2397)	(0.2356)	(0.1657)
Adj. R^2	0.1944	0.3002	0.3700
DW	2.1158	1.7858	1.7102
F-Test	1.6820 ^{b}	2.3434 ^{a}	2.9919 ^{a}
N	78	78	78

^{a}, ^{b}, and ^{c} respectively denote statistical significance at a 1-, 5-, and 10-percent level.

Thus, our results seem to uphold the argument that economic factors have a significant economic impact on stock markets co-movements, similar to the findings of Forbes and Chinn (2003). It has been argued that besides trade linkages, other factors such as foreign direct investment, foreign bank lending, depository receipts (DRs) listing, mutual fund investment and in particular, financial crisis, can also have significant influence on cross-market correlations (see Johnson and Soenen, 2002; Forbes and Chinn, 2003; Kaminsky et al, 2004; Claessens and Forbes, 2001). The Asian stock markets underwent a volatile phase during the financial crisis in 1997, and subsequently some markets faced temporary contagion effects, meaning therefore, that the influence of financial crisis on cross-country stock markets correlations can not be ruled out. The influence of DRs Listings, Cross-listings and Country funds influence on stock markets integration is examined in section 7.5.3.Bekeart and Harvey (1996) point out that capital market liberalization events are of great importance for policy who may be weighing the cost and benefits of various liberalization initiatives.

7.4.3 Time-varying Regional and Global Integration

In the previous section, regional integration was explored using the correlation between stock market returns of each market in the sample, the World Index, the US, UK, and the regional markets. This section discusses the stock market integration at regional level and global level using the stock market integration scores obtained for each country over the period of 1990-2004. The main reason for using this technique in addition to correlation is to triangulate evidence of time-varying stock returns co-movement. The calculated regional and global integration scores were plotted for each country to make a comparison over the period.

Regional integration

The regional integration scores in Fig 7.1 show that South Korea and Thailand had a relatively higher level of regional integration than Indonesia and Malaysia, whereas India and Pakistan showed no regional integration in the early 1990s. After the Asian financial crisis in 1997, regional integration rose remarkably from 0.05 to 0.30 for Malaysia, 0.0 to 0.20 for Indonesia and 0.05 to 0.20 for South Korea and Thailand respectively. This finding provides further explanation of the results produced by Yang et al. (2004), which show Asian markets exhibited stronger regional integration during the Asian financial crisis. The researcher does not observe any significant regional integration for India and Pakistan during the crisis period as found in the correlation analysis. In the case of India and Pakistan, there was no regional integration in 1997.

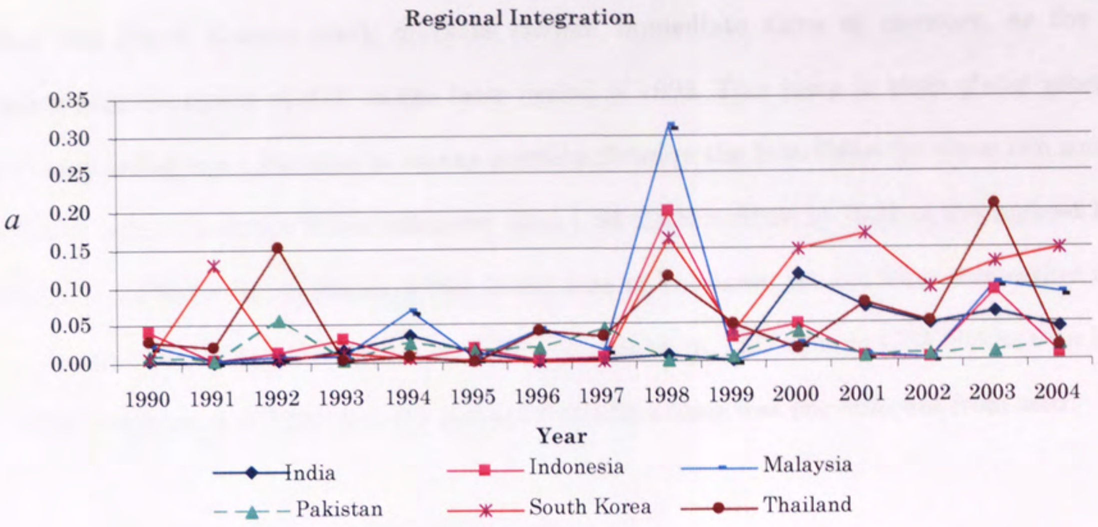

Fig 7.1 Regional Integration Score of a Stock Market, a
The figure shows the variation in the regional integration scores of six Southeast Asian stock markets relative to the *MSCI Asia and Pacific Index* using Barari (2004) over the period 1990-2004.

In the post-crisis period, there was an increase in the integration score for India, which jumped by 0.10 in the year after 1999. In the case of Indonesia, Thailand and South Korea, there was no such drastic movement in regional integration, whereas for Malaysia the regional integration score fell dramatically in 1997. There was a marginal increase in the regional integration score for Pakistan from 0 in 1998 to 0.05 in 2000.

Global integration

The global integration scores in Fig 7.2 show that Malaysia and Thailand both had relatively higher levels of global integration than Indonesia and South Korea in the early 1990s. This finding appears to suggest that earlier relaxation in the limit of foreign investment increased global net equity capital flows in these two countries. According to Kaminsky et al. (2001), end of year holding of dedicated emerging market fund assets was US$ 8.2 billion in Malaysia and US$ 10.3 billion in South Korea compared to US$ 9.8 billion in Thailand 1995. The holding of dedicated emerging market fund assets increased to US$ 12 billion for Malaysia by the end of year 1996, and consequently, Malaysia's global integration score rose from 0.10 in 1995 to 0.19 in 1996 (see Fig 7.2).

During the Asian financial crises, global integration became more sluggish for all countries. However, the Thai and South Korean stock markets showed immediate signs of recovery, as the global integration reached scores of 0.20 in the later period of 1999. This jump in their global integration scores corresponded to an increase in equity portfolio flows in the late-1990s for these two countries. For instance, equity portfolio flows increased from US$ 2,525 million in 1997 to the highest level of US$ 13,094 in 2000 for South Korea, while in the case of Thailand, the recovery was rather insipid, with equity portfolio flows increasing from US$ 292 million in 1997 to only US$ 900 million in 2000 (IMF, 2002). In the case of Pakistan, the global integration score was not different from zero.

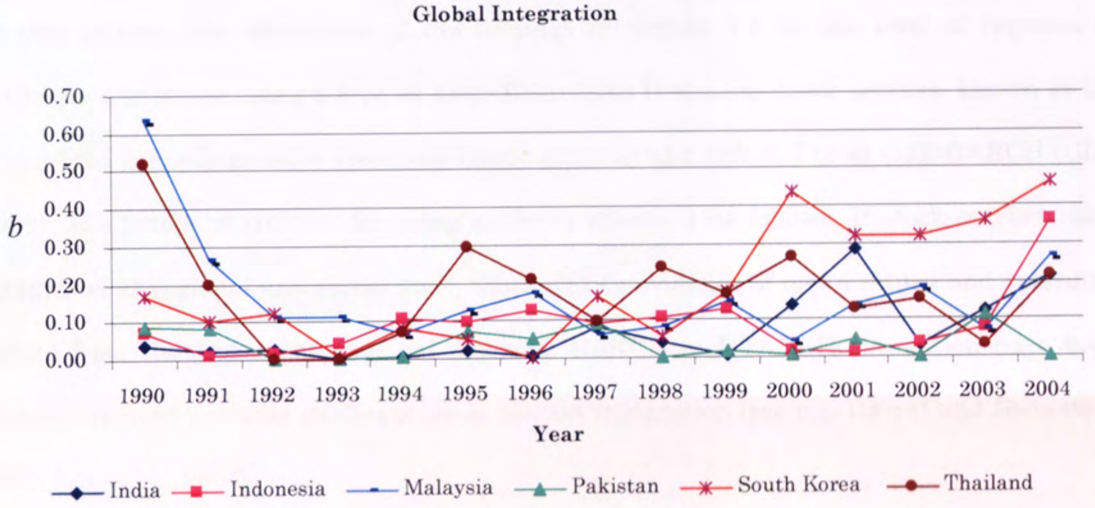

Fig 7.2 Global Integration Score of a Stock market, b
The figure shows the variation in the global integration scores of six Southeast Asian stock markets relative to the *MSCI AC World Index* using Barari (2004) over the period 1990-2004.

Overall, the integration scores 'a' and 'b' seem to suggest that three of the six countries – Indonesia, Malaysia and Thailand, were more integrated at global level and less integrated at regional level in the early 1990s. During the mid- 1990s, all countries showed more integration at global level than regional level. During the Asian financial crisis, only four serious victims of the Asian financial crisis - Indonesia, Malaysia, South Korea and Thailand, exhibited stronger regional integration (see Yang et al, 2004). This study's findings for Southeast Asian stock markets are different from those of Barari (2004) for South American stock markets. Barari (2004) found that South American stock markets were more integrated regionally than globally in the early 1990s. However, this study's results indicate that Southeast Asian stock markets were more integrated globally than regionally in the early 1990s. Nevertheless, it was found that the level of integration during the period 1993-1996 was similar across the two regions of Asia Pacific and South America. Thus, it can be argued that global capital flows have integrated stock markets across the region but that this phenomenon was not everlasting as events during the financial crisis unfolded the partial or complete disconnection from the global markets for some countries.

7.5. Stock Markets Integration and Spillover Effects

In this section, the robustness of the findings in section 7.4 on the level of regional and global integration is tested using a type of Auto–Regressive Heteroskedastic process, known as the TARCH (Threshold Auto–Regressive Heteroskedastic process) also referred to as GJR-GARCH (Glosten et al, 1993). The prime motivation for using spillover effects is as follows. If stock markets have become integrated at regional and global level, there will be evidence of mean return and volatility spillover effects from the global and regional markets. GARCH and TARCH estimation have been popular techniques used previous studies of stock market integration (see e.g. Darrat and Benkato, 2003; Ng, 2000; Lee et al., 2004).

To examine the magnitude and nature of spillover effects from the world and regional markets, the two-stage procedure used by Lee et al. (2004) to evaluate the constant mean return and volatility spillover effects, was adapted. The TARCH model based on its suitability for Pacific Basin countries as reported in Ng (2000, was used. The standard GARCH model is symmetric in its response to past innovation, whereas TARCH is asymmetric in the sense that it captures the unequal effect of negative and positive shock to subsequent volatility. One explanation for this unequal effect has been leverage effect. These leverage effects will most likely to be found in firms that already employ considerable debt financing as evident also in our sample of firms. The researcher also compared both models by using the news impact curve introduced by Pagan and Schwert (1990) (See Fig 7.3

Appendix-7-A for details). The generalized specification for the mean and conditional variance under the TARCH model, hereafter referred to as Model 1, is as follows:

$$
\begin{aligned}
R_{i,t} &= \gamma_{i,0} + \gamma_{i,1} R_{i,t-1} + \sum_{l=0}^{1} \gamma_{i,2,l} \hat{u}_{t-l}^{ASIA} + \sum_{l=1}^{2} \gamma_{i,3,l} \hat{u}_{t-l}^{WORLD} + \varepsilon_{i,t} \\
h_{i,t-1} &= \alpha_{i,0} + \alpha_{i,1} \varepsilon_{i,t-1}^{2} + \beta_i h_{i,t-1} + \sum_{l=0}^{1} \psi_{i,2,l} \hat{u}^{2}{}_{t-l}^{ASIA} + \sum_{l=1}^{2} \psi_{i,3,l} \hat{u}^{2}{}_{t-l}^{WORLD} + \lambda_i \varepsilon_{i,t-1}^{2} I_{i,t}^{-}
\end{aligned}
\qquad (7.7)
$$

where $R_{i,t}$ is the return on the *i*th stock market index. $h_{i,t}$ is the conditional variance of returns of the *i*th stock market index. I_t^- is a dummy variable equal to 1 when $\varepsilon_{i,t}^2 < 0$ and 0 otherwise. $\hat{u}_{t-1}^{ASIA}$ are the residuals obtained from regressing returns on the *MSCI All Asia and Pacific index* on a constant and its one period lagged return. Similarly, $\hat{u}_{t-l}^{WORLD}$ are the residuals obtained from regressing returns on the *MSCI AC World Index* on a constant and its one period lagged return. $\hat{u}^{2}{}_{t-l}^{ASIA}$ and $\hat{u}^{2}{}_{t-l}^{WORLD}$ are the square of these residuals. These residuals capture the contemporaneous and one period lagged $l = 0 \text{ and } 1$ spillover effects from the *MSCI All Asia & Pacific index,* and one and two period lagged returns $l = 1 \text{ and } 2$, and spillover effects from the *MSCI AC World Index.* The one period and two period lag structure for return and volatility spillover effects for the *MSCI AC World Index* is used because of the different timing of the trades on the world markets such as the US and Asian markets. The researcher used contemporaneous and one period lag structure for the *Asia and Pacific index* because there are overlaps between trading hours of the Asia Pacific markets. The parameters $\gamma_{2,0}, \gamma_{2,1}$ and $\gamma_{3,1}, \gamma_{3,2}$, whereas, $\psi_{2,0}, \psi_{2,1}$ and $\psi_{3,1}, \psi_{3,2}$ refer to mean spillover effect, and in the Equation (7.7) refer to volatility spillover effect in the subsequent analysis.

Stock Market Liberalization and Spillover Effects

Ng (2000) has shown that stock market integration with the world and regional markets for Southeast Asian countries has been influenced by stock market liberalization events. To capture the impact of these stock market liberalization events, the Model 1 was modified as follows. Four distinct stock market liberalization events thought to have an impact on the mean and volatility spillover effects, were selected for each country, these being: First Country Fund launch, First DR listings; First Cross listing of firms from the sample countries in the US (New York Stock Exchange, NASDAQ) and the UK (London Stock Exchange) and increase in US$ equity flows. The theoretical argument underlying the inclusion of these events rests on the assumption that capital market reforms are likely to affect the relative importance of world factors over time.

The researcher selected cross-listing on developed stock markets because such events increase the liquidity of stocks listed abroad and increase the exposure and visibility of local markets to foreign market shocks (relocation impact), which might have spillover effect on the other firms in the same country which has not been tested in empirical literature. Also the increase in US$ net equity capital flows in the sample countries has been substantial since 1990 (Chelley-Steeley, 2004). An increase in US$ equity flows would expand the investment opportunity set for US investors and result in increased purchases of local stocks thus creating a demand impact (Edison and Warnock, 2003) on the degree of market integration. Model 1 is expanded and Model 2 is specified in Eq. (7.8) to examine the change in relative importance of these factors.

$$
\begin{aligned}
R_{i,t} &= \gamma_{i,0} + \gamma_{i,1} R_{i,t-1} + \sum_{l=0}^{1} \gamma_{i,2,l} \hat{u}_{t-l}^{ASIA} + \sum_{l=1}^{2} \gamma_{i,3,l} \hat{u}_{t-l}^{WORLD} \\
&\quad + (\delta_{i,1} L_1^i + \delta_{i,2} L_2^i + \delta_{i,3} L_3^i + \delta_{i,4} L_4^i) \bar{u}_t^{ASIA} + (\varphi_{i,1} L_1^i + \varphi_{i,2} L_2^i + \varphi_{i,3} L_3^i + \varphi_{i,4} L_4^i) \bar{u}_{t-l}^{WORLD} + \varepsilon_{i,t} \\
h_{i,t} &= \alpha_{i,0} + \alpha_{i,1} \varepsilon_{i,t-1}^2 + \beta_i h_{i,t-1} + \sum_{l=0}^{1} \psi_{i,1,l} \hat{u}_{t-l}^{ASIA} + \sum_{l=0}^{2} \psi_{i,2,l} \hat{u}_{t-l}^{WORLD} \\
&\quad + (\rho_{i,1} L_1^i + \rho_{i,2} L_2^i + \rho_{i,3} L_3^i + \rho_{i,4} L_4^i) \bar{u}^{2}{}_t^{ASIA} + (\chi_{i,1} L_1^i + \chi_{i,2} L_2^i + \chi_{i,3} L_3^i + \chi_{i,4} L_4^i) \bar{u}^{2}{}_{t-l}^{WORLD} + \lambda_i \varepsilon_{i,t-1}^2 I_{i,t-l}^-
\end{aligned}
$$

(7.8)

where $R_{i,t}$ is the return on the ith stock market index. $h_{i,t}$ is the conditional variance of returns on the ith stock market index. I_t^- is a dummy variable equal to 1 when $\varepsilon_{i,t}^2 < 0$ and 0 otherwise $\bar{u}_{t-l}^{ASIA}$, $\bar{u}_{t-l}^{WORLD}$, $\bar{u}^{2}{}_{t-l}^{ASIA}$ and $\bar{u}^{2}{}_{t-l}^{WORLD}$ have been defined earlier. $\bar{u}_{t-l}^{ASIA}$ and $\bar{u}_{t-l}^{WORLD}$ capture the contemporaneous and one period lagged spillover effect from the region and world respectively. $\bar{u}^{2}{}_{t-l}^{ASIA}$ and $\bar{u}^{2}{}_{t-l}^{WORLD}$ capture the potential volatility spillover effect from the region and world. L_1^i, L_2^i, L_3^i and L_4^i denote dummy variables, showing DR programmes, Cross-border listing, Country fund and Increase in US$ capita flows, each dummy variable being equal to 1 for liberalization events indicated above and 0 otherwise. In order to capture the impact of unobserved macro-economic and year specific factors, year dummies denoted by d_t were introduced in Model 1 as shown in Eq. (7.9):

$$\begin{aligned}R_{i,t} &= \gamma_{i,0} + \gamma_{i,1}R_{i,t-1} + \sum_{l=0}^{1}\gamma_{i,2,l}\hat{u}_{t-l}^{ASIA} + \sum_{l=1}^{2}\gamma_{i,3,l}\hat{u}_{t-l}^{WORLD} \\ &\quad + (\delta_{i,1}L_1^i + \delta_{i,2}L_2^i + \delta_{i,3}L_3^i + \delta_{i,4}L_4^i)\bar{u}_t^{ASIA} + (\varphi_{i,1}L_1^i + \varphi_{i,2}L_2^i + \varphi_{i,3}L_3^i + \varphi_{i,4}L_4^i)\,\bar{u}_{t-1}^{WORLD} + d_t + \varepsilon_{i,t} \\ h_{i,t} &= \alpha_{i,0} + \alpha_{i,1}\varepsilon_{i,t-1}^2 + \beta_i h_{i,t-1} + \sum_{l=0}^{1}\psi_{i,1,l}\hat{u}_{t-l}^{ASIA} + \sum_{l=0}^{1}\psi_{i,2,l}\hat{u}_{t-l}^{WORLD} \\ &\quad + (\rho_{i,1}L_1^i + \rho_{i,2}L_2^i + \rho_{i,3}L_3^i + \rho_{i,4}L_4^i)\bar{u}^{2}{}_t^{ASIA} + (\chi_{i,1}L_1^i + \chi_{i,2}L_2^i + \chi_{i,3}L_3^i + \chi_{i,4}L_4^i)\bar{u}^{2}{}_{t-1}^{WORLD} + d_t + \lambda_i\varepsilon_{i,t-1}^2 I_{i,t-l}^-\end{aligned}$$

(7.9)

The conditions for non-negativity in the above Model are $\alpha_{i,0} \geq 0, \alpha_{i,1} \geq 0, \beta \geq 0$ and $(\alpha_{i,1} + \lambda_i) \geq 0$. The non-negativity conditions are sufficient but not necessary for conditional variance. If one or more of the coefficients were to take on a negative value, then for a sufficiently large squared innovation term attached to that coefficient, the fitted values from the model for the conditional variance could be negative, which would be non-sensical (Brooks, 2002). In order to ensure that non-negativity conditions are met by the study's estimates, plots of estimated conditional variance series are used to detect any departure from a non-negativity condition besides visual inspection. The researcher also compared standardized residuals from the TARCH in Eq. (7.7) with simple GARCH to compare the models (see Fig 7.4 Appendix-7-B for details). To complete the GARCH specification, an assumption was needed about the conditional distribution of the error term. The standardized residuals from the TARCH model were plotted and it was found that a normal (Gaussian) distribution assumption is preferable for the error term in Eq. (7.9) (see Fig 7.5 Appendix-7-C for details). To assess the robustness of this assumption about the error term, the researcher tested for non-normality of residuals from the model using the following statistic:

$$\widehat{v}_{i,t} = \frac{\varepsilon_{i,t}}{\widehat{\sigma}_{i,t}} \qquad (7.10)$$

where $\widehat{v}_{i,t}$ series, known as the standardized residual at each point in time, is divided by the conditional standard deviation. The Jarque-Bera normality test is reported to show whether $\widehat{v}_{i,t}$ are normally distributed or not. Additionally, the LM test and ARCH were reported in the residuals (see Engle 1982). Having decided the distributional assumption for the error term, the TARCH model is estimated by the method of maximum likelihood to obtain the parameter estimates of $\gamma_{2,0},\gamma_{2,1}$, $\psi_{1,0},\psi_{1,1}$, $\gamma_{3,1},\gamma_{3,2}$ and $\psi_{2,1},\psi_{2,2}$.

The Wald test was used on the estimates of $\gamma_{2,0},\gamma_{2,1}$, $\psi_{1,0},\psi_{1,1}$, $\gamma_{3,1},\gamma_{3,2}$ and $\psi_{2,1},\psi_{2,2}$, to test the hypothesis of regional stock market integration, and global integration. The following heat wave and meteor shower hypotheses are tested:

H1: $\gamma_{2,0} = \gamma_{2,1} = 0$ there is no heat wave effect on the returns from the Asia and Pacific.
H2: $\gamma_{3,1} = \gamma_{3,2} = 0$ there is no meteor shower effect on the returns from the world.
H3: $\psi_{1,0} = \psi_{1,1} = 0$ there is no heat wave effect on the volatility from the Asia and Pacific.
H4: $\psi_{2,1} = \psi_{2,2} = 0$ there is no meteor shower effect on the volatility from the world.

The 'heat wave' effect across stock markets is based on the assumption that if investors reshuffle their equity portfolios in one Asian stock market this shock will transmit to other regional markets. Recall that the parameters, $\gamma_{2,0},\gamma_{2,1}$ and $\psi_{1,0},\psi_{1,1}$ capture the contemporaneous and one-period lagged mean and volatility spillover effects from Asia and Pacific. Therefore, we assume that these coefficients capture 'heat wave' effects as in Engle (1990). The 'meteor shower' effect on stock markets, on the other hand, is based on the assumption that when the conditional volatility of stock markets increases due to global shocks, it will rain down across the spectrum of developed and Asian countries, and not just cause shock to the domestic market. For instance, an increase in oil prices wipes out the significant gain of stock markets across all countries because of increasing trade linkages (Forbes and Chinn, 2003). The parameters $\gamma_{3,1},\gamma_{3,2}$ and $\psi_{2,1},\psi_{2,2}$ capture the one-period and two-period lagged mean and volatility spillover effect from the World, and implicitly capture 'meteor shower' effect. Bekaert and Harvey (1997) indicate that increasing impact of world factors on volatility in some emerging markets is consistent with increase market integration.

If the null hypothesis of no heat wave effect from the world and region is rejected, then we can conclude that there is some level of integration at regional and global level. Therefore, the sign of the coefficients in the model are of significant importance because a negative sign will indicate lack of integration with the regional and global markets, while a positive sign will indicate greater integration viz. a viz. regional markets and world.

Regional Spillover Effects

An exploration is made as to which of the regional markets – Japan, Hong Kong and Singapore (assuming these to be the three largest regional stock markets relative to the sample countries) has a significant influence on mean return and volatility spillover effects (i.e. heat wave effects). Model 2 is specified as follows:

$$\begin{aligned} R_{i,t} &= \gamma_{i,0} + \gamma_{i,1} R_{i,t-1} + \sum_{l=0}^{1} \gamma_{i,2,l} \hat{u}_{t-l}^{JP} + \sum_{l=0}^{1} \gamma_{i,3,l} \hat{u}_{t-l}^{SG} + \gamma_{i,4} \sum_{l=0}^{1} \gamma_{i,4,l} \hat{u}_{t-l}^{HKG} + \gamma_5 FC + \varepsilon_{i,t} \\ H_{i,t} &= \alpha_{i,0} + \alpha_{i,1} \varepsilon_{i,t-1}^{2} + \beta_i H_{i,t-1} + \sum_{l=0}^{1} \psi_{i,2,l} \hat{u}^{2\,JP}_{t-l} + \sum_{l=0}^{1} \psi_{i,3,l} \hat{u}^{2\,SG}_{t-l} + \sum_{l=0}^{1} \psi_{i,4,l} \hat{u}^{2\,HKG}_{t-l} + \lambda_i \varepsilon_{i,t-1}^{2} I_{i,t-l}^{-} \end{aligned} \tag{7.11}$$

where $R_{i,t}$ is the return on the *i*th stock market index. I_t^- is a dummy variable equal to 1 when $\varepsilon_{i,t} < 0$ and 0 otherwise . $H_{i,t}$ is the conditional variance of returns of the *i*th stock market index. where $\hat{u}_{t-l}^{JP}$, $\hat{u}_{t-l}^{SG}$, and $\hat{u}_{t-l}^{HK}$ are lagged residuals for $l = 0$ and 1 from Japan, Singapore and Hong Kong markets in the mean equation obtained using the procedure described earlier. $\hat{u}^{2\,JP}_{t-1}, \hat{u}^{2\,SG}_{t-1},$ and $\hat{u}^{2\,HK}_{t-1}$ are the lagged squared residuals for $l = 0$ and 1 from the Japan, Singapore and Hong Kong markets' returns in the variance equation. *FC* is a dummy variable denoting period of Asian and Russian financial crisis (01/07/1997 to 30/08/1998). Contemporaneous effects for these regional markets were allowed for, because of the overlapping trading times. The following hypotheses:

H5: $\gamma_{2,0} = \gamma_{2,1} = 0$ there is no heat wave effect on the returns from Japan.
H6: $\gamma_{3,0} = \gamma_{3,1} = 0$ there is no heat wave effect on the returns from Singapore.
H7: $\gamma_{4,0} = \gamma_{4,1} = 0$ there is no heat wave effect on the returns from Hong Kong.
H8: $\psi_{2,0} = \psi_{2,1} = 0$ there is no heat wave effect on the volatility from Japan.
H9: $\psi_{3,0} = \psi_{3,1} = 0$ there is no heat wave effect on the volatility from Singapore
H10: $\psi_{4,0} = \psi_{4,1} = 0$ there is no heat wave effect on the volatility from Hong Kong

7.5.1 Empirical Results

Spillover Effects (Model 1)

The estimation results (in local currency) show that except Malaysia, South Korea and Thailand, there are significant contemporaneous mean spillover effects from the regional markets (see Table 7.4). Thus, H1 is rejected only for India, Indonesia and Pakistan. On the other hand, except for Pakistan and South Korea, there are significant one-period lagged mean spillover effects from the world. H2 is rejected for India, Indonesia, Malaysia, and Thailand. Among the stock market liberalization events, the Cross-border listing event denoted by and Country-fund event denoted by have transmitted significant positive mean spillover effects from the regional markets to Malaysia and Indonesia respectively. The latter finding seems to suggest that opening of stock markets in these countries led to significant transmission of contemporaneous positive shocks on the stock market returns.

Turning to volatility spillover effects (in local currency), it can be seen that for all the sample countries, the coefficients of $\alpha_{i,1}$ and β are highly significant (*p*-value <0.01). The volatility of the returns on the regional markets has a significantly negative contemporaneous effect on the volatility of return in Indonesia, Malaysia and Thailand. Therefore, H3 is rejected for these countries. Likewise, there is significantly negative one period- and two period lagged volatility transmission from the world to Malaysia, South Korea and Thailand respectively, H4 is rejected. The significant coefficients for year dummies ((*p*-value <0.01) here, show impact of other unobserved factors on volatility of shocks. We estimate Model 1 again excluding year dummies in Table 7.5, the results appear relatively the same only with the exception that the size of the β coefficients has decreased in the case of South Korea and Thailand. The diagnostic results show significant evidence of non-normality in the residuals as shown by *JB* values. This occurrence is not unexpected as Bai et al. (2003) attribute the leptokurtosis in the financial data to both volatility clustering and conditional non-normality. They show that our specification can generate the excess kurtosis observed in most of the financial data.

Table 7.4
Return and Volatility Spillover Effects -I

The table reports the estimation results of Model 1 for sample countries.

$$R_{i,t} = \gamma_{i,0} + \gamma_{i,1} R_{i,t-1} + \sum_{l=0}^{1} \gamma_{i,2,l} \hat{u}_{t-l}^{ASIA} + \sum_{l=1}^{2} \gamma_{i,3,l} \hat{u}_{t-l}^{WORLD} + (\delta_{i,1} L_1^i + \delta_{i,2} L_2^i + \delta_{i,3} L_3^i + \delta_{i,4} L_4^i) \hat{u}_t^{ASIA} + (\varphi_{i,1} L_1^i + \varphi_{i,2} L_2^i + \varphi_{i,3} L_3^i + \varphi_{i,4} L_4^i) \hat{u}_{t-1}^{WORLD} + d_t + \varepsilon_{i,t}$$

$$h_{i,t} = \alpha_{i,0} + \alpha_{i,1} \varepsilon_{i,t-1}^2 + \beta_i h_{i,t-1} + \sum_{l=0}^{1} \psi_{i,1,l} \hat{u}_{t-l}^{ASIA} + \sum_{l=1}^{2} \psi_{i,2,l} \hat{u}_{t-l}^{WORLD} + (\rho_{i,1} L_1^i + \rho_{i,2} L_2^i + \rho_{i,3} L_3^i + \rho_{i,4} L_4^i) \hat{u}^{2\,ASIA}_t + (\chi_{i,1} L_1^i + \chi_{i,2} L_2^i + \chi_{i,3} L_3^i + \chi_{i,4} L_4^i) \hat{u}^{2\,WORLD}_{t-1} + d_t + \lambda_i \varepsilon_{i,t-1}^2 I_{i,t-1}^-$$

where $R_{i,t}$ and $h_{i,t}$ is return the conditional variance of returns of the ith stock market index. $I_{i,t-l}^-$ is equal to 1 when $\varepsilon^2 < 0$ and 0 otherwise. $\hat{u}_{t-l}^{ASIA}$, $\hat{u}_{t-l}^{WORLD}$ are the residuals obtained from first-stage procedure. $\hat{u}^{2\,ASIA}_{t-l}$ and $\hat{u}^{2\,WORLD}_{t-l}$ are square of these residuals. L_1^i, L_2^i, L_3^i and L_4^i denote first DR programmes, first Cross-border listing, first Country fund and Increase in US$ capita flows, each dummy variable being equal to 1 for these events and 0 otherwise; and d_t denotes time-dummies.

	Country											
Parameters	India		Indonesia		Malaysia		Pakistan		South Korea		Thailand	
Mean Spillover	(IR)	(US$)	(Rp)	(US$)	(RM)	(US$)	(PR)	(US$)	(Won)	(US$)	(Bht)	(US$)
γ_0	0.0065	0.0045	0.0013	-0.0121	-0.0010	-0.0009	0.0016	0.0020	0.0001	0.0020	-0.0040	0.0000
	(0.0076)	(0.0091)	(0.0056)	(0.0209)	(0.0059)	(0.0202)	(0.0036)	(0.0106)	(0.0050)	(0.0147)	(0.085)	(0.0125)
γ_1	0.1124^b	0.0857^b	-0.0613	-0.0128	0.0678	0.0295	0.1704^b	0.1834^a	-0.0631	-0.0978^b	0.0255	0.0045
	(0.0460)	(0.0617)	(0.0423)	(0.0451)	(0.0428)	(0.0570)	(0.0400)	(0.0454)	(0.0420)	(0.0461)	(0.0449)	(0.0499)
$\gamma_{2,0}$	0.2887^a	0.0680	0.1203c	0.1467^b	0.0338	0.5406^a	0.0851^b	0.1386^a	0.1090	0.7706^a	-0.0102	0.6932^a
	(0.0586)	(0.0614)	(0.0676)	(0.0671)	(0.0440)	(0.0533)	(0.0441)	(0.0546)	(0.0796)	(0.0737)	(0.0606)	(0.0745)
$\gamma_{2,1}$	0.0823	-0.1768	-0.0603	-0.0011	-0.2598^b	0.3307^a	-0.0159	0.0766	0.0986	0.2945c	-0.2306^c	0.3122^c
	(0.14770	(0.1594)	(0.1089)	(0.1171)	(0.1268)	(0.1121)	(0.0643)	(0.0948)	(0.1168)	(0.1371)	(0.1356)	(0.1748)
$\gamma_{3,1}$	-0.0471	0.3454^b	0.3122^a	0.2316	0.3492^a	-0.0480	0.1738^b	0.1006	0.0369	-0.0887	0.2925b	-0.0691
	(0.1605)	(0.1931)	(0.1213)	(0.1579)	(0.1415)	(0.1192)	(0.0859)	(0.1126)	(0.1751)	(0.1976)	(0.1178)	(0.1766)
$\gamma_{3,2}$	0.1629^a	0.0812	0.2692^a	0.1923c	0.0883^a	0.0848	0.0288	0.0858	0.0715	0.1361	0.0563	0.2488^a
	(0.0626)	(0.0619)	(0.0717)	(0.0805)	(0.0284)	(0.0724)	(0.0608)	(0.0693)	(0.0645)	(0.0711)	(0.0751)	(0.0676)
δ_1	-0.7643^c	0.5787^b	0.0156	0.3078	-1.0612^a	1.2235c	-0.0242	-0.5760	0.4995	-0.3920	0.4977	0.0933
	(0.3939)	(0.3190)	(0.5292)	(0.5905)	(0.4831)	(0.7044)	(0.2985)	(0.4421)	(0.5465)	(0.4656)	(0.4941)	(0.7530)
δ_2	0.1812	-0.0154	-0.0921	-0.2395	0.5927^a	-0.6583^a	0.0115	-0.0383	0.0100	-0.0560	0.3915^b	-0.3802
	(0.2058)	(0.2379)	(0.1680)	(0.2021)	(0.0170)	(0.1853)	(0.3062)	(0.3339)	(0.1764)	(0.1916)	(0.1575)	(0.2176)
δ_3	-0.1462	0.0958	0.7551^a	0.6930^a	0.5345	-0.1572		-	-0.2237	-0.3350	-	-
	(0.2252)	(0.2475)	(0.2485)	(0.2651)	(0.4034)	(1.0392)			(0.1984)	(0.1968)		
δ_4	-0.1005	-0.1870	-0.1421	-0.1800	0.6900	-0.9928c	-0.0761	-0.0712	-0.2388	-0.1523	-0.1600	-0.1301
	(0.3533)	(0.4749)	(0.1641)	(0.1968)	(0.4568)	(0.5022)	(0.1483)	(0.2722)	(0.1852)	(0.3985)	(0.2621)	(0.3871)
φ_1	1.0727	-1.2191^b	0.2645	-0.4724	0.7619	-0.5539	-0.7033	-0.1240	-0.3826	0.2892	-0.2618	-0.6681
	(0.7042)	(0.5745)	(0.7270)	(0.7154)	(0.7012)	(1.0384)	(0.4650)	(0.6231)	(0.5196)	(0.7320)	(0.8278)	(1.0914)
φ_2	0.0812	0.0334	0.0198	0.0456	-0.5780^a	-0.2158	-0.3395	0.1792	-0.2253	-0.0512	-0.2936	0.0236
	(0.2762)	(0.3156)	(0.1588)	(0.2702)	(0.1731)	(1.2450)	(0.3303)	(0.5463)	(0.1979)	(0.2186)	(0.1777)	(0.2552)
φ_3	-0.0947	-0.1071	-0.7650^b	-0.8875	-0.5935	0.1352		-	0.4068^b	0.4062	-	-
	(0.2746)	(0.2868)	(0.3330)	(0.3647)	(0.5647)	(0.2039)			(0.2051)	(0.2186)		
φ_4	-0.5189	-0.3884	0.4403	0.7741	-0.5824	1.0380	-0.2250	0.3782	0.5219	0.3729	0.2295	0.5406
	(0.0861)	(0.7516)	(0.2880)	(0.3240)	(0.6636)	(0.6522)	(0.3204)	(0.5384)	(0.7012)	(0.9332)	(0.4184)	(0.5307)
D91	0.0026	0.0004	-0.0097	0.0007	0.0026	0.0029	0.0155^b	0.0146	-0.0026	-0.0077	0.0071	0.0032
	(0.0091)	(0.0114)	(0.0072)	(0.0217)	(0.0067)	(0.0209)	(0.0059)	(0.0123)	(0.0061)	(0.0152)	(0.0098)	(0.0136)
D92	-0.0034	-0.0028	0.0008	0.0128	0.0038	0.0053	-0.0048	-0.0079	0.0023	0.0011	0.0086	0.0090
	(0.0126)	(0.0115)	(0.0065)	(0.0214)	(0.0063)	(0.0243)	(0.0062)	(0.0126)	(0.0072)	(0.0151)	(0.0094)	(0.0142)

D93	-0.0072	-0.0020	0.0110	0.0238	0.0148	0.0148	-0.0010	-0.0006	0.0068	-0.0008	0.0147	0.0094
	(0.0100)	(0.0116)	(0.0065)	(0.0213)	(0.0069)	(0.0211)	(0.0052)	(0.0128)	(0.0064)	(0.0158)	(0.0099)	(0.0149)
D94	-0.0049	-0.0023	-0.0079	0.0051	-0.0037	-0.0012	-0.0010	-0.0029	0.0026	0.0018	0.0003	0.0021
	(0.0087)	(0.0102)	(0.0067)	(0.0214)	(0.0077)	(0.0210)	(0.0052)	(0.0116)	(0.0056)	(0.0151)	(0.0098)	(0.0135)
D95	-0.0108	-0.0103	-0.0024	0.0088	0.0001	-0.0011	-0.0068	-0.0093	-0.0056	-0.0080	0.0014	-0.0045
	(0.0085)	(0.0102)	(0.0067)	(0.0213)	(0.0070)	(0.0207)	(0.0057)	(0.0117)	(0.0062)	(0.0154)	(0.0009)	(0.0143)
D96	-0.0084	-0.0058	0.0022	0.0149	0.0043	0.0047	-0.0017	-0.0042	-0.0063	-0.0096	-0.0051	-0.0094
	(0.0092)	(0.0105)	(0.0062)	(0.0212)	(0.0063)	(0.0204)	(0.0053)	(0.0121)	(0.0062)	(0.0153)	(0.0098)	(0.0134)
D97	-0.0038	-0.0073	-0.0123	-0.0097	-0.0157*	-0.0186	0.0021	-0.0010	-0.0110	-0.0084	-0.0098	-0.0178
	(0.0086)	(0.0103)	(0.0091)	(0.0268)	(0.0084)	(0.0222)	(0.0048)	(0.0117)	(0.0091)	(0.0167)	(0.0117)	(0.0165)
D98	-0.0083	-0.0071	0.0014	0.007	0.0029	-0.0090	-0.0084	-0.0101	0.0082	0.0106	0.0012	0.0006
	(0.0090)	(0.0102)	(0.0113)	(0.0279)	(0.0127)	(0.0218)	(0.0090)	(0.0131)	(0.0100)	(0.0190)	(0.0019)	(0.0172)
D99	0.0018	0.0063	0.0045	0.0224	0.0058	0.0133	0.0033	0.0002	0.0102	0.0027	0.0077	-0.0026
	(0.0097)	(0.0108)	(0.0083)	(0.0236)	(0.0087)	(0.0223)	(0.0074)	(0.0125)	(0.0096)	(0.0170)	(0.0109)	(0.0148)
D00	-0.0081	-0.0082	-0.0077	-0.0022	-0.0031	-0.0035	-0.0002	-0.0015	-0.0144	-0.0155	-0.0061	-0.0077
	(0.0115)	(0.0128)	(0.0071)	(0.0217)	(0.0074)	(0.0208)	(0.0067)	(0.0124)	(0.0093)	(0.0162)	(0.0103)	(0.0145)
D01	-0.0084	-0.0058	-0.0005	0.0084	0.0031	0.0037	0.0008	-0.0023	0.0101	0.0129	0.0071	-0.0012
	(0.0106)	(0.0118)	(0.0066)	(0.0221)	(0.0068)	(0.0208)	(0.0060)	(0.0124)	(0.0070)	(0.0156)	(0.0100)	(0.0145)
D02	-0.0052	-0.0030	0.0018	0.0206	0.0008	0.0009	0.0076	0.0117	0.0021	0.0045	0.0059	0.0081
	(0.0088)	(0.0097)	(0.0074)	(0.0217)	(0.0064)	(0.0207)	(0.0054)	(0.0121)	(0.0077)	(0.0154)	(0.0095)	(0.0150)
D03	0.0022	0.0056	0.0122	0.0269	0.0055	0.0020	0.0050	0.0023	0.0048	0.0000	0.0175*	0.0090
	(0.0088)	(0.0105)	(0.0067)	(0.0214)	(0.0066)	(0.0205)	(0.0060)	(0.0125)	(0.0069)	(0.0153)	(0.0094)	(0.0133)
D04	-0.0047	-0.0010	0.0031	0.0147	0.0026	0.0007	0.0023	0.0015	0.0021	0.0008	0.0091	-0.0081
	(0.0089)	(0.0112)	(0.0069)	(0.0216)	(0.0063)	(0.0204)	(0.0044)	(0.0116)	(0.0067)	(0.0154)	(0.0096)	(0.0132)
Volatility Spillover												
α_0	0.0011^{a}	0.0013^{b}	0.00111^{a}	0.0030^{b}	0.0009^{a}	0.0014^{c}	0.0011^{b}	0.0011^{a}	0.0015^{b}	0.0015^{c}	0.0015^{b}	0.0018^{b}
	(0.0003)	(0.0005)	(0.0003)	(0.0013)	(0.0002)	(0.0007)	(0.0001)	(0.0003)	(0.0002)	(0.0008)	(0.000)	(0.0007)
α_1	0.1143^{b}	0.0847	0.1225^{b}	-0.0366	0.1231^{b}	0.1178^{c}	0.1071^{b}	0.1004^{c}	0.1074^{b}	0.1379^{b}	0.1123	0.10484
	(0.0533)	(0.0564)	(0.0500)	(0.0330)	(0.0568)	(0.0629)	(0.0471)	(0.0600)	(0.0544)	(0.0561)	(0.0618)	(0.0786)
β	0.4487^{a}	0.4728^{a}	0.5315^{a}	0.4109^{b}	0.5589^{a}	0.5671^{a}	0.5589^{b}	0.5560^{a}	0.4237^{a}	0.4723^{b}	0.5368^{a}	0.5289^{a}
	(0.1415)	(0.1723)	(0.0985)	(0.1599)	(0.1076)	(0.1504)	(0.0632)	(0.1325)	(0.0848)	(0.0744)	(0.1345)	(0.1637)
λ	-0.0179	-0.0229	0.0317	0.1834^{b}	0.0362	-0.0190	-0.0351^{c}	-0.0092	-0.0220	0.1354^{c}	0.0156	0.0254
	(0.0728)	(0.0648)	(0.0845)	(0.0749)	(0.0792)	(0.0929)	(0.0663)	(0.0745)	(0.0714)	(0.0744)	(0.0936)	(0.0981)
$\psi_{1,0}$	0.0585	-0.0747	-0.0894^{a}	-0.0757	-0.0647^{b}	-0.0603	-0.0705^{b}	-0.0839	-0.0301	0.2852^{c}	-0.1534^{b}	-0.0858
	(0.0893)	(0.0825)	(0.0638)	(0.0407)	(0.0286)	(0.0449)	(0.0226)	(0.0611)	(0.1286)	(0.1411)	(0.0722)	(0.1278)
$\psi_{1,1}$	-0.0354	-0.0579	-0.0803	0.0297	-0.0841^{b}	-0.0392	-0.0565^{b}	-0.0708	-0.0895	-0.0979	-0.1234	-0.1840
	(0.0956)	(0.0892)	(0.0638)	(0.0606)	(0.0389)	(0.0768)	(0.0264)	(0.0618)	(0.0971)	(0.1526)	(0.1008)	(0.1229)
$\psi_{2,1}$	-0.0653	-0.0681	-0.0757	-0.2380^{a}	-0.0864^{b}	-0.0074	-0.0688	-0.0558	-0.0615	-0.0308	-0.1318^{b}	-0.1538
	(0.0819)	(0.0998)	(0.0568)	(0.0587)	(0.0297)	(0.0697)	(0.0563)	(0.0488)	(0.0801)	(0.1571)	(0.0607	(0.1085)
$\psi_{2,2}$	-0.1008	-0.0674	-0.0719	-0.0160	-0.0768^{a}	-0.0138	-0.0836	-0.0675	-0.1128b	-0.1446	-0.1336^{b}	-0.1565
	(0.0653)	(0.0735)	(0.0435)	(0.1281)	(0.0201)	(0.0595)	(0.0587)	(0.0549)	(0.0593)	(0.1221)	(0.0433)	(0.1456)
ρ_1	0.0099	-0.0143	0.0202	0.0308	0.0037	0.0067	-0.0093	-0.0115	0.0038	0.0786	-0.0026	-0.0072
	(0.0444)	(0.0107)	(0.0269)	(0.0182)	(0.0194)	(0.0383)	(0.0129)	(0.0270)	(0.0317)	(0.0995)	(0.0500)	(0.0568)
ρ_2	0.0001	-0.0030	0.0017	0.0062	0.0011	0.0005	-0.0049	-0.0164	-0.0019	-0.0004	0.0003	0.0012
	(0.0055)	(0.0067)	(0.0057)	(0.0700)	(0.0050)	(0.0051)	(0.0103)	(0.0177)	(0.0055)	(0.0064)	(0.0068)	(0.0085)
ρ_3	-0.0085	-0.0032	-0.0025	-0.0234^{b}	-0.0012	0.0043	-	-	-0.0035	-0.0035	-	-
	(0.0070)	(0.0097)	(0.0055)	(0.0105)	(0.0282)	(0.0587)			(0.0078)	(0.0088)		
ρ_4	-0.0218c	0.0101	-0.0062	0.0121^{c}	0.0022	0.0072	-0.0070^{b}	-0.0103	-0.0127^{b}	-0.0127	-0.0095	-0.0039
	(0.0107)	(0.0175)	(0.0042)	(0.0060)	(0.0184)	(0.0371)	(0.0023)	(0.0080)	(0.0026)	(0.0294)	(0.0085)	(0.0203)
χ_1	0.0515	0.0012	0.0185	-0.0170	0.0061	0.0077	-0.0085	-0.0020	0.0054	-0.0576	-0.0003	-0.0311

	(0.0494)	(0.0392)	(0.0253)	(0.0292)	(0.0494)	(0.0520)	(0.0145)	(0.0303)	(0.0929)	(0.1306)	(0.1053)	(0.0793)
χ_2	0.0040	0.0026	0.0036	0.0004	0.0027	0.0009	0.0196c	0.0185	0.0037	-0.0031	0.0029	-0.0052
	(0.0102)	(0.0134)	(0.0046)	(0.0099)	(0.0034)	(0.0061)	(0.0116)	(0.0242)	(0.0055)	(0.0086)	(0.0092)	(0.0119)
χ_3	0.0040	0.0029	0.0117	0.0266	-0.0034	0.0047	-	-	-0.0173^{c}	-0.0075	-	-
	(0.0109)	(0.0154)	(0.0079)	(0.0166)	(0.0481)	(0.0855)			(0.0076)	(0.0115)		
χ_4	-0.0078	-0.0904^{b}	-0.0181	-0.0186	0.0036	0.0143	-0.0268^{b}	-0.0164	0.0309^{c}	0.0047	-0.0214	-0.0210
	(0.0422)	(0.0335)	(0.0077)	(0.0122)	(0.0491)	(0.0855)	(0.0104)	(0.0235)	(0.0165)	(0.0485)	(0.0257)	(0.0273)
D91	-0.0006^{c}	-0.0005	-0.0003	-0.0021^{b}	-0.0004^{c}	-0.0011	-0.0003^{a}	-0.0005^{c}	-0.0011^{b}	-0.0047	-0.0007	-0.0012^{c}
	(0.0003)	(0.0003)	(0.0003)	(0.0012)	(0.0002)	(0.0007)	(0.0001)	(0.0003)	(0.0002)	(0.0008)	(0.0005)	(0.0006)
D92	0.0004	0.0000	-0.0004	-0.0026^{b}	-0.0003	-0.0004	-0.0004^{b}	-0.0003	-0.0007^{b}	-0.0011	-0.0003	-0.0007
	(0.0004)	(0.0003)	(0.0003)	(0.0012)	(0.00020	(0.0007)	(0.0002)	(0.0002)	(0.003)	(0.0008)	(0.0005)	(0.0006)
D93	-0.0002	-0.0003	-0.0005^{c}	-0.0027^{b}	-0.0005^{c}	-0.0010	-0.0004^{b}	-0.0004	-0.0010^{b}	-0.0011	-0.0005	-0.0007
	(0.0003)	(0.0004)	(0.0003)	(0.0012)	(0.0002)	(0.0007)	(0.0002)	(0.0003)	(0.0002)	(0.0008)	(0.0005	(0.0006)
D94	-0.0008^{b}	-0.0009^{b}	-0.0005^{c}	-0.0025^{b}	-0.0002	-0.0009	-0.0007^{a}	-0.0007	-0.0013^{b}	-0.0014^{c}	-0.0008	-0.0013^{b}
	(0.0003)	(0.0004)	(0.0003)	(0.0012)	(0.0002)	(0.0007)	(0.0001)	(0.0030)	(0.0002)	(0.0008)	(0.0005)	(0.0006)
D95	-0.0009^{a}	-0.0008^{b}	-0.0005^{c}	-0.0025^{b}	-0.0004^{b}	-0.0011	-0.0006^{a}	-0.0005^{b}	-0.0011^{b}	-0.0012	-0.0007	-0.0011^{c}
	(0.0003)	(0.0004)	(0.0003)	(0.0012)	(0.0002)	(0.0007)	(0.0001)	(0.0002)	(0.0002)	(0.0008)	(0.0005)	(0.0006)
D96	-0.0006^{a}	-0.0007^{c}	-0.0009^{b}	-0.0027^{b}	-0.0005^{b}	-0.0013	-0.0005^{a}	-0.0005^{b}	-0.0011^{b}	-0.0012	-0.000	-0.0013^{b}
	(0.0003)	(0.0004)	(0.0003)	(0.0012)	(0.0002)	(0.0007)	(0.0001)	(0.0003)	(0.0002)	(0.0008)	(0.0005)	(0.0007)
D97	-0.0006^{a}	-0.0007^{c}	-0.0013	0.0001	0.0000	0.0000	-0.0006^{a}	-0.0006^{a}	0.0003	-0.0008	-0.0001	0.0004
	(0.0003)	(0.0004)	(0.0003)	(0.0011)	(0.0004)	(0.0006)	(0.0001)	(0.0002)	(0.0008)	(0.0008)	(0.0005)	(0.0007)
D98	-0.0004^{a}	-0.0005	0.0002	0.0078^{a}	0.0000	0.0001	0.0004	0.0003	0.0010	0.0007	0.0000	0.0009
	(0.0002)	(0.0003)	(0.0005)	(0.0023)	(0.0006)	(0.0006)	(0.0004)	(0.0003)	(0.0006)	(0.0014)	(0.0006)	(0.0009)
D99	-0.0002	-0.0003	-0.0001	0.0002	-0.0001	-0.0002	-0.0002	-0.0002	0.0001	-0.0007	-0.0002	-0.0005
	(0.0003)	(0.0003)	(0.0003)	(0.0012)	(0.0002)	(0.0006)	(0.0002)	(0.0003)	(0.0004)	(0.0008)	(0.0005)	(0.0005)
D00	0.0000	0.0001	-0.0006^{a}	-0.0018	-0.0003^{c}	-0.0010	-0.0002	-0.0003	0.0000	-0.0008	-0.0004	-0.0006
	(0.0003)	(0.0004)	(0.0002)	(0.0011)	(0.0002)	(0.0007)	(0.0002)	(0.0002)	(0.0004)	(0.0008)	(0.0005)	(0.0006)
D01	-0.0001	-0.0001	-0.0002	-0.0016	-0.0003^{c}	-0.0010	-0.0002	-0.0003	-0.0060^{a}	-0.0010	-0.0002	-0.0005
	(0.0002)	(0.0003)	(0.0002)	(0.0016)	(0.0002)	(0.0007)	(0.0002)	(0.0002)	(0.0002)	(0.0008)	(0.0005)	(0.0005)
D02	-0.0006^{a}	-0.0008^{b}	-0.0004^{b}	-0.0019	-0.0003^{c}	-0.0012	-0.0003^{a}	-0.0004^{a}	-0.0003	-0.0011	-0.0004	-0.0004
	(0.0003)	(0.0004)	(0.0002)	(0.0011)	(0.0002)	(0.0007)	(0.0001)	(0.0002)	(0.0002)	(0.0008)	(0.000)	(0.0006)
D03	-0.0006^{a}	-0.0007^{c}	-0.0007^{b}	-0.0025	-0.0004^{b}	-0.0012	-0.0005^{a}	-0.0005^{a}	-0.0008^{a}	-0.0012	-0.0007	-0.0012^{b}
	(0.0003)	(0.0004)	(0.0003)	(0.0012)	(0.0002)	(0.0007)	(0.0001)	(0.0002)	(0.0002)	(0.0008)	(0.0005)	(0.0006)
D04	-0.0007^{a}	-0.0006^{b}	-0.0080^{a}	-0.0023	-0.0005^{b}	-0.0013^{b}	-0.0008^{a}	-0.0008^{a}	-0.0100^{a}	-0.0013	-0.0009	-0.0014^{b}
	(0.0003)	(0.0003)	(0.0003)	(0.0012)	(0.0002)	(0.0070)	(0.0001)	(0.0003)	(0.0002)	(0.0008)	(0.005)	(0.0006)
Hypotheses:												
$H_1 : \gamma_{2,0} = \gamma_{2,1} = 0$	12.21^{a}	1.3822	1.5847	2.4963^{c}	2.8581^{c}	59.8082^{a}	1.9845	3.5610^{b}	1.1789	55.3488^{a}	1.4458	45.7172^{a}
$H_2 : \gamma_{3,1} = \gamma_{3,2} = 0$	3.4595^{a}	2.3722^{a}	9.8383^{a}	3.8060^{b}	7.916^{a}	0.7303	2.0500	1.0813	0.6493	2.0334	3.3291^{a}	7.2937^{a}
$H_3 : \psi_{1,0} = \psi_{1,1} = 0$	0.2145	1.3731	8.0913^{a}	1.8750	5.9554^{b}	1.5752	11.2676^{b}	2.4305^{b}	0.824	2.1098	4.9189^{a}	2.1793
$H_4 \;\; \psi_{2,1} = \psi_{2,2} = 0$	2.8461^{c}	1.1648	2.3202^{c}	10.837^{a}	8.2791^{a}	0.0510	14.5773^{b}	0.5181	4.3369^{a}	1.2044	5.2851^{a}	0.0214
ARCH Test	0.1007	0.4872	1.3277	0.0798	0.1075	0.2140	1.84	1.0363	1.30	4.4976^{a}	4.70^{a}	0.5169
J-B Test	9.2717^{a}	31.6865^{a}	38.7722^{a}	88.8622^{a}	316.61^{a}	503.31^{a}	22.02^{a}	14.125^{a}	9.19^{b}	13.118^{a}	53.62^{a}	5.3818^{c}
N	780	780	780	780	780	780	780	780	780	780	780	780

The table also shows the results of the hypotheses (H1, H2, H3 and H4) using Wald test. The ARCH LM test and Jarque-Bera Normality test are also reported. Bollerslev-Wooldrige (1992) heteroskedasticity-consistent standard errors are reported in the parenthesis. ^{a}, ^{b}, and ^{c} respectively denote statistical significance at a 1-, 5-, and 10-percent level.

Table 7.5
Return and Volatility Spillover Effects - II

The table shows estimation results of Model 2.

$$R_{i,t} = \gamma_{i,0} + \gamma_{i,1} R_{i,t-1} + \sum_{l=0}^{1} \gamma_{i,2,l} \hat{u}_{t-l}^{ASIA} + \sum_{l=1}^{2} \gamma_{i,3,l} \hat{u}_{t-l}^{WORLD} + (\delta_{i,1} L_1^i + \delta_{i,2} L_2^i + \delta_{i,3} L_3^i + \delta_{i,4} L_4^i) \bar{u}_t^{ASIA} + (\varphi_{i,1} L_1^i + \varphi_{i,2} L_2^i + \varphi_{i,3} L_3^i + \varphi_{i,4} L_4^i) u_{t-1}^{WORLD} + \varepsilon_{i,t}$$

$$h_{i,t} = \alpha_{i,0} + \alpha_{i,1} \varepsilon_{i,t-1}^2 + \beta_i h_{i,t-1} + \sum_{l=0}^{1} \psi_{i,1,l} \hat{u}_{t-l}^{ASIA} + \sum_{l=1}^{2} \psi_{i,2,l} \hat{u}_{t-l}^{WORLD} + (\rho_{i,1} L_1^i + \rho_{i,2} L_2^i + \rho_{i,3} L_3^i + \rho_{i,4} L_4^i) \bar{u}^2{}_t^{ASIA} + (\chi_{i,1} L_1^i + \chi_{i,2} L_2^i + \chi_{i,3} L_3^i + \chi_{i,4} L_4^i) \bar{u}^2{}_{t-1}^{WORLD} + \lambda_i \varepsilon_{i,t-1}^2 I_{i,t-l}^-$$

where $R_{i,t}$ is return on the *i*th stock market index. $h_{i,t}$ is the conditional variance of returns of the *i*th stock market index. $I_{i,t-l}^-$ is a dummy variable equal to 1 when $\varepsilon^2 < 0$ and 0 otherwise. $\hat{u}_{t-l}^{ASIA}$, $\hat{u}_{t-l}^{WORLD}$ are the residuals obtained from first stage procedure. $\hat{u}^2{}_{t-l}^{ASIA}$ and $\hat{u}^2{}_{t-l}^{WORLD}$ are square of these residuals. L_1^i, L_2^i, L_3^i and L_4^i denote dummy variables, showing first DR programmes, first Cross-border listing, first Country fund and Increase in US$ capita flows. each dummy variable being equal to 1 for these events and 0 otherwise.

	Country											
	India		Indonesia		Malaysia		Pakistan		South Korea		Thailand	
Parameters	(IR)	(US$)	(Rp)	(US$)	(RM)	(US$)	(PR)	(US$)	(Won)	(US$)	(Bht)	(US$)
Mean Spillover												
γ_0	0.0022	0.0012	0.0016	-0.0024	0.0024 ^{b}	-0.0001	0.0024 ^{c}	0.0022	0.0001	-0.0010	-0.0006	0.0024 ^{c}
	(0.0013)	(0.0026)	(0.0014)	(0.0047)	(0.0011)	(0.0045)	(0.0013)	(0.0025)	(0.0014)	(0.0015)	(0.0014)	(0.0013)
γ_1	0.1469 ^{a}	0.0817	-0.0370	0.0296	0.1394 ^{c}	0.0608	0.2089 ^{a}	0.2240 ^{a}	-0.0092	-0.0692	0.1226a	0.0179
	(0.0433)	(0.0621)	(0.0543)	(0.0828)	(0.0525)	(0.0985)	(0.0474)	(0.0593)	(0.0474)	(0.0450)	(0.0463)	(0.0389)
$\gamma_{2,0}$	0.2323 ^{a}	0.0162	0.1380	0.0780	0.0361	0.5841 ^{a}	0.0496	0.1579c	0.1072	0.9430 ^{a}	-0.0203	0.6725 ^{a}
	(0.0726)	(0.0997)	(0.1033)	(0.1667)	(0.0505)	(0.1445)	(0.0430)	(0.0821)	(0.0811)	(0.0679)	(0.0583)	(0.0704)
$\gamma_{2,1}$	0.0497	-0.1274	-0.0396	0.2819	-0.2558 ^{b}	0.3731	-0.0018	0.0851	0.2293 ^{c}	0.4578 ^{a}	-0.2395 ^{c}	0.1426
	(0.1197)	(0.2313)	(0.2018)	(0.2405)	(0.1336)	(0.4479)	(0.0639)	(0.1411)	(0.1337)	(0.1350)	(0.1302)	(0.1188)
$\gamma_{3,1}$	-0.0228	0.3566	0.2805 ^{c}	0.1392	0.3246 ^{a}	-0.1540	0.1646b	0.0426	0.0480	-0.2981 ^{a}	0.2877 ^{b}	-0.0417
	(0.1822)	(0.3417)	(0.1584)	(0.3089)	(0.1843)	(0.4531)	(0.0829)	(0.1494)	(0.2321)	(0.1832)	(0.1195)	(0.1234)
$\gamma_{3,2}$	0.1137	0.1848	0.2773 ^{a}	0.3594 ^{b}	0.1330 ^{a}	0.0514	0.0057	0.0447	0.1299 ^{c}	0.1130	0.0594	0.2529 ^{a}
	(0.0684)	(0.1167)	(0.1121)	(0.1683)	(0.0508)	(0.2197)	(0.0390)	(0.1004)	(0.0766)	(0.0556)	(0.0829)	(0.0609)
δ_1	-0.8918 ^{a}	0.5758	-0.0012	-0.1423	-1.0891 ^{b}	1.3618	0.1415	-0.4951	0.3152	-0.1264	0.3321	0.1783
	(0.2979)	(0.4403)	(0.5934)	(1.4277)	(0.5148)	(1.6474)	(0.3311)	(0.8245)	(0.2800)	(0.5832)	(0.4936)	(0.5795)
δ_2	0.2190	-0.0234	-0.1289	-0.3395	0.5639 ^{a}	-0.7245	0.0344	-0.1331	-0.1648	-0.0320	0.4744 ^{b}	-0.1859
	(0.1923)	(0.3838)	(0.1697)	(0.339)	(0.1825)	(0.5507)	(0.3157)	(0.8767)	(0.1992)	(0.2026)	(0.1493)	(0.1750)
δ_3	-0.2470	0.1376	0.7908 ^{a}	1.2071	0.5184	-0.2106	n-a	n-a	-0.1703	-0.3686	n-a	n-a
	(0.1849)	(0.4150)	(0.6049)	(0.5426)	(0.4455)	(1.0707)			(0.1919)	(0.2177)		
δ_4	-0.1102	-0.2020	-0.1348	-0.5369	0.6076	-1.1669	-0.1263	-0.0818	-0.2322	-0.4503	0.0318	-0.1400
	(0.1928)	(0.5053)	(0.1855)	(0.5143)	(0.4650)	(1.4586)	(0.1353)	(0.4677)	(0.1816)	(0.3964)	(0.2395)	(0.1990)
φ_1	1.1507 ^{b}	-1.2358 ^{c}	0.2330	-0.5958	0.5384	-0.7789	-0.6039	-0.1096	-0.1921	-0.3412	-0.1564	-0.7347
	(0.5384)	(0.7358)	(0.6320)	(1.2636)	(0.7357)	(2.4289)	(0.5246)	(1.0887)	(0.4423)	(0.8215)	(0.8623)	(0.7793)
φ_2	0.0522	-0.0461	0.0561	0.1315	-0.4340	0.1521	-0.1974	0.3000	-0.1380	0.1026	-0.3854 ^{b}	0.1213
	(0.2710)	(0.5256)	(0.1795)	(0.5696)	(0.2377)	(0.6080)	(0.2763)	(1.0563)	(0.2500)	(0.2512)	(0.1730)	(0.2027)
φ_3	-0.0648	-0.1656	-0.7468 ^{c}	-0.7194	-0.6228	-0.1549	n-a	n-a	0.4235 ^{c}	0.3087	n-a	n-a
	(0.2321)	(0.4983)	(0.3975)	(0.6943)	(0.6280)	(1.1634)			(0.2262)	(0.2464)		
φ_4	-0.6733	-0.1177	0.4459	0.3424	-0.5548	1.2544	-0.3022	0.3901	0.1360	1.1194	-0.5206	0.5004
	(0.6415)	(0.9971)	(0.3694)	(1.0835)	(0.6767)	(2.0303)	(0.2682)	(0.8497)	(0.6282)	(0.9153)	(0.4068)	(0.2269)

Volatility Spillover												
α_0	0.0012^{a}	0.0014^{a}	0.0013^{a}	0.0030^{a}	0.0009^{a}	0.0015^{c}	0.0011^{a}	0.0017	0.0009^{a}	0.0009^{a}	0.0013^{a}	0.0000
	(0.0000)	(0.0001)	(0.0002)	(0.0006)	(0.0000)	(0.0007)	(0.0001)	(0.0004)	(0.0002)	(0.0001)	(0.0000)	(0.0000)
α_1	0.1167	0.0885	0.1276^{c}	0.1073	0.1116^{a}	0.1188	0.0629	0.1005	0.2028^{a}	0.2285^{a}	0.1646^{c}	0.0792^{a}
	(0.0800)	(0.0952)	(0.0691)	(0.0859)	(0.0465)	(0.1082)	(0.0503)	(0.1098)	(0.0791)	(0.0653)	(0.0862)	(0.0248)
β	0.4704^{a}	0.5379^{a}	0.5688^{a}	0.4974^{a}	0.5129^{a}	0.5649^{a}	0.5471^{a}	0.5350^{a}	0.2828	0.2500^{a}	0.2531	0.9025^{a}
	(0.0306)	(0.0002)	(0.0714)	(0.0958)	(0.0358)	(0.2182)	(0.0625)	(0.1875)	(0.1804)	(0.0563)	(0.0002)	(0.0210)
λ	-0.0871	-0.0973	0.0283	0.1448	0.1535	0.0128	-0.0389	-0.0162	0.0123	0.1991^{b}	0.1474	0.0091
	(0.1026)	(0.0944)	(0.1219)	(0.1282)	(0.1251)	(0.0934)	(0.0988)	(0.1169)	(0.0791)	(0.0915)	(0.1261)	(0.0299)
$\psi_{1,0}$	-0.0645	-0.0927	-0.1054	-0.1838	-0.0657	-0.0726	-0.0672	-0.0862	0.0809	0.1772^{c}	-0.1673^{b}	0.5429^{a}
	(0.1569)	(0.1307)	(0.1265)	(0.3269)	(0.0552)	(0.1454)	(0.0492)	(0.0888)	(0.1477)	(0.1059)	(0.0654)	(0.1632)
$\psi_{1,1}$	-0.0872	-0.0812	-0.0945	-0.1732	-0.0926	-0.0394	-0.0569	-0.0736	-0.0707	-0.0385	-0.1128	-0.5367^{a}
	(0.0964)	(0.1017)	(0.1878)	(0.2827)	(0.1037)	(0.2508)	(0.0465)	(0.0921)	(0.0968)	(0.1360)	(0.1508)	(0.1470)
$\psi_{2,1}$	-0.1084	-0.1059	-0.0897	-0.1914	-0.1098	0.0029	-0.0752	-0.0548	0.2109	0.2256	-0.0603	0.0708
	(0.0829)	(0.2442)	(0.1173)	(0.2678)	(0.0600)	(0.4291)	(0.0656)	(0.1277)	(0.2100)	(0.1651)	(0.0952)	(0.1342)
$\psi_{2,2}$	-0.0902	-0.0955	0.0318	0.0687	-0.1291^{b}	0.0047	-0.0901^{a}	-0.0820	0.0067	-0.2932^{a}	-0.0421	-0.0861
	(0.0701)	(0.1686)	(0.0206)	(0.1154)	(0.0225)	(0.3143)	(0.0479)	(0.1166)	(0.1157)	(0.0633)	(0.1685)	(0.1182)
ρ_1	0.0107	-0.0089	0.0318	0.0687	0.0052	0.0100	-0.0180	-0.0278	0.0343	0.0548^{c}	-0.0030	-0.0155
	(0.0159)	(0.0223)	(0.0206)	(0.1154)	(0.0228)	(0.1166)	(0.0196)	(0.0556)	(0.0141)	(0.0288)	(0.0493)	(0.0300)
ρ_2	-0.0038	-0.0084	0.0037	-0.0034	0.0013	0.0013	0.0083	0.0071	-0.0188	-0.0059	0.0035	0.0031
	(0.0091)	(0.0216)	(0.0078)	(0.0402)	(0.0091)	(0.0158)	(0.0179)	(0.0684)	(0.0081)	(0.0123)	(0.0071)	(0.0027)
ρ_3	-0.0186^{c}	-0.0190	-0.0077	-0.1232^{b}	0.0114	0.0055	n-a	n-a	-0.0124	-0.0148	n-a	n-a
	(0.0102)	(0.0279)	(0.0175)	(0.0510)	(0.0299)	(0.0607)			(0.0086)	(0.0144)		
ρ_4	-0.0165	-0.0035	-0.0204^{a}	-0.0439^{b}	0.0034	0.0106	-0.0175^{b}	-0.0196^{b}	-0.0224^{a}	-0.0174	-0.0124	-0.0162^{a}
	(0.0128)	(0.0270)	(0.0083)	(0.0152)	(0.0193)	(0.1049)	(0.0030)	(0.0093)	(0.0059)	(0.0220)	(0.0117)	(0.0039)
χ_1	0.0179	-0.0042	0.0351	0.0687	0.0085	0.0122	-0.0105	-0.0003	-0.0302^{c}	-0.0411	-0.0100	0.0282
	(0.0247)	(0.0563)	(0.0202)	(0.1166)	(0.0444)	(0.1343)	(0.0229)	(0.0670)	(0.0174)	(0.0370)	(0.0973)	(0.0436)
χ_2	0.0015	0.0011	0.0077	0.0300	0.0034	0.0018	0.0463^{b}	0.0495	0.0332^{a}	-0.0075	0.0097	-0.0021
	(0.0123)	(0.0315)	(0.0079)	(0.0430)	(0.0052)	(0.0210)	(0.0161)	(0.0623)	(0.0087)	(0.0136)	(0.0093)	(0.0053)
χ_3	0.0067	0.0153	0.0199	0.1953^{b}	-0.0298	0.0072	n-a	n-a	-0.0237^{b}	0.0078	n-a	n-a
	(0.0132)	(0.0369)	(0.0236)	(0.0680)	(0.0423)	(0.0895)			(0.0096)	(0.0155)		
χ_4	-0.0319	-0.0698	-0.0489^{a}	-0.1121^{c}	0.0067	0.0230	-0.0494^{b}	-0.0421	0.0040	-0.0338	-0.0111	0.0223^{c}
	(0.0286)	(0.0732)	(0.0079)	(0.0613)	(0.0431)	(0.1116)	(0.0062)	(0.0331)	(0.0190)	(0.0468)	(0.0213)	(0.0090)
Hypotheses:												
$H_1: \gamma_{2,0} = \gamma_{2,1} = 0$	5.2653^{a}	0.2203	1.4638	0.7711	2.1362	8.4415^{b}	0.7110	1.9224	2.0968	97.056^{a}	1.7066	46.6926^{a}
$H_2: \gamma_{3,1} = \gamma_{3,2} = 0$	1.3805	1.9808	5.5503^{a}	2.3066	4.8473^{a}	0.0966	2.0634	0.1811	1.5196	3.9017^{b}	3.2720^{b}	8.8076^{a}
$H_3: \psi_{1,0} = \psi_{1,1} = 0$	7.6430^{a}	4.0253^{c}	0.7715	3.1583^{c}	2.0931	0.1860	10.990^{b}	2.0202	0.3123	1.5139	3.9094^{b}	1.1950
$H_4\ \psi_{2,1} = \psi_{2,2} = 0$	5.5006^{a}	1.7686	1.1964	1.0932	2.3736c	0.0010	47.99^{a}	0.1315	0.6690	21.4523^{a}	0.3652	0.8274
ARCH Test	3.19^{b}	6.30^{a}	12.88^{a}	4.85^{a}	0.1975	0.2667	10.15^{a}	4.66^{a}	3.13^{b}	51.6163^{a}	5.479^{a}	0.4517
J-B Test	99.30^{a}	123.76^{a}	510.33^{a}	24.21^{a}	1031.7^{a}	9.86^{a}	128.28^{a}	70.29^{a}	99.58^{a}	8.1879^{a}	120.55^{a}	3.9776^{c}
N	780	780	780	780	780	780	780	780	780	780	780	780

The table also shows the results of the hypotheses (H1, H2, H3 and H4) using Wald test. The ARCH LM test and Jarque-Bera Normality test are also reported. Bollerslev-Wooldrige (1992) heteroskedasticity-consistent standard errors are reported in the parenthesis. ^{a}, ^{b}, and ^{c} respectively denote statistical significance at a 1-, 5-, and 10-percent level.

Table 7.6 reports the estimates of Model 1 excluding the stock market liberalization events and year dummies to investigate the impact of structural breaks as identified by Bekaert et al. (2002), on stock market integration for the sample countries. We estimated Model 1: (a) pre-break (b) post-break, (c) financial crisis (1 July 1997-30 August 1998). The crisis period is further subdivided into: (d) transition period (1 Oct 1998 – 30 June 1999), (e) post-crisis period (July 1999 – 31 Dec 2001), and (f) stock markets renaissance period (1 Jan 2002 – 31 Dec 2004). We find significant contemporaneous returns spillovers (i.e. heat wave effect) from the regional markets to Indonesia, Malaysia, South Korea, Thailand (*p*-value <0.10 and <0.01) and (though not significant) to Pakistan in the pre-break period. These parameter estimates imply that regional markets explained on average 13% of the variations in returns in the case of Indonesia, 20% for Malaysia and more than 20% for South Korea and Thailand. We do not find regional markets have any influence in the case of India, and Pakistan respectively. Therefore, we reject (H1) in the case of Malaysia, South Korea and Thailand (*p*-value <0.01). The parameter estimates shows that $|\gamma_{2,0}|>|\gamma_{3,1}|$ for Malaysia, South Korea and Thailand, which implies that these markets were more influenced by the regional factors than by world factors in the pre-break period. This finding is also supported by the higher regional integration scores for these markets. We do not find evidence of significant spillover effects from the World Index, thus, we fail to reject (H2) and (H4) for all countries (except South Korea).

After break in the net equity capital flows, we find that the degree of regional integration vis-à-vis global integration varied across countries (see Table 7.7). We find increase in magnitude of coefficients $\gamma_{2,0}$ and $\psi_{1,0}$ from pre-break period that show higher contemporaneous effects of regional markets on the returns and volatility. The estimation results show much stronger evidence of spillover effects from the regional markets to India, Malaysia and Thailand (*p*-value <0.05, <0.10) respectively, and though not significant in the case of Indonesia, Pakistan and South Korea. This result is also confirmed by the relative size of parameter estimates, i.e.

$|\gamma_{2,0}|>|\gamma_{3,1}|$ for Malaysia. We fail to reject (H2) for all countries (except Thailand) i.e., we do not find one-period lagged effect on return spillovers from the World Index. Our results imply that though the world factors became more important for some of the countries but these factors remained less significant for Pakistan and South Korea.

It is worth noting that whether changes in the equity capital flow was good news (bad news) for each country. The impact of good news denoted by $\alpha_{i,1}$ varied from a low of 4% for Indonesia to a high of 13% for Thailand in pre-break period (in local currency). But in post-break period, the impact of good news varied from a high of 17% for Malaysia to a low of 6% for Indonesia (see Table 7.6). We find that β has increased for Thailand and it has decreased in other countries from its pre-break level. Thus, we can tentatively conclude that volatility shocks might have been reduced after increase in equity flows in most of the Asian countries in post break period.

During the Asian and Russian financial crisis, the comparison of estimates for regional vs. global spillover effects show significant increase in the importance of the regional factors for all the countries that further reinforces that regional factors dominate the world factors for these markets (see Table 7.8). We reject (H1) for India, South Korea and Thailand. We find heterogeneous volatility spillover effects from the regional markets and the World Index. For instance, in the case of India, Indonesia, and Pakistan, there has been significant decrease in the contemporaneous volatility spillover effects from the regional markets (p-value<0.01), therefore, (H3) is rejected only for these countries. On the other hand, we find significant one period lagged return spillover effects from the World Index for South Korea and Thailand (p-value < 0.01). These results suggest that world factors might have become important which we suspect might be due to risk averse attitude of the international investors during the crisis period. During the Asian financial crisis, we find that effect of bad news on the volatility in the serious victims economies varied from -0.05 for South Korea to -0.20 for Malaysia. The magnitude of β increased for Indonesia and Malaysia from its post-break level.

In the post crisis period, regional factors dominated the world factors in explaining return and volatility spillovers (Table 7.9). The meteor shower effect on return was only significant for Pakistan and South Korea, (H2) is rejected for these countries. We find significant negative volatility spillover effects from the regional market to all countries (*p*-value <0.01) except Malaysia and Pakistan. We find significant positive spillover effects from the World Index in the case of Indonesia, South Korea and Thailand (*p*-value <0.01) and Malaysia (not significant). The world factors explained more than 20% variation in stock returns. These finding are supported by higher global integration scores for South Korea and Thailand found earlier over the period 2000-2004.

During the stock markets renaissance period (see Table 7.10), there is evidence of significant positive spillover effects from the regional markets to all the countries except Pakistan. The impact of regional factors varies across countries. In the case of India, Indonesia, and Thailand, there is positive one-period lagged spillover effects from the World Index (*p*-value <0.01) and in Malaysia (not significant).The impact of good news such as markets recovery varies from a low of 7% for Pakistan to a high of 20% for Thailand. There has been significant decrease in the magnitude of the volatility spillovers from the World to all countries except South Korea.

Table 7.6

Return and Volatility Spillover Effects (pre-break period)

The table reports the estimation results of Model 1 for the sample countries before pre-break period.

$$R_{i,t} = \gamma_{i,0} + \gamma_{i,1} R_{i,t-1} + \sum_{l=0}^{1} \gamma_{i,2,l} \bar{u}_{t-l}^{ASIA} + \sum_{l=1}^{2} \gamma_{i,3,l} \bar{u}_{t-l}^{WORLD} + \varepsilon_{i,t}$$

$$h_{i,t-1} = \alpha_{i,0} + \alpha_{i,1} \varepsilon_{i,t-1}^{2} + \beta_i h_{i,t-1} + \sum_{l=0}^{1} \psi_{i,2,l} \bar{u}^{2\,ASIA}_{t-l} + \sum_{l=1}^{2} \psi_{i,3,l} \bar{u}^{2\,WORLD}_{t-l} + \lambda_i \varepsilon_{i,t-1}^{2} I_{i,t}^{-}$$

	Country											
	India		Indonesia		Malaysia		Pakistan		South Korea		Thailand	
	01/01/1990-30/05/1993		01/01/1990-31/12/1995		01/01/1990-28/2/1994		01/01/1990-31/1/1996		01/01/1990-31/1/1996		01/01/1990-31/1/1996	
Parameters	(IR)	(US $)	(Rp)	(US $)	(RM)	(US $)	(PR)	(US $)	(Won)	(US $)	(Bht)	(US $)
γ_1	0.1435^{b}	0.0977	0.1352^{b}	0.0663	0.2778^{a}	0.2018^{b}	0.2619a	0.2661^{b}	0.0350	-0.0417	0.1126	0.0538
	(0.0712)	(0.0755)	(0.0234)	(0.0665)	(0.1008)	(0.0929)	(0.0628)	(0.0532)	(0.0619)	(0.0578)	(0.0648)	(0.0612)
$\gamma_{2,0}$	-0.0573	-0.0749	0.1397^{c}	0.2069^{c}	0.2289^{a}	0.2118^{a}	0.1071	0.0776	0.3039^{a}	0.3023^{c}	0.4278^{a}	0.4176
	(0.0974)	(0.0904)	(0.0750)	(0.0661)	(0.0697)	(0.0598)	(0.0877)	(0.0530)	(0.0776)	(0.0749)	(0.0957)	(0.1035)
$\gamma_{2,1}$	-0.3136	-0.2243	-0.0873	-0.1193	-0.0759	-0.0611	0.1262	-0.0415	0.2660^{b}	0.2136^{b}	-0.1139	-0.1782
	(0.2314)	(0.2258)	(0.0798)	(0.0858)	(0.0705)	(0.0916)	(0.1256)	(0.0943)	(0.1000)	(0.1086)	(0.0791)	(0.1104)
$\gamma_{3,1}$	0.2660	0.1868	0.5380^{b}	0.3373^{c}	0.1280	0.1550	0.1530	0.1143	-0.0283	-0.0631	0.3115	0.4017^{c}
	(0.4029)	(0.3936)	(0.1454)	(0.1501)	(0.1315)	(0.1451)	(0.1905)	(0.1578)	(0.0868)	(0.1199)	(0.2117)	(0.2214)
$\gamma_{3,2}$	-0.0416	-0.0099	0.2112	0.1183	0.0644	0.1176^{b}	-0.2283	0.0285	-0.1787	-0.0130	0.1853	0.1677
	(0.1224)	(0.1150)	(0.1327)	(0.1172)	(0.0929)	(0.0465)	(0.1397)	(0.0382)	(0.1202)	(0.1019)	(0.1489)	(0.1428)
α_1	0.0843	0.0704	0.0454	-0.0057	0.0781	0.1492	0.0795	0.1710	0.0989	0.2170	0.1381	0.0722
	(0.1258)	(0.1040)	(0.1110)	(0.0258)	(0.1339)	(0.1119)	(0.0567)	(0.1092)	(0.0868)	(0.0956)	(0.1061)	(0.0362)
β	0.5199^{a}	0.5197^{a}	0.2814	0.9387^{a}	0.5253v	0.2561	0.7753	0.2689	0.6705^{b}	0.1713	0.4447^{b}	0.9034
	(0.0466)	(0.0572)	(0.4258)	(0.0583)	(0.0727)	(0.0975)	(0.0891)	(0.2254)	(0.2886)	(0.3148)	(0.1271)	(0.0516)
λ	-0.2227	-0.1510	-0.0851	0.0207	-0.0365	0.2108	-0.1007	-0.1006	-0.0823	-0.1593	0.0437	-0.0827
	(0.1342)	(0.1204)	(0.1068)	(0.0356)	(0.1834)	(03113)	(0.0750)	(0.1273)	(0.0864)	(0.1177)	(0.1263)	(0.0491)
$\psi_{1,0}$	-0.1093	-0.1205	-0.0492	-0.0635	-0.0511	-0.0406	0.0803	-0.0217	0.0850	0.1271	0.5341	0.7620^{b}
	(0.0923)	(0.0929)	(0.0582)	(0.0447)	(0.0712)	(0.0422)	(0.0961)	(0.0290)	(0.0950)	(0.0936)	(0.2239)	(0.2839)
$\psi_{1,1}$	-0.0974	-0.1051	-0.0545	0.0070	-0.0464^{c}	-0.0296	0.0396	-0.0549^{c}	0.0518	0.0101	-0.4246^{b}	-0.7255
	(0.1170)	(0.1074)	(0.0574)	(0.0531)	(0.0207)	(0.0445)	(0.1448)	(0.0169)	(0.1375)	(0.1029)	(0.1276)	(0.2633)
$\psi_{2,1}$	-0.1389	-0.1560	-0.2246	-0.0422	-0.1162	-0.1128^{c}	0.3054	-0.0096	-0.3191^{b}	-0.1572^{c}	0.3753	0.6553
	(0.4051)	(0.3396)	(0.1157)	(0.0291)	(0.1049)	(0.0566)	(0.3604)	(0.0442)	(0.0648)	(0.0700)	(0.3184)	(0.5745)
$\psi_{2,2}$	-0.1447	-0.1441	0.2352	0.1992	-0.1151	-0.1504	-0.3948	-0.0548^{c}	0.3371^{a}	0.0429	0.5466	-0.6164
	(0.2734)	(0.2771)	(0.3796)	(0.1067)	(0.0971)	(0.1920)	(0.2770)	(0.0215)	(0.1344)	(0.0812)	(0.3390)	(0.5282)
Hypotheses:												
$H_1 : \gamma_{2,0} = \gamma_{2,1} = 0$	2.51	1.76	3.78	10.53^{b}	16.76^{a}	12.61^{a}	2.53	3.06	22.46^{a}	22.09^{a}	20.17^{a}	17.65^{a}
$H_2 : \gamma_{3,1} = \gamma_{3,2} = 0$	1.10	0.46	14.82^{a}	5.59^{a}	1.14	7.10^{c}	3.00	0.61	2.44	0.32	3.38	4.25^{c}
$H_3 : \psi_{1,0} = \psi_{1,1} = 0$	2.90	3.90	3.38	5.19^{a}	9.91^{b}	2.72	2.02	19.31^{b}	2.24	1.90	11.25^{b}	7.30
$H_4\ \psi_{2,1} = \psi_{2,2} = 0$	0.60	0.64	4.05	4.43	8.36^{b}	30.54^{a}	2.50	15.67^{b}	24.81^{a}	6.36^{c}	3.49	1.32
LM ARCH TEST(1)	0.40	1.84	0.27	0.001	6.28^{b}	0.16	0.41	1.13	0.06	0.15	0.17	0.01
Normality TEST	14.08^{a}	25.13^{b}	133.59^{a}	63.89^{a}	0.32	2.18	16.27^{a}	18.08^{b}	2.85	4.38	2.05	4.28
N	177	177	313	313	217	217	365	365	317	317	317	317

The table also shows the results of the hypotheses (H1, H2, H3 and H4) using Wald test. The ARCH LM test and Jarque-Bera Normality test are also reported. Bollerslev-Wooldrige (1992) heteroskedasticity-consistent standard errors are reported in the parenthesis. ^{a}, ^{b}, and ^{c} respectively denote statistical significance at a 1-, 5-, and 10-percent level.

Table 7.7

Return and Volatility Spillover Effects (post-break period)

The table reports the estimation results of Model 1 for sample countries in the post-break period.

$$R_{i,t} = \gamma_{i,0} + \gamma_{i,1}R_{i,t-1} + \sum_{l=0}^{1}\gamma_{i,2,l}\bar{u}_{t-l}^{ASIA} + \sum_{l=1}^{2}\gamma_{i,3,l}\bar{u}_{t-l}^{WORLD} + \varepsilon_{i,t}$$

$$h_{i,t-1} = \alpha_{i,0} + \alpha_{i,1}\varepsilon_{i,t-1}^{2} + \beta_{i}h_{i,t-1} + \sum_{l=0}^{1}\psi_{i,2,l}\bar{u}^{2}{}_{t-l}^{ASIA} + \sum_{l=1}^{2}\psi_{i,3,l}\bar{u}^{2}{}_{t-l}^{WORLD} + \lambda_{i}\varepsilon_{i,t-1}^{2}I_{i,t}^{-}$$

	Country											
	India		Indonesia		Malaysia		Pakistan		South Korea		Thailand	
Sample period:	*01/06/1993-30/06/1997*		*01/01/1996-30/06/1997*		*1/03/1994-30/06/1997*		*01/01/1997-30/06/1997*		*01/02/96-30/06/97*		*01/02/96-30/06/97*	
Parameters	(IR)	(US $)	(Rp)	(US $)	(RM)	(US $)	(PR)	(US $)	(Won)	(US $)	(Bht)	(US $)
γ_1	0.2125^{a}	0.1959^{b}	0.2174^{b}	-0.0902	0.0831	0.1154^{c}	0.3081	0.3702^{b}	-0.0557	-0.0276	-0.0158	-0.0702
	(0.0617)	(0.0781)	(0.1097)	(0.0595)	(0.0738)	(0.0554)	(0.1641)	(0.1661)	(0.0566)	(0.0809)	(0.1059)	(0.0948)
$\gamma_{2,0}$	0.2796^{b}	0.2643	0.0796	0.4514^{a}	0.5175^{a}	0.4357^{c}	0.3637	0.3554	0.1527	0.1251	0.4775^{a}	0.5025^{a}
	(0.1126)	(0.1123)	(0.1723)	(0.1339)	(0.0941)	(0.0980)	(0.3058)	(0.3003)	(0.1565)	(0.0900)	(0.1807)	(0.1709)
$\gamma_{2,1}$	0.1695	0.2279	0.2808	0.4856^{a}	0.1132	0.2700^{c}	-0.3891	-0.4826	-0.1760	0.0024	0.6636^{a}	0.7086^{a}
	(0.1323)	(0.1370)	(0.1256)	(0.1484)	(0.0719)	(0.1002)	(0.3576)	(0.3335)	(0.2690)	(0.2591)	(0.2087)	(0.2083)
$\gamma_{3,1}$	-0.0345	-0.2959	-0.3558^{b}	-0.4219	0.1628	-0.0501	0.3623	0.3955	0.0678	-0.1206	-0.5586^{a}	-0.3901^{c}
	(0.1324)	(0.1312)	(0.2630)	(0.1901	(0.1821)	(0.1105)	(0.2838)	(0.2794)	(0.3001)	(0.2861)	(0.1515)	(0.2162)
$\gamma_{3,2}$	0.2163^{c}	0.1320	0.0485	0.2346	0.1202	0.1837	-0.1437	-0.1594	-0.0079	-0.1167	0.1337^{b}	0.1274
	(0.1265)	(0.1085)	(0.2718)	(0.1193	(0.1613)	(0.1427)	(0.2861)	(0.3018)	(0.2327)	(0.2478)	(0.2294)	(0.1970)
α_1	0.0606	0.1262	0.1102	-0.1875	0.1742	0.0233	0.1280	0.1352	-0.0869	-0.1161^{b}	0.0009	0.0290
	(0.0656)	(0.0858)	(0.2024)	(0.0776	(0.1386)	(0.0465)	(0.1958)	(0.1675)	(0.0809)	(0.0487	(0.1142)	(0.0496)
β	0.8272^{a}	0.7613	0.2025	0.4680	0.1654	0.8659^{a}	0.5718	0.5498	0.5046^{a}	0.4300	0.6553^{a}	0.7873^{b}
	(0.0429)	(0.0653)	(0.3790)	(0.1850	(0.3020)	(0.0490)	(0.3611)	(0.3539)	(0.1483)	(0.5626)	(0.0997)	(0.0734)
λ	0.0743	-0.0967	-0.2280	-0.1875	-0.0656	0.1675^{c}	-0.1849	-0.1805	-0.1171	-0.0248	0.5089^{a}	0.3683^{b}
	(0.1053)	(0.0905)	(0.1866)	(0.0776	(0.1542)	(0.0755)	(0.3195)	(0.2845)	(0.1078)	(0.0571)	(0.2013)	(0.1411)
$\psi_{1,0}$	0.0862	0.1397	-0.0825	-0.0093	0.0604	0.1369	0.1879	0.0976	-0.0623	-0.2262^{c}	0.6189	0.4485
	(0.2097)	(0.1947)	(0.1509)	(0.1165)	(0.1082)	(0.1350)	(0.2394)	(0.1880)	(0.1066)	(0.1069)	(0.2725)	(0.2918)
$\psi_{1,1}$	0.0776	0.1383	-0.2772^{a}	0.0439	-0.1549	-0.0830	-0.0394	-0.0504	-0.0248	0.2060	0.3261	-0.3293
	(0.2041)	(0.1831)	(0.0697)	(0.0994)	(0.0390)	(0.1331)	(0.2874)	(0.2264)	(0.3465)	(0.1942)	(0.5500)	(0.2451)
$\psi_{2,1}$	-0.8492v	-0.8940^{b}	-0.1312	0.0843	0.1427	-0.3877^{a}	-0.9151^{c}	-0.8878v	-0.5444	-0.7593^{b}	-0.4579	-0.5905*
	(0.0760)	(0.0941)	(0.3861)	(0.2506)	(0.3425)	(0.1328)	(0.4461)	(0.4321)	(0.3513)	(0.2692)	(0.3930)	(0.3823)
$\psi_{2,2}$	0.0822	-0.0769^{b}	0.7565	-0.5927	0.5244	0.2852^{b}	-0.3006^{c}	-0.2878^{c}	-0.3731	-0.0659	0.1875	1.0261^{a}
	(0.1017)	(0.0291)	(0.5531)	(0.1684)	(0.4882)	(0.1327)	(0.1647)	(0.1628)	(0.3674)	(0.6454)	(0.2199)	(0.2930)
Hypotheses:												
$H_1 : \gamma_{2,0} = \gamma_{2,1} = 0$	6.94^{b}	8.76^{a}	5.11	19.28^{a}	36.18^{a}	36.84^{b}	2.17	2.99	1.80	2.94	19.45^{a}	24.46^{a}
$H_2 : \gamma_{3,1} = \gamma_{3,2} = 0$	3.10	13.26^{a}	2.01	11.89^{a}	1.25	22.22^{b}	1.63	2.02	0.05	0.31	14.45^{a}	4.38
$H_3 : \psi_{1,0} = \psi_{1,1} = 0$	18.80^{b}	8.54^{a}	17.15^{a}	0.31	18.32^{a}	27.04^{b}	0.99	0.30	0.34	4.71^{c}	10.49^{a}	3.56
$H_4\ \psi_{2,1} = \psi_{2,2} = 0$	133.05	217.48^{b}	1.87	14.36^{a}	1.38	17.12^{b}	25.08^{a}	19.01^{a}	4.83^{b}	10.05^{b}	1.86	13.16^{a}
LM ARCH Test	3.42	0.63	0.20	0.02	0.02	1.74	0.94	0.70	0.00	0.14	0.65	0.01
Normality Test	3.39	6.79^{c}	1.76	0.77	1.25	4.92	1.26	1.58	0.49	1.04	2.20	2.20
N	214	214	78	78	174	174	27	27	74	74	74	74

. The table also shows the results of the hypotheses (H1, H2, H3 and H4) using Wald test. The ARCH LM test and Jarque-Bera Normality test are also reported. Bollerslev-Wooldrige (1992) heteroskedasticity-consistent standard errors are reported in the parenthesis. ^{a}, ^{b}, and ^{c} respectively denote statistical significance at a 1-, 5-, and 10-percent level.

Table 7.8

Return and Volatility Spillover Effects (Asian and Russian Financial crisis - 01/07/1997 to 30/08/1998)

The table shows the estimation results for Model 1 for sample countries during Asian & Russian financial crisis.

$$R_{i,t} = \gamma_{i,0} + \gamma_{i,1}R_{i,t-1} + \sum_{j=0}^{1} \gamma_{i,2,j}\hat{u}_{t-j}^{ASIA} + \sum_{j=1}^{2} \gamma_{i,3,j}\hat{u}_{t-j}^{WORLD} + \varepsilon_{i,t}$$

$$h_{i,t-1} = \alpha_{i,0} + \alpha_{i,1}\varepsilon_{i,t-1}^{2} + \beta_{i}h_{i,t-1} + \sum_{j=0}^{1} \psi_{i,2,j}\hat{u}^{2\,ASIA}_{t-j} + \sum_{j=1}^{2} \psi_{i,3,j}\hat{u}^{2\,WORLD}_{t-1} + \lambda_{i}\varepsilon_{i,t-1}^{2}I_{i,t}^{-}$$

Parameters	Country											
	India (IR)	(US$)	Indonesia (Rp)	(US$)	Malaysia (RM)	(US$)	Pakistan (PR)	(US$)	South Korea (Won)	(US$)	Thailand (Bht)	(US$)
γ_1	0.0740	0.1923^{c}	-0.2838^{b}	0.0154	-0.1286^{b}	-0.0869	0.1589	0.3243^{c}	-0.2660v	-0.0305	0.0836	-0.0167
	(0.1070)	(0.1309)	(0.1315)	(0.1456)	(0.0591)	(0.1044)	(0.1369)	(0.1730)	(0.0831)	(0.1367)	(0.1183)	(0.0939)
$\gamma_{2,0}$	0.0949	0.0095	0.1915	-0.4844	0.2126	1.5264^{b}	0.2149^{a}	0.0352	0.3880	1.1225^{a}	0.4407^{b}	2.0271^{a}
	(0.0783)	(0.1866)	(0.1872)	(0.3781)	(0.3159)	(0.4224)	(0.1053)	(0.2264)	(0.3151)	(0.4333)	(0.1682)	(0.2662)
$\gamma_{2,1}$	0.4018^{b}	-0.1995	0.4327^{c}	1.0522	0.6287	-0.8819^{b}	0.2054	-0.5646^{a}	0.9275^{a}	0.7480	0.5623^{a}	0.5256
	(0.1965)	(0.1753)	(0.2536)	(0.7863)	(0.4311)	(0.3360)	(0.1872)	(0.1642)	(0.2608)	(0.5347)	(0.2239)	(0.3505)
$\gamma_{3,1}$	-0.0622	0.5916^{a}	0.5375	0.2551	0.4827	1.2020^{b}	-0.1870	0.7727^{b}	-0.7686^{a}	-0.5607	-0.1139	0.2413
	(0.1880)	(0.1865)	(0.3611)	(0.9125)	(0.4888)	(0.6921)	(0.2323)	(0.3164)	(0.2255)	(0.5451)	(0.2932)	(0.9065)
$\gamma_{3,2}$	0.2559	0.5404^{a}	0.4266	0.2570	-0.4229	0.6145	0.1245	-0.2058	-0.7199^{c}	0.5609	0.5637^{b}	0.0169
	(0.1863)	(0.2005)	(0.3634)	(0.6789)	(0.5556)	(0.4337)	(0.2194)	(0.4867)	(0.4002)	(0.5166)	(0.1455)	(0.5356)
α_1	-0.0672	-0.0901	0.1884	-0.1980	-0.0742^{c}	0.0945	-0.0737	0.1054	-0.0185	-0.0475	0.3555	-0.0157
	(0.1472)	(0.0982)	(0.1559)	(0.2200)	(0.0485)	(0.2679)	(0.1413)	(0.0845)	(0.0878)	(0.1470)	(0.2306)	(0.1275)
β	0.4925^{a}	0.1597	0.2880^{b}	0.3149	0.3135	0.3306	0.3078	0.4473	0.0474^{c}	0.6164^{a}	0.2203	0.4853^{b}
	(0.0972)	(3.0194)	(0.1226)	(0.3681)	(1.3238)	(0.7148)	(0.3169)	(0.3043)	(0.0982)	(0.2102)	(0.2095)	(0.2394)
λ	-0.0547	0.0570	0.2139	1.1222^{a}	-0.1327	-0.1770	0.5322^{a}	-0.1620	-0.0481	0.6450^{b}	0.0745	0.2637
	(0.1855)	(0.1733)	(0.3024)	(0.3553)	(0.1704)	(0.2530)	(0.2999)	(0.1610)	(0.0763)	(0.3410)	(0.4542)	(0.3644)
$\psi_{1,0}$	-0.1769^{a}	0.1594^{b}	-0.5900^{b}	-2.4507^{a}	0.6558	0.8667	-0.2719^{a}	-0.2025^{a}	4.9727^{a}	2.2581	0.1046	-0.9524
	(0.0231)	(0.2392)	(0.2753)	(0.6735)	(1.3238)	(1.4735)	(0.0984)	(0.0662)	(1.4012)	(1.8155)	(0.3480)	(0.7190)
$\psi_{1,1}$	0.0752	-0.1930	-0.7890^{a}	-1.1564	0.1837	-0.9620	-0.1428	-0.1414	-0.7162^{c}	-1.0172	-0.0524	0.6548
	(0.1641)	(0.4491)	(0.2595)	(1.6040)	(1.2189)	(1.0521)	(0.2315)	(0.2257)	(0.3825)	(1.5380)	(0.1259)	(0.8386)
$\psi_{2,1}$	-0.3716^{a}	-0.3378^{c}	-0.1083	3.3128	0.9053	2.7684	-0.4920	-1.1341^{b}	-0.9493^{a}	-0.8588	-1.1829^{b}	5.2714^{c}
	(0.1331)	(0.1729)	(0.3281)	(4.5297)	(1.5209)	(3.5846)	(0.2933)	(0.4965)	(0.2925)	(1.0631)	(0.4432)	(2.8618)
$\psi_{2,2}$	-0.1100^{c}	-0.0334	0.9559	-1.5421	0.9666	0.4991	-0.3002	0.0169	4.7955^{a}	1.0990	-0.4739^{c}	0.6358
	(0.0736)	(0.1369)	(0.8126)	(3.1484)	(2.4813)	(1.8261)	(0.2287)	(0.2636)	(1.3587)	(1.6231)	(0.2718)	(1.9049)
Hypotheses:												
$H_1 : \gamma_{2,0} = \gamma_{2,1} = 0$	2.46^{b}	0.67	1.93	3.94^{b}	1.09	12.97^{a}	2.74c	7.61^{b}	7.13^{a}	3.48^{b}	14.77^{a}	21.69^{a}
$H_2 : \gamma_{3,1} = \gamma_{3,2} = 0$	1.28	10.53^{a}	13.99^{a}	0.81	0.81	2.06	0.60	3.07	7.75^{a}	1.92	7.97^{a}	0.03
$H_3 : \psi_{1,0} = \psi_{1,1} = 0$	16.74^{a}	0.50	15.68^{b}	9.03^{a}	0.42	0.41	8.65^{a}	15.43^{a}	10.38^{b}	1.15	0.69	0.99
$H_4 \ \psi_{2,1} = \psi_{2,2} = 0$	4.18^{a}	13.09^{a}	0.7376	0.32	0.19	0.34	3.07^{b}	0.40	7.43^{a}	0.35	4.54^{a}	1.21
LM ARCH Test	0.72	0.83	0.37	0.60	0.18	0.15	0.48	1.59	0.46	1.55	0.50	0.20
Normality Test	0.94	1.14	1.40	21.01^{a}	20.93^{a}	8.52^{b}	2.18	2.04	1.22	1.37	1.67	1.50
N	61	61	61	61	61	61	61	61	61	61	61	61

The table also shows the results of the hypotheses (H1, H2, H3 and H4) using Wald test. The ARCH LM test and Jarque-Bera Normality test are also reported. Bollerslev-Wooldrige (1992) heteroskedasticity-consistent standard errors are reported in the parenthesis ^{a}, ^{b}, and ^{c} respectively denotes statistical significance at a 1-, 5-, and 10-percent level.

Table 7.9

Return and Volatility Spillover Effects (post crisis period)

The table shows estimation results of Model 1 for sample countries in post crisis period.

$$R_{i,t} = \gamma_{i,0} + \gamma_{i,1} R_{i,t-1} + \sum_{l=0}^{1} \gamma_{i,2,l} \bar{u}_{t-l}^{ASIA} + \sum_{l=1}^{2} \gamma_{i,3,l} \bar{u}_{t-l}^{WORLD} + \varepsilon_{i,t}$$

$$h_{i,t-1} = \alpha_{i,0} + \alpha_{i,1} \varepsilon_{i,t-1}^{2} + \beta_{i} h_{i,t-1} + \sum_{l=0}^{1} \psi_{i,2,l} \bar{u}^{2\,ASIA}_{t-l} + \sum_{l=1}^{2} \psi_{i,3,l} \bar{u}^{2\,WORLD}_{t-l} + \lambda_{i} \varepsilon_{i,t-1}^{2} I_{i,t}$$

	Country											
	India		Indonesia		Malaysia		Pakistan		South Korea		Thailand	
Parameters	(IR)	(US$)	(Rp)	(US$)	(RM)	(US$)	(PR)	(US$)	(Won)	(US$)	(Bht)	(US$)
γ_1	0.0247	0.0173	-0.0204	-0.0173	0.1373 ^{a}	0.0655 ^{b}	0.1148	0.2418 ^{b}	-0.1071	-0.1647 ^{b}	-0.1228 ^{b}	-0.1686 ^{c}
	(0.0804)	(0.0795)	(0.0646)	(0.0808)	(0.0537)	(0.0297)	(0.0755)	(0.0676)	(0.0719)	(0.0652)	(0.0771)	(0.0459)
$\gamma_{2,0}$	0.4395 ^{a}	0.4670 ^{a}	0.9045 ^{a}	1.2436 ^{a}	0.5655 ^{a}	0.5316 ^{b}	-0.1106	-0.0924	1.4673 ^{a}	1.6175 ^{a}	1.0636 ^{a}	1.1786 ^{a}
	(0.1398)	(0.1416)	(0.1430)	(0.1135)	(0.1303)	(0.1196)	(0.1093)	(0.1376)	(0.1446)	(0.1649)	(0.0804)	(0.1421)
$\gamma_{2,1}$	0.2871 ^{c}	0.2880 ^{c}	0.0853	0.2022	0.0588	0.0345	-0.0790	0.1343	0.2546	0.3524	0.0438	-0.0975
	(0.1649)	(0.1666)	(0.1547)	(0.2785)	(0.1813)	(0.1788)	(0.1046)	(0.1961)	(0.1688)	(0.2554)	(0.1497)	(0.1943)
$\gamma_{3,1}$	-0.1355	-0.1289	0.0995	-0.0208	-0.0170	-0.0351	0.1105	-0.1103	0.0218	0.1318	-0.0353	0.2379
	(0.1875)	(0.1888)	(0.2108)	(0.3147)	(0.1415)	(0.1079)	(0.0915)	(0.1651)	(0.1911)	(0.2429)	(0.1790)	(0.2306)
$\gamma_{3,2}$	0.1144 ^{c}	0.1063	0.2544 ^{c}	0.5152 ^{a}	0.1354	0.1410	0.2237	0.4042 ^{b}	0.2586 ^{a}	0.4577 ^{a}	0.2981 ^{b}	0.2829
	(0.0791)	(0.0795)	(0.1677)	(0.1491)	(0.1268)	(0.1654)	(0.1006)	(0.1343)	(0.0985)	(0.1365)	(0.1305)	(0.1793)
α_1	-0.0351	-0.0413	0.0843	0.0760	-0.0516	-0.0595 ^{c}	0.0581 ^{c}	0.0670	0.2285	0.0549	0.2256 ^{c}	0.2176
	(0.0743)	(0.0759)	(0.0834)	(0.1473)	(0.0361)	(0.0246)	(0.0384)	(0.0432)	(0.1860)	(0.0825)	(0.1350)	(0.1567)
β	0.4600 ^{a}	0.4617 ^{a}	0.4413 ^{b}	0.2874	0.1393	0.3461 ^{b}	0.9887 ^{a}	0.9523 ^{a}	0.2130	0.5676 ^{c}	0.4275 ^{b}	0.4653 ^{a}
	(0.1171)	(0.1170)	(0.1230)	(0.2905)	(0.6300)	(0.1827)	(0.0399)	(0.0457)	(0.2329)	(0.3092)	(0.1476)	(0.1296)
λ	0.0442	0.0424	-0.1624 ^{c}	-0.1247	0.1206	0.0680	-0.1871 ^{b}	-0.2063v	-0.2427	-0.1335	-0.3383 ^{c}	-0.3421 ^{b}
	(0.1760)	(0.1720)	(0.0892)	(0.1558)	(0.1932)	(0.0402)	(0.0841)	(0.0654)	(0.1879)	(0.1313)	(0.1348)	(0.1466)
$\psi_{1,0}$	-0.1842	-0.1810	0.3627	-0.8764 ^{a}	0.2501	0.0163	-0.1064	0.1460	0.2721	0.1288	-0.3699 ^{b}	-0.0916
	(0.1426)	(0.1499)	(0.3078)	(0.2636)	(0.2452)	(0.2310)	(0.1366)	(0.3836)	(0.2807)	(0.4481)	(0.0724)	(0.2296)
$\psi_{1,1}$	-0.2603 ^{c}	-0.2698	-0.6752 ^{a}	-0.6450	0.3649	1.7631 ^{b}	0.1683	0.0700	-0.4361 ^{a}	0.2955	-0.2112 ^{c}	-0.3255
	(0.1520)	(0.1549)	(0.1643)	(0.7790)	(0.6810)	(0.7133)	(0.1574)	(0.3898)	(0.1424)	(0.6607)	(0.1246)	(0.2395)
$\psi_{2,1}$	-0.1498	-0.1522	1.0470 ^{b}	0.8245	0.0416	-0.3449	-0.2049	-0.3566	1.1713 ^{a}	1.3108 ^{b}	0.5563 ^{b}	0.6721 ^{c}
	(0.1757)	(0.1797)	(0.5103)	(1.4461)	(0.2120)	(0.2204)	(0.1338)	(0.2063)	(0.4592)	(0.7167)	(0.2432)	(0.4007)
$\psi_{2,2}$	-0.1954	-0.2020	0.4323	-0.9074	0.1326	0.7315	-0.0087	0.2192	-0.6607 ^{a}	-1.2731 ^{a}	-0.0892	0.2208
	(0.1392)	(0.1502)	(0.2989)	(0.5846)	(0.2698)	(0.6120)	(0.1183)	(0.2130)	(0.2576)	(0.4719)	(0.2254)	(0.4031)
Hypotheses:												
$H_1 : \gamma_{2,0} = \gamma_{2,1} = 0$	12.94 ^{a}	13.79 ^{a}	40.14 ^{a}	124.03 ^{a}	18.86 ^{a}	20.13 ^{a}	1.58	1.23	103.04 ^{a}	103.01 ^{a}	174.76 ^{a}	68.78 ^{a}
$H_2 : \gamma_{3,1} = \gamma_{3,2} = 0$	2.19	1.89	2.42	12.02 ^{a}	1.53	0.77	5.55 ^{b}	15.17 ^{a}	8.89 ^{b}	8.89 ^{b}	5.21 ^{c}	3.58
$H_3 : \psi_{1,0} = \psi_{1,1} = 0$	6.53 ^{b}	6.95 ^{b}	32.86 ^{a}	11.08 ^{a}	1.81	6.42 ^{b}	1.24	2.75	11.40 ^{a}	11.40 ^{a}	27.94 ^{a}	2.71
$H_4 \ \psi_{2,1} = \psi_{2,2} = 0$	1.93	1.51	12.60 ^{b}	3.26	0.42	2.61	2.90	1.14	14.34 ^{a}	14.34 ^{a}	7.86 ^{b}	7.18 ^{b}
LM ARCH Test	0.73	0.56	0.06	0.62	0.00	0.07	0.37	0.43	0.01	0.08	0.77	1.15
Normality Test	1.07	1.35	3.87	15.69 ^{b}	8.72 ^{b}	30.69 ^{b}	0.74	1.09	1.07	1.12	1.04	1.19
N	131	131	131	131	131	131	131	131	131	131	131	131

The table also shows the results of the hypotheses H1, H2, H3 and H4 using Wald test. The ARCH LM test and Jarque-Bera Normality test are also reported. Bollerslev-Wooldrige (1992) heteroskedasticity-consistent standard errors are reported in the parenthesis. ^{a}, ^{b}, and ^{c} respectively denotes statistical significance at a 1-, 5-, and 10-percent level

Table 7.10

Return and Volatility Spillover Effects (Markets Renaissance period)

This table shows estimation results of Model 1 for sample countries in market renaissance period

$$R_{i,t} = \gamma_{i,0} + \gamma_{i,1} R_{i,t-1} + \sum_{l=0}^{1} \gamma_{i,2,l}\hat{u}_{t-l}^{ASIA} + \sum_{l=1}^{2} \gamma_{i,3,l}\hat{u}_{t-l}^{WORLD} + \varepsilon_{i,t}$$

$$h_{i,t-1} = \alpha_{i,0} + \alpha_{i,1}\varepsilon_{i,t-1}^{2} + \beta_{i} h_{i,t-1} + \sum_{l=0}^{1} \psi_{i,2,l}\hat{u}^{2\,ASIA}_{t-l} + \sum_{l=1}^{2} \psi_{i,3,l}\hat{u}^{2\,WORLD}_{t-l} + \lambda_{i}\varepsilon_{i,t-1}^{2} I_{i,t}^{-}$$

Parameters					Country							
	India		Indonesia		Malaysia		Pakistan		South Korea		Thailand	
	(IR)	(US$)	(Rp)	(US$)	(RM)	(US$)	(PR)	(US$)	(Won)	(US$)	(Bht)	(US$)
γ_1	0.2076 ^{a}	0.1462 ^{b}	0.0049	0.0978	0.0476	0.0717	0.0465	0.1501 ^{b}	-0.0340	-0.0629 ^{c}	-0.0981	-0.0605
	(0.0685)	(0.0723)	(0.0625)	(0.0531)	(0.0719)	(0.0760)	(0.0571)	(0.0503)	(0.0355)	(0.0323)	(0.0679)	(0.0695)
$\gamma_{2,0}$	0.5827 ^{a}	0.6042 ^{b}	0.4767 ^{a}	0.5594 ^{a}	0.3778 ^{a}	0.3661 ^{b}	0.1667 ^{c}	0.0958	1.2219 ^{a}	1.3884 ^{b}	0.5884 ^{b}	0.6530 ^{a}
	(0.0827)	(0.1227)	(0.1151)	(0.1399)	(0.0556)	(0.0541)	(0.0936)	(0.1067)	(0.0979)	(0.1034)	(0.0908)	(0.0859)
$\gamma_{2,1}$	0.1379	0.1616	0.1790	0.1422	0.1396 ^{c}	0.1617 ^{c}	-0.1615	0.0741	0.2341	0.2233 ^{c}	0.2722	0.0375
	(0.1089)	(0.1522)	(0.1135)	(0.1682)	(0.0917)	(0.0966)	(0.1423)	(0.1411)	(0.1419)	(0.1225)	(0.1219)	(0.1027)
$\gamma_{3,1}$	-0.1455 ^{c}	-0.1954	-0.0949	-0.1309	-0.0194	-0.0084	0.2646	0.1924	-0.3239	-0.2547	-0.0370	0.1188
	(0.0897)	(0.1496)	(0.0649)	(0.1244)	(0.0762)	(0.0659)	(0.1720)	(0.1833)	(0.1297)	(0.1714)	(0.1318)	(0.1226)
$\gamma_{3,2}$	0.2964 ^{a}	0.3302 ^{a}	0.1741 ^{b}	0.3487 ^{a}	0.0505 ^{c}	0.0452 ^{c}	0.1539 ^{a}	0.1186 ^{b}	0.1489	0.1685	0.1312 ^{b}	0.3449
	(0.0429)	(0.0454)	(0.1011)	(0.1084)	(0.0247)	(0.0255)	(0.0468)	(0.0459)	(0.1093)	(0.1342)	(0.0504)	(0.0387)
α_1	-0.1529 ^{b}	0.0749	-0.0632	0.0187	-0.0316	-0.0243	0.0790	0.0740	-0.0759 ^{a}	0.1194	0.2044 ^{b}	0.2371
	(0.0775)	(0.1304)	(0.0215)	(0.0596)	(0.0549)	(0.0707)	(0.1093)	(0.1075)	(0.0345)	(0.0957)	(0.0649)	(0.0541)
β	0.4657 ^{a}	0.5128 ^{a}	0.2215 ^{c}	0.3056	0.3600	0.3927 ^{b}	0.4761 ^{a}	0.4876 ^{b}	0.8350	0.4638 ^{a}	0.8091 ^{b}	0.9386 ^{a}
	(0.2579)	(0.0635)	(0.1362)	(0.6712)	(0.4760)	(0.1045)	(0.1139)	(0.2504)	(0.0536)	(0.1771)	(0.0627)	(0.0303)
λ	0.4588 ^{b}	-0.0065	-0.0632 ^{b}	0.0485	-0.0316	0.0963	-0.1464	-0.1419 ^{a}	0.1028 ^{c}	-0.2701	-0.1646	-0.2993 ^{b}
	(0.2253)	(0.1871)	(0.0215)	(0.0854)	(0.0549)	(0.1156)	(0.1073)	(0.1075)	(0.0568)	(0.1047)	(0.0770)	(0.0521)
$\psi_{1,0}$	0.2666 ^{c}	-0.0355	0.2863 ^{c}	0.3633	-0.0196	-0.0280	-0.1050	-0.0818	0.0241 ^{a}	0.0847	0.0474	0.0476
	(0.1506)	(0.2540)	(0.1672)	(0.3107)	(0.0360)	(0.0262)	(0.0788)	(0.1307)	(0.0966)	(0.1580)	(0.0826)	(0.0731)
$\psi_{1,1}$	-0.0746	-0.0909	0.2456 ^{b}	-0.0076	-0.0215	-0.0237	-0.0939	-0.0952	-0.1354 ^{a}	-0.2994	-0.2262 ^{c}	-0.1488
	(0.1106)	(0.1354)	(0.1921)	(0.4472)	(0.0687)	(0.0675)	(0.1474)	(0.1610)	(0.1424)	(0.1043)	(0.1014)	(0.1025)
$\psi_{2,1}$	-0.0639	-0.0749	-0.2486 ^{b}	-0.2517	-0.0131	-0.0149	0.0124	-0.0691	-0.1629 ^{b}	0.1594 ^{c}	-0.1505 ^{b}	-0.0548 ^{c}
	(0.0530)	(0.0643)	(0.0966)	(0.0983)	(0.0320)	(0.0460)	(0.1364)	(0.0919)	(0.0527)	(0.1594)	(0.0933)	(0.0472)
$\psi_{2,2}$	-0.0657 ^{b}	-0.0812	0.0851	-0.0253	-0.0223 ^{c}	-0.0227 ^{b}	-0.1343	-0.1150 ^{a}	0.5612 ^{a}	0.7013 ^{a}	-0.1189	-0.0675 ^{a}
	(0.0259)	(0.0559)	(0.0984)	(0.0933)	(0.0129)	(0.0024)	(0.0953)	(0.0478)	(0.0990)	(0.2079)	(0.0805)	(0.0302)
Hypotheses:												
$H_1 : \gamma_{2,0} = \gamma_{2,1} = 0$	49.62 ^{a}	24.25 ^{a}	17.46 ^{a}	16.11 ^{a}	47.55 ^{a}	48.48 ^{a}	4.99 ^{c}	0.99	103.04 ^{a}	183.01v	43.80 ^{a}	57.80 ^{a}
$H_2 : \gamma_{3,1} = \gamma_{3,2} = 0$	47.67 ^{a}	55.97 ^{a}	6.68 ^{b}	12.82 ^{a}	4.19	3.14	14.55 ^{a}	8.48 ^{b}	8.89 ^{b}	4.47	6.88 ^{b}	79.42 ^{a}
$H_3 : \psi_{1,0} = \psi_{1,1} = 0$	3.45	0.97	6.45 ^{b}	1.73	0.94	2.58	4.56	1.36	11.40 ^{b}	26.13 ^{a}	6.46 ^{b}	2.78
$H_4 \;\; \psi_{2,1} = \psi_{2,2} = 0$	6.43 ^{b}	3.72	6.61 ^{b}	11.69 ^{a}	3.31	273.62 ^{a}	4.37	8.50 ^{b}	14.34 ^{a}	16.41 ^{a}	2.59	5.31
LM ARCH Test	1.03	0.31	0.01	0.24	0.01	0.00	0.24	0.63	0.07	0.05	0.28	0.27
Normality Test	3.85	24.95 ^{a}	6.18	5.80 ^{c}	7.75 ^{c}	7.17 ^{c}	32.32 ^{a}	40.05 ^{a}	3.60	0.09	1.05	3.27
N	158	158	158	158	158	158	158	158	158	158	158	158

. The table also shows the results of the hypotheses H1, H2, H3 and H4 using Wald test. The ARCH LM test and Jarque-Bera Normality test are also reported. Bollerslev-Wooldrige (1992) heteroskedasticity-consistent standard errors are reported in the parenthesis. ^{a}, ^{b}, and ^{c} respectively denotes statistical significance at a 1-, 5-, and 10-percent level

Regional Spillover Effects (Model 2)

Our prime motivation underlying regional analysis is to distinguish segmentation of markets within region. Previous studies have shown the lowest degree of risk sharing among the East Asian countries due to uninsurable country specific risks such as shocks in the non-traded sector, wage and labor markets. Also most East Asian countries have less developed financial markets with high transaction costs and information asymmetry (Wang, 2004). It is possible that level of co-movement that each market displays with the markets in other countries also depends on the set of regulations it has in place. The absence of common regulations in Asian countries might be one cause of low regional integration. Yang et al. (2003) find linkage among the Asian stock markets during crisis, indicating that some of the markets might not be integrated with other regional markets during normal time. We argue that there is very little empirical work on the regional integration for Southeast Asian countries. To this end, we examine the returns and volatility effects from the regional stock markets of Hong Kong, Japan, and Singapore using Model 2.

The estimation results are shown in Table 7.11. We find difference in the impact of contemporaneous returns spillover effects from Japan, Singapore and Hong Kong to Indonesia, Malaysia, South Korea and Thailand. For instance, impact of returns spillover effects from Japan is the highest and the lowest for South Korea and Thailand respectively as shown by coefficient $\gamma_{2,0}$. This finding is opposite to Johnson and Soenen (2002). They find significant contemporaneous relation between stock market of Thailand and Japan over 1988-1998 using Geweke (1982) feedback measure. Another possible reason for lack of influence from Japan to these markets might be due to rapid economic growth in many countries relative to Japan (Johnson and Soenen 2002). On the other hand, impact of returns spillover effects from Singapore is the highest and the lowest for Thailand and Indonesia as shown by coefficient $\gamma_{3,0}$. The impact of returns spillover effects from Hong Kong is the highest and the lowest for South Korea and Pakistan.

Table 7.11
Return and Volatility Spillover Effects (Model 2)

The table reports the estimation results of Model 2.

$$R_{i,t} = \gamma_{i,0} + \gamma_{i,1}R_{i,t-1} + \sum_{l=0}^{1}\gamma_{i,2,l}\bar{u}_{t-l}^{JP} + \sum_{l=0}^{1}\gamma_{i,3,l}\bar{u}_{t-l}^{SG} + \gamma_{i,4}\sum_{l=0}^{1}\gamma_{i,4,l}\bar{u}_{t-l}^{HKG} + \gamma_5 FC + \varepsilon_{i,t}$$

$$H_{i,t} = \alpha_{i,0} + \alpha_{i,1}\varepsilon_{i,t-1}^{2} + \beta_i H_{i,t-1} + \sum_{l=0}^{1}\psi_{i,2,l}\bar{u}^{2\,JP}_{t-l} + \sum_{l=0}^{1}\psi_{i,3,l}\bar{u}^{2\,SG}_{t-l} + \sum_{l=0}^{1}\psi_{i,4,l}\bar{u}^{2\,HKG}_{t-l} + \lambda_i\varepsilon_{i,t-1}^{2}I_{i,t-l}^{-}$$

Parameters	Country					
	India	Indonesia	Malaysia	Pakistan	South Korea	Thailand
γ_1	0.1337^{a}	0.0278	0.0816^{b}	0.2044^{a}	-0.0677^{c}	0.0302
	(0.0379)	(0.0369)	(0.0383)	(0.0397)	(0.0358)	(0.0376)
$\gamma_{2,0}$	0.1239^{a}	0.0445	0.0314^{b}	0.0763^{b}	0.2365^{a}	-0.0024
	(0.0458)	(0.0362)	(0.0121)	(0.0393)	(0.0471)	(0.0432)
$\gamma_{2,1}$	-0.0159	0.0068	-0.0257	-0.0411	0.0112	0.0476
	(0.0384)	(0.0329)	(0.0242)	(0.0318)	(0.0484)	(0.0423)
$\gamma_{3,0}$	0.2011^{a}	0.3209^{a}	0.4947^{b}	0.0964^{c}	0.2980^{a}	0.6224^{a}
	(0.0575)	(0.049)	(0.0352)	(0.0538)	(0.0627)	(0.0591)
$\gamma_{3,1}$	-0.0416	0.0715	0.0905^{a}	0.0035	0.0582	-0.0088
	(0.0535)	(0.0515)	(0.0395)	(0.0541)	(0.0605)	(0.0623)
$\gamma_{4,0}$	0.0619	0.0886^{a}	0.1024^{b}	0.0188	0.1940^{a}	0.1671^{a}
	(0.0498)	(0.0335)	(0.0303)	(0.0443)	(0.0443)	(0.0472)
$\gamma_{4,1}$	0.1104^{b}	0.1057^{a}	-0.0214	0.1321^{a}	0.0494	-0.0120
	(0.0450)	(0.0366)	(0.0275)	(0.0500)	(0.0524)	(0.0438)
γ_5	-0.0019	-0.0109	-0.0094	0.0006	-0.0028	-0.0053
	(0.0043)	(0.0076)	(0.0058)	(0.0061)	(0.0062)	(0.0061)
α_1	0.1670^{a}	-0.0198	0.0113	0.2086	-0.0020	0.0297
	(0.0623)	(0.0155)	(0.0149)	(0.0689)	(0.0174)	(0.0228)
β	0.7450^{a}	0.9130^{a}	0.9001^{a}	0.4682^{a}	0.9250^{a}	0.8886v
	(0.0506)	(0.0186)	(0.0228)	(0.0581)	(0.0319)	(0.0314)
λ	0.0250	0.0864	0.0751^{b}	-0.1175	0.0496	0.0632^{c}
	(0.0681)	(0.0266)	(0.0352)	(0.0813)	(0.0251)	(0.0335)
$\psi_{1,0}$	0.1357^{b}	0.0371	-0.0180^{b}	-0.0173	0.0774	0.0223
	(0.0591)	(0.0314)	(0.0092)	(0.0243)	(0.0522)	(0.0412)
$\psi_{1,1}$	-0.1324^{a}	-0.0485	0.0287^{b}	-0.0473^{a}	-0.0623	-0.0171
	(0.0460)	(0.0310)	(0.0138)	(0.0132)	(0.0512)	(0.0401)
$\psi_{2,0}$	0.1534^{a}	0.0759^{c}	0.1120^{a}	-0.0071	0.1396^{a}	0.1947^{a}
	(0.0589)	(0.0396)	(0.0216)	(0.0290)	(0.0595)	(0.0776)
$\psi_{2,1}$	-0.1354^{a}	-0.0108	-0.1234^{a}	-0.0026	-0.1135^{c}	-0.1543^{c}
	(0.0480)	(0.0417)	(0.0200)	(0.0232)	(0.0584)	(0.0767)
$\psi_{3,0}$	0.0481^{c}	-0.0078	0.0230^{a}	0.0365	0.0124	0.0003
	(0.0440)	(0.0056)	(0.0086)	(0.0362)	(0.0104)	(0.0113)
$\psi_{3,1}$	-0.0612^{c}	-0.0104	0.0454^{a}	-0.0160	0.0423	0.0090
	(0.0349)	(0.0072)	(0.0153)	(0.0566)	(0.0356)	(0.0262)
ψ_4	-0.00002	0.0002^{b}	0.0001^{c}	0.0008	0.00006	0.00005
	(0.00005)	(0.0001)	(0.00007)	(0.0003)	(0.00008)	(0.0006)
Hypotheses:						
$H_5 : \gamma_{2,0} = \gamma_{2,1} = 0$	8.10^{a}	1.50	7.31^{a}	10.75^{a}	25.23^{a}	1.26
$H_6 : \gamma_{3,0} = \gamma_{3,1} = 0$	2.23	42.85^{a}	216.42^{a}	3.21	24.39^{a}	111.19^{a}
$H_7 : \psi_{4,0} = \psi_{4,1} = 0$	6.08^{b}	14.93^{a}	12.04^{a}	6.97^{b}	19.47^{a}	12.62^{a}
$H_8\ \psi_{1,0} = \psi_{1,1} = 0$	10.30^{a}	5.80^{c}	4.31	12.73^{a}	3.04	0.37
$H_9\ \psi_{2,0} = \psi_{2,1} = 0$	7.95^{a}	18.40^{a}	44.64^{a}	0.10	6.37^{b}	8.08^{b}
$H_{10}\ \psi_{3,0} = \psi_{3,1} = 0$	4.82^{c}	2.36	10.11^{a}	1.10	3.50	0.12
LM ARCH Test	0.21	0.93	0.03	0.21	0.04	1.47
Normality Test	11.67^{a}	25.16^{a}	95.71^{a}	54.01^{a}	3.27	10.67^{a}
N	782	782	782	782	782	782

The table also presents test of hypothesis (H5, H6, H7, H8, H9 and H10) using Wald test. ARCH LM test and Jarque-Bera Normality test. Bollerslev-Wooldrige heteroskedasticity-consistent standard errors are reported in the parenthesis. [a], [b], and [c] respectively denotes statistical significance at a 1-, 5-, and 10-percent level

We reject (H5) for India, Malaysia, Pakistan, and South Korea indicating the contemporaneous spillover effects from Japan, but there are no such effects in the case of Indonesia and Thailand. There is significant evidence of return spillover effects from Singapore to all the countries (*p*-value <0.01), thus, (H6) is rejected for all countries (except India and Pakistan). The hypothesis (H7) is rejected for all countries. These findings indicate stock markets of India and Pakistan have no contemporaneous relationship with Singapore.

The volatility spillover effects from the regional markets show different patterns of volatility transmission. For instance, we find significant volatility spillover effects from Japan and Hong Kong to India and Malaysia also shown by Johnson and Soenen (2002). They find significant relationship between Japan and India, Indonesia, and Malaysia during the later years of 1990s. We find significant volatility spillover effects from Singapore for all countries reject (except Pakistan). The higher magnitude of coefficient $\psi_{2,0}$ indicates volatility spillover effect for Thailand and South Korea are due to Singapore. We reject (H10) for India and Malaysia (*p*-value <0.10, and <0.01 respectively) suggesting contemporaneous and one-period lagged volatility spillover effects from Hong Kong. In sum, our analysis show that within Asian region, stock market of Pakistan is isolated and rests of the markets have varying degree of integration with the region's largest stock markets.

7.5.2 The Effect of Exchange Rates

Roll (1992) argues that when returns of stock index are expressed in a country's local currency, part of the index return volatility is induced by monetary phenomenon such as anticipated and actual inflation rates. There is a reason to believe that in the context of stock market liberalization, inflation as well as exchange rate movements will be of concern to international investors. According to Kim and Singal (2000), increase in capital flows after market opening may result in greater inflation and a stronger currency because if there are not enough investment opportunities to absorb new inflow of foreign capital, excess capital may fuel inflation and larger changes in portfolio of capital flows (inflow and outflow) increase the volatility of inflation and exchange rates[6]. However, the empirical evidence is mixed for countries after opening of markets. Using exchange rates expressed as U.S. $ per unit of local currency, Kim and Singal (2000) found that changes in exchange rates have been negative in sample countries prior to market opening, which implied a significant decrease in the currency value of emerging markets but this rate of depreciation fell significantly after market opening. The currency of Pakistan showed more rapid depreciation after market opening than other countries after one year of market opening, whereas, Thailand and South Korea experienced relative appreciation in their local currencies after 3 years of market opening.

On the other hand, Tsutsui and Hirayama (2004) argue that if dominant cause of the stock price co-movements are real shocks common to many countries, exchange rates would not play a leading role in stock price linkage. However, if active portfolio adjustments by international investors are the chief cause of the linkage, exchange rates must be a contributing factor in transmitting shocks from one country to another, because investors compute stock returns in their local currency. They found that portfolio adjustments due to changes in the exchange rates are not a significant cause of stock price co-movements for London, Tokyo and New York stock markets.

To test that our results are robust to currency denomination, we also report estimates in a common currency, U.S. $, besides in local currency for each country. We are interested in finding out whether portfolio adjustments by international investors due to depreciation of local currencies have been a contributing factor in transmitting shocks from one country to another. Compared to the results that use domestic currency there is no significant difference between the two set of estimates during the pre-break period for India and Malaysia (see Table 7.5). However, there is significant difference between two set of estimates for Pakistan, which indicates significant volatility spillover effects from both regional markets and the World Index. This

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[6] Some Asian countries had fixed exchange rates prior to market opening and financial crisis.

finding show that exchange rate changes have been a contributing factor in transmitting shocks to Pakistan, as a result, we reject (H3) and (H4) for Pakistan. In the post-break period, we find evidence of increase in return spillover effects from the region to Indonesia and decrease in one-period lagged volatility spillover effects from the World Index to India, and Thailand (see Table 7.6). The finding is consistent with view that the effect of the world factors on domestic volatility is reduced when local currency appreciates.

During the financial crisis period, we find increase in magnitude of returns spillovers from the World Index to Indonesia and Malaysia shown by coefficient $\gamma_{3,1}$, respectively (see Table 7.7). This finding again shows that stock price co-movements have been the outcome of exchange rates changes common across these countries. In the post-crisis period, results are nearly similar to local currency for Indonesia, Pakistan and South Korea. There has been decrease in spillover effect from the World Index to Indonesia and Malaysia. During the stock markets renaissance period, we find no evidence of volatility spillovers from world to India, Indonesia and Thailand and regional return spillovers to Pakistan and South Korea (see Table 7.9). In sum, our estimates that use returns measured in U.S. $ tell the same story i.e., stock market integration has been time varying. The regional factors have been more important rather global factors for some Asian markets compared other countries.

7.6. Conclusion

In this chapter, we have investigated the degree of stock market integration for 6 Southeast Asian countries. The correlation analysis and stock market integration scores show that co-movement of stock returns has been time-varying prior to Asian financial crisis. In general, stock market integration at regional level has been significantly influenced by bilateral trade. This findings appears to be consistent with recent studies (Forbes and Chinn, 2003; Johnson and Soenen, 2002).

We find that stock markets show more global integration rather than regional integration.In particular, stock market liberalization events, such as introduction of country funds, DRs, cross border listings and US $ capital flows have significant influenced the level of global integration and reduced market segmentation. Overall, our findings seem support time varying nature of stock markets integration as suggested in recent studies (Ng, 2000; Chelley-Steely, 2004; Barari, 2004).

Our results have policy implication for portfolio investors in sense that portfolio diversification advantages are rather less after capital account liberalization in Indonesia, Malaysia, South Korea and Thailand compared to India and Pakistan which still provide higher returns through portfolio diversification. These findings have critical implications for the regulators and policy makers of the Asian countries, for example, how to sustain the nexus of global integration and at the same time promote regional integration? Whether a global or regional integration is more beneficial for the policy makers and economic development in general? How sensible is it, in an increasingly global economy, to make policy decisions largely at the national level? (Brooks et al, 2003). We believe that this is an important research area worth exploring in the context of cost and benefits of liberalization debate. Another critical question that emerges from global integration scores is, what inference can we draw about impact of gradual integration on cost of equity capital for these countries? This issue is dealt in next empirical chapter.

APPENDIX –7

Correlation Coefficients Stock Market 1990-2004

This table presents the bi-variate yearly correlation coefficients of sample stock markets relative to the developed markets the (UK and the US); MSCI AC World and Asia Pacific Index, Regional stock markets Japan, Singapore and Hong Kong as well as between sample countries over 1989-2004. The arrow sign shows ↑ increase (↓decrease) in the size of the calculated correlation coefficient for each country.

India	Developed markets				Regional markets							
YEAR	US	UK	WORLD	ASIA	JP	SG	HK	ID	PAK	KOR	MAL	THL
1990	-0.0121	-0.2374	-0.2122	-0.1578	-0.2189	-0.2206	0.0135	0.0001	0.0660	-0.1978	-0.0710	0.2660
1991	0.2378	0.1949	0.1285	0.0500	0.0417	-0.0128	0.0444	0.0841	0.0892	0.0479	0.1240	-0.0017
1992	0.0931	-0.2361	-0.1886	-0.0771	-0.0443	-0.1590	-0.2691	0.0670	-0.2298	-0.0595	-0.1297	0.2657
1993	-0.0021	0.1151	-0.0385	-0.0584	-0.1037	0.1486	0.0587	0.0382	-0.0021	-0.0028	0.0688	0.0177
1994	0.1864	0.0822	0.1160	0.3145	0.3191 ^{b}	0.1305	0.0425	0.1889	-0.1724	0.3713 ^{a}	0.4256 ^{a}	0.3155 ^{a}
1995	-0.1812	0.0341	0.1674	0.2899 ^{b}	0.2260	0.1155	0.1502	0.2720	0.1694	0.2738 ^{b}	0.0361	-0.0017
1996	0.1970	-0.1160	-0.0535	0.0222	-0.0648	-0.4047	-0.2059	-0.0136	0.0282	0.1709	0.0142	-0.0261
1997	0.0499	0.1570	0.2376	0.1366	0.0615	0.1921	0.1400	0.5287 ^{a}	0.2520	0.1153	0.3409 ^{a}	0.1758
1998	0.3050 ^{b}↑	0.1429↓	0.2243↓	0.0746↓	-0.0181↓	0.1194↓	0.0656↓	0.1940↓	0.0695↓	-0.0131↓	0.1444↓	0.0976↓
1999	-0.0578	0.1954↑	0.2989 ^{b}↑	0.0762	0.0183	0.0891	0.1058	0.2542↑	0.1630↑	0.2336↑	0.1879↑	0.1270↑
2000	0.0228	0.0361	0.3588 ^{a}	0.4756 ^{a}	0.4956 ^{a}	0.3471 ^{b}	0.4160 ^{a}	0.1865	0.0011	0.3885 ^{a}	0.1945	0.2131
2001	0.4223 ^{a}	0.2237	0.5117 ^{a}	0.5063 ^{a} ↑	0.4435 ^{a}	0.5756 ^{a}	0.4901 ^{a} ↑	0.1193	0.3539 ^{b}↑	0.5703 ^{a} ↑	0.1956	0.2608↑
2002	0.1424	0.2317	0.1446	0.2460	0.2288	0.1492	0.2744 ^{b}	0.1566	0.3348 ^{b}	0.2253	0.1389	0.1846
2003	0.4002 ^{a}	0.1124	0.4163 ^{a}	0.4063 ^{a}	0.3268 ^{b}	0.4617 ^{a}	0.4672 ^{a}	0.3021 ^{b}	-0.0078	0.3749 ^{a}	0.2545	0.3856 ^{a}
2004	0.4293 ^{a}	0.3703 ^{a}	0.4143 ^{a}	0.3728 ^{a}	0.2960 ^{b}	0.4963 ^{a}	0.3987 ^{a}	0.5281 ^{a}	0.1030	0.3681 ^{a}	0.2575	0.5467 ^{a}

Indonesia YEAR	US	UK	WORLD	ASIA	JP	SG	HK	IN	PAK	KOR	MAL	THL
1990	0.0781	-0.2610	0.2773 ^{b}	0.2206	0.2139	0.4141 ^{a}	0.2413	0.0017	0.0240	0.0307	0.3591 ^{a}	0.3470 ^{a}
1991	0.0014	-0.1500	0.1751	0.1037	0.1770	0.1801	0.0238	0.0841	0.0984	0.0256	0.2440	0.3469 ^{b}
1992	-0.2707	-0.1019	-0.1842	-0.0264	-0.0133	-0.0545	0.2699	0.0670	0.0459	0.1333	0.1984	0.0985
1993	0.0870	-0.2398	0.1740	-0.0255	-0.0559	0.1526	-0.0321	0.0382	0.0907	0.1717	0.0204	0.0854
1994	0.0913	0.1135	0.3996 ^{b}	0.3539 ^{b}	0.2122	0.4396 ^{a}	0.4700 ^{a}	0.1889	-0.1724	0.3712 ^{a}	0.4256 ^{a}	0.3155 ^{b}
1995	0.0459	-0.0104	0.3335 ^{b}	0.3922 ^{b}	0.2517	0.3845 ^{b}	0.4302 ^{a}	0.2720	0.3320 ^{a}	0.0987	0.5242 ^{a}	0.5908 ^{a}
1996	0.3199 ^{b}	0.1701	0.3875 ^{a}	0.2980 ^{b}	0.1615	0.4750 ^{b}	0.3309 ^{b}	-0.0136	0.2592	-0.0372	0.3041 ^{b}	0.4156 ^{a}
1997	0.1512	0.2554	0.3024 ^{b}	0.2251	0.0697	0.3197 ^{b}	0.3012 ^{b}	0.5287 ^{a}	0.2520	0.0115	0.4009 ^{a}	0.1658
1998	0.4110 ^{a}	0.3688 ^{a} ↑	0.3238 ^{b}↑	0.5059 ^{a}	0.4609 ^{a}	0.5208 ^{a} ↑	0.3761 ^{a} ↑	0.1940	-0.0748	0.3951 ^{a} ↑	0.4414 ^{a} ↑	0.5422 ^{a} ↑
1999	0.3014 ^{b}	0.0561	0.3599 ^{a} ↑	0.3341 ^{b}	0.1424	0.3405 ^{b}	0.4017 ^{a}	0.2542	-0.0603	0.1716	0.2300	0.5412 ^{a}
2000	0.0041	-0.1512	0.1914	0.3051 ^{b}	0.2300	0.3555 ^{b}	0.2743 ^{b}	0.1865	0.0879	0.3587 ^{a}	0.0830	0.2358
2001	0.0800	-0.1979	0.0259	0.0927	0.0605	0.1417	0.0086	0.1193	0.0207	0.1176	0.3225 ^{a} ↑	0.3577 ^{a} ↑
2002	-0.2237	0.1425	0.2317	0.1466	0.2456	0.2289	0.1792	0.2745 ^{b}	0.1567	0.3348 ^{b}	0.2254	0.1390
2003	0.1838	0.0581	0.2728	0.4416 ^{a}	0.4822 ^{a}	0.5113 ^{a}	0.4021 ^{a}	0.3021 ^{b}	-0.0636	0.3560 ^{a}	0.3008 ^{b}	0.2661
2004	0.4367 ^{a}	0.2697	0.5814 ^{a}	0.4883 ^{a}	0.3808 ^{a}	0.5932 ^{a}	0.5793 ^{a}	0.5281 ^{a}	0.1645	0.6118 ^{a}	0.5136 ^{a}	0.3769 ^{a}

$^{a,\ b,\ \text{and}\ c}$ denotes significance at 1, 5 and 10% level respectively, countries and Indexes are abbreviated as follows: MSCI AC World Index (WORLD); MSCI Asia and Pacific Index (ASIA); Japan (JP), Singapore (SG), Hong Kong (HK), India (IN), Indonesia (ID), Malaysia (MA), Pakistan (PAK), South Korea (KOR) and Thailand (THL).

Malaysia	Developed markets				Regional markets							
YEAR	US	UK	WORLD	ASIA	JP	SG	HK	IN	ID	PAK	KOR	THL
1990	0.3366^{b}	0.1917	0.7316^{b}	0.6176^{a}	0.6572^{a}	0.8309^{a}	0.5775^{a}	-0.0710	0.3591^{a}	0.3788^{a}	0.2850^{a}	0.5050^{a}
1991	0.3065^{b}	0.2530	0.5026^{b}	0.3633^{a}	0.3737^{a}	0.5767^{a}	0.0834	0.1240	0.2440	0.0070	-0.0881	0.4565^{a}
1992	0.2514	0.0341	0.2922^{b}	0.2170	0.2394	0.4520^{a}	0.3115^{b}	-0.1297	0.1894	0.0567	0.2923^{a}	0.2623
1993	0.2456	0.2585	0.3797^{a}	0.3159^{c}	0.1816	0.6590^{a}	0.4783^{a}	0.0688	0.0204	0.1784	0.4021^{a}	0.3195^{c}
1994	0.0615	0.1471	0.2406	0.3764	0.1703	0.7737^{a}	0.4173^{a}	0.3001^{b}	0.4256^{a}	0.0063	0.2856	0.5741^{a}
1995	0.0600	0.2316	0.3547^{a}	0.3399^{c}	0.1915	0.5114^{b}	0.5312^{a}	0.0361	0.5242^{a}	0.2615	0.0567	0.4816^{a}
1996	0.0595	-0.0578	0.4435^{a}	0.3338^{c}	0.2354	0.5344^{a}	0.3522^{b}	0.0122	0.3041^{b}	0.1072	0.1804	0.4181^{a}
1997	0.2724	0.0073	0.2889^{b}	0.1891	-0.0016	0.5878^{a}	0.2260	0.2699	0.4009^{a}	0.3165^{b}	0.2421	0.4005^{a}
1998	0.3843^{a} ↑	0.2941^{b} ↑	0.4296^{a} ↑	0.6824^{a}↑	0.6226^{a} ↑	0.6310^{a} ↑	0.4559^{a} ↑	0.1444↓	0.4414^{a} ↑	0.0076↓	0.4041^{a} ↑	0.4848^{a} ↑
1999	0.2323	-0.0292	0.3648^{a} ↓	0.1384↓	0.1354↓	0.2838^{b}↓	0.1394↓	0.1879	0.2033↓	0.1528	0.0686↓	0.2460↓
2000	0.0870	-0.1452	0.2061	0.2274	0.2212	-0.0149	0.1213	0.1945	0.0830	0.0736	0.1569	0.1690
2001	0.2601	0.0956	0.3091^{b}	0.1907	0.1435	0.3532^{b}	0.3681^{a}	0.1956	0.3225^{b}	-0.1013	0.3570^{a}	0.2910^{a}
2002	-0.1491	0.4356^{a}	-0.1515	0.5078^{a}	0.6051^{a}	0.4788^{a}	0.3979^{a}	0.4760^{a}	0.2254	0.1233	0.0355	0.4072^{a}
2003	0.1262	-0.0712	0.3851^{a}	0.4700^{a}	0.4199^{a}	0.4428^{a}	0.4434^{a}	0.2545	0.3008^{b}	0.0988	0.3612^{a}	0.3888^{a}
2004	0.2670	0.2015	0.5320^{a}	0.5040^{a}	0.4827^{a}	0.4712^{a}	0.5151^{a}	0.2575	0.5136^{a}	-0.1518	0.4296^{a}	0.3533^{a}

Pakistan												
YEAR	US	UK	WORLD	ASIA	JP	SG	HK	IN	ID	KOR	MAL	THL
1990	0.1669	0.1589	0.3764^{a}	0.3029^{b}	0.3285^{b}	0.3229^{b}	0.3896^{b}	0.0660	0.0240	0.1364	0.3788^{a}	0.3400^{b}
1991	0.0960	0.0082	-0.1915	-0.1412	-0.1397	-0.1082	-0.0324	0.0892	0.0984	0.2214	0.0070	-0.0816
1992	-0.0832	0.1852	0.0250	-0.0821	-0.2028	0.0297	0.0417	-0.2298	0.0459	0.0505	0.0567	0.0801
1993	0.0257	-0.1536	-0.0733	0.0245	-0.1118	0.0966	0.0537	-0.0021	0.0907	0.2589	0.1784	0.3397^{b}
1994	0.0710	-0.1131	0.0549	0.1897	0.3075^{b}	-0.0825	-0.2527	0.1351	-0.1724	-0.0991	0.0063	-0.1612
1995	0.0268	-0.0419	0.2789^{b}	0.2682	0.2081	0.0839	-0.1187	0.1694	0.3320	-0.1662	0.2615	0.1220
1996	0.2177	-0.0959	0.1380	0.0596	-0.0400	0.3432^{b}	0.1741	0.0282	0.2592	0.0247	0.1073	0.2931^{b}
1997	0.2166	0.0150	0.2406	0.3958^{a}	0.4050^{a}	0.4542^{a}	0.1356	0.1771	0.2520	0.0672	0.3165^{b}	0.2195
1998	0.0919↓	-0.1522↓	0.0892↓	0.0013↓	-0.0263↓	0.0879↓	0.1568	0.0695↓	-0.0748↓	-0.0601↓	0.0076↓	0.1056↓
1999	0.0627	0.1541↑	0.0470	0.1311↑	0.1231↑	0.2312↑	0.0885	0.1630↑	-0.0603	-0.2118	0.1528↑	0.0274
2000	0.1426	0.0236	0.1332	-0.1221	-0.0440	-0.0360	-0.0562	0.0011	0.0879	-0.1549	0.0736	0.1611
2001	0.0793	0.0688	0.1903↑	0.1279↑	0.1609↑	0.2607↑	0.0989	0.3539^{b}↑	0.0207	0.3356^{b}↑	0.1013↑	-0.0110
2002	0.1627	0.0379	-0.0747	0.2227	0.0499	0.0754	0.0145	-0.0236	0.1670	0.1123	0.1233	0.1878
2003	0.0438	-0.0334	0.0642	0.0518	-0.0380	0.0844	-0.0628	-0.0078	-0.0636	0.2176	0.0988	-0.1654
2004	-0.0670	-0.1856	-0.0212	0.0809	0.0362	0.0051	-0.0343	0.1030	0.1645	-0.0324	-0.1518	0.0418

Appendix 7 (continued...)

Korea	Developed markets				Regional markets							
YEAR	US	UK	WORLD	ASIA	JP	SG	HK	ID	IN	PAK	MAL	THL
1990	0.2216	0.0799	0.3212^{b}	0.2603	0.2347	0.2589	0.2945^{b}	-0.1978	0.0307	0.1364	0.2850^{b}	0.3540^{b}
1991	0.0990	0.1750	0.2487	0.4576^{a}	0.4238^{a}	0.1403	0.2674	0.0479	0.0256	0.2210	-0.0881	0.0856
1992	0.0286	0.0181	0.3095*	0.2589	0.1499	0.3617^{a}	0.2043	-0.0595	0.1333	0.0505	0.2923	0.1312
1993	-0.1378	-0.1205	0.0046	0.0585	-0.0871	-0.0093	-0.0543	-0.0028	0.1717	0.2589	0.0402	0.2094
1994	0.0567	0.1096	0.2124	0.1075	0.0344	0.4018^{a}	0 .2218	0.0293	0.3713^{a}	-0.0991	0.2856^{b}	0.1271
1995	0.1087	0.0342	0.0926	0.1330	0.1413	0.0062	0.1535	0.2738^{b}	0.0987	-0.1662	0.0567	0.1746
1996	0.0817	0.0935	0.0642	0.0309	-0.0638	0.0768	0.1035	0.1070	-0.0372	0.0276	0.1804	0.0359
1997	0.3754^{a}	-0.0739	0.3565^{a}	0.2092	0.0153	0.3609^{a}	0.1676	0.1860	0.0115	0.0672	0.2421	0.2113
1998	0.2449↓	0.3596^{a}	0.2134↓	0.3917^{a} ↑	0.2807↑	0.4949^{a} ↑	0.3578^{a} ↑	-0.0131	0.3951^{a} ↑	-0.0601	0.4041^{a} ↑	0.5873^{a}↑
1999	0.2523	0.1698	0.4451^{a} ↑	0.4093^{a} ↑	0.1494	0.5262^{a} ↑	0.4267^{a} ↑	0.2336↑	0.1716	-0.2118	0.0686	0.3006^{b}↓
2000	0.4146^{a}	0.1118	0.6009^{a}	0.7068^{a}	0.6538^{a}	0.2275^{a}	0.6392^{a}	0.3885^{a}	0.3587^{a}	-0.1549	0.1569	0.4908^{a}
2001	0.4140^{a}	0.1437	0.6252^{a} ↑	0.6600^{a}	0.5680^{a}	0.5792^{a} ↑	0.6381^{a}	0.5703^{a} ↑	0.1175	0.3356^{b}↑	0.3570^{a} ↑	0.4326^{a}
2002	-0.1072	0.1045	0.0739	0.0595	-0.0228	-0.0447	0.1604	-0.0044	0.3348^{b}	0.1123	0.0355	0.1697
2003	0.4927^{a}	0.1339	0.5763^{a}	0.6334^{a}	0.4872^{a}	0.5559^{a}	0.5377^{a}	0.3749^{a}	0.3560^{a}	0.2176	0.3612^{a}	0.2972^{b}
2004	0.4678^{a}	0.3217^{b}	0.6561^{a}	0.7405^{a}	0.6226^{a}	0.4761^{a}	0.5726^{a}	0.3681^{a}	0.6118^{a}	-0.0324	0.4296^{a}	0.4518^{a}

Thailand												
YEAR	US	UK	WORLD	ASIA	JP	SG	HK	ID	IN	PAK	KOR	MAL
1990	0.1958	0.2449	0.6092^{a}	0.4990^{a}	0.4634^{a}	0.5352^{a}	0.4857^{a}	0.2657	0.3465^{b}	0.3401^{b}	0.3538^{b}	0.5052^{a}
1991	0.2040	0.0852	0.3744^{a}	0.3571^{a}	0.3566^{a}	0.4624^{a}	0.0940^{a}	-0.0017	0.3469^{b}	-0.0816	0.0856	0.4656^{a}
1992	-0.2352	-0.3504	-0.0216	-0.3652^{a}	-0.3616^{a}	-0.0178	-0.0889	0.2657	0.0985	0.0801	0.1312	0.2323
1993	0.0052	0.0373	-0.0210	-0.0348	-0.1750	0.2828^{b}	0.3354^{b}	0.0177	0.0954	0.3397	0.2094	0.3195^{b}
1994	0.2499	0.2415	0.2692	0.2224	-0.0038	0.6281^{a}	0.4781^{a}	0.2110	0.3155^{b}	-0.1612	0.1271	0.5741^{a}
1995	0.2699	0.1189	0.5373^{a}	0.3824^{a}	0.2793^{b}	0.5969^{a}	0.5310^{a}	-0.0017	0.5908^{a}	0.1220	0.1746	0.4816^{a}
1996	0.0738	0.1380	0.4516^{a}	0.4180^{a}	0.3327^{b}	0.5822^{a}	0.4559^{b}	-0.0261	0.4256^{a}	0.2931^{b}	0.0359	0.4181^{a}
1997	-0.0041	0.0128	0.2420	0.1269	-0.0432	0.2030	0.1004	0.1771	0.1758	0.2195	0.2116	0.4005^{b}
1998	0.5521^{a}	0.3746v	0.5336^{a} ↑	0.5643^{a} ↑	0.3658^{a} ↑	0.7629^{a} ↑	0.6021^{a} ↑	0.0976↓	0.5422^{a} ↑	0.1056↓	0.5873^{b}↑	0.4848^{a} ↑
1999	0.1240	0.0275	0.3795^{a} ↓	0.3791^{a} ↓	0.2464↓	0.5347^{a}	0.4392^{a} ↓	0.1270	0.5412^{a}	0.0247	0.3006^{b}↓	0.2460↓
2000	0.3145	0.0727	0.4944^{a}	0.3902^{a}	0.3357^{b}	0.5791^{a}	0.4623^{a}	0.2131	0.2358	0.1611	0.4908^{a}	0.1690
2001	0.1574↓	-0.1165↓	0.3028^{b}↓	0.3328^{b}↓	0.2526↓	0.3441^{b}↓	0.3980^{a} ↓	0.2608	0.3577^{a}	-0.0106	0.4326^{a} ↓	0.5910^{a}
2002	0.0488	0.2796^{b}	0.0682	0.4388^{a}	0.2682	0.1717	0.5657^{a}	0.4173^{a}	0.1390	0.1878	0.1697	0.4072^{a}
2003	-0.0100	-0.0447	0.1594	0.4372^{a}	0.3553^{a}	0.3520^{b}	0.2622	0.3526^{a}	0.2661	-0.1654	0.2972^{b}	0.3888^{a}
2004	0.2981^{b}	0.4155^{a}	0.4691^{a}	0.3997^{a}	0.3012^{b}	0.4215^{a}	0.4967^{a}	0.5467^{a}	0.3769^{a}	0.0418	0.4518^{a}	0.3533^{a}

Appendix 7 (concluded)

News Impact Curves

The news impact curve plots the next period volatility h_t that would arise from various positive and negative values of given an estimated model, in our case, simple GARCH (1, 1) TARCH (1,1). The curves are drawn by using the estimated conditional variance equation given in the Eq. (7.1) as follows:

$$R_{i,t} = \gamma_{i,0} + \gamma_{i,1} R_{i,t-1} + \sum_{l=0}^{1} \gamma_{i,2,l} \hat{u}_{t-l}^{ASIA} + \sum_{l=1}^{2} \gamma_{i,3,l} \hat{u}_{t-l}^{WORLD} + \varepsilon_{i,t}$$
$$h_{i,t} = \alpha_{i,0} + \alpha_{i,1} \varepsilon_{i,t-1}^{2} + \beta_i h_{i,t-1} + \sum_{l=0}^{1} \psi_{i,2,l} \hat{u}^{2}{}_{t-l}^{ASIA} + \sum_{l=1}^{2} \psi_{i,3,l} \hat{u}^{2}{}_{t-l}^{WORLD} \qquad (7.7)$$

We fixed the volatility to the median of the estimated conditional variance series obtained from estimation of Eq. (7.7) using simple GARCH (1,1) and TARCH(1,1), and then estimated the one-period impact, conditional on last period's volatility. For this purpose, first, we generated 'z' series using the trend command in Eviews 5.1, series z= -4+@trend (1)*1/100 ,which generated an equi-spaced z series between -4 and +4, then using the following equation , we obtained series $\log \sigma^2{}_t$.

$$\log h_{i,t} = \varpi + \hat{\beta} \log h_{i,t-1} + \hat{\alpha} \mid z_{t-1} \mid + \hat{\gamma} z_{t-1} \qquad (A-1)$$

Then we plotted the volatility $\log h_t$ series against the 'z' impact for each country. The resulting news impact curves for the GARCH and GJR (TARCH) are given in figures.

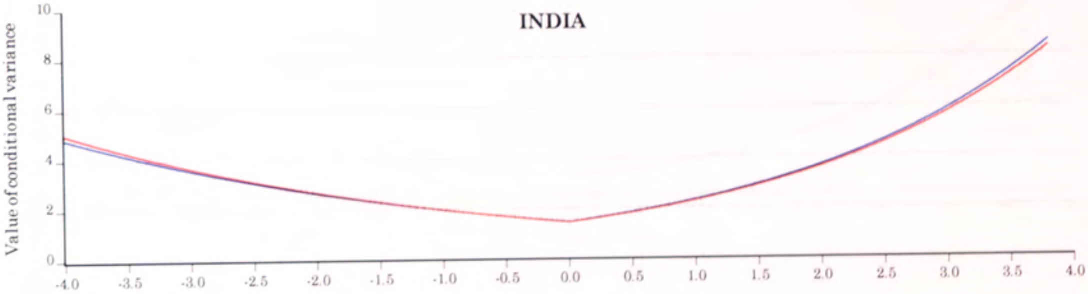
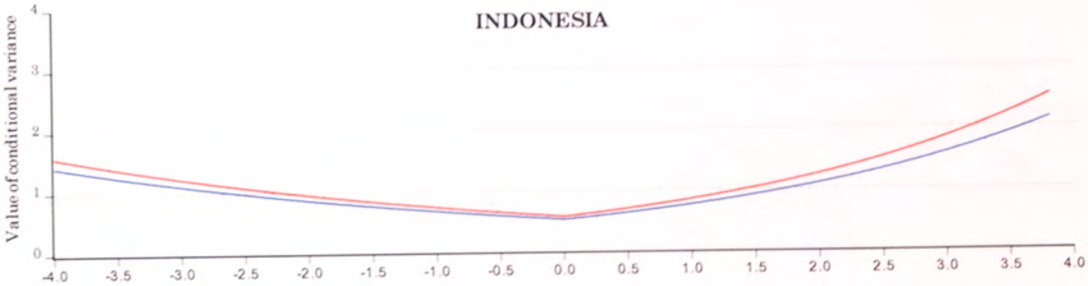


Fig 7.3 (continued...)



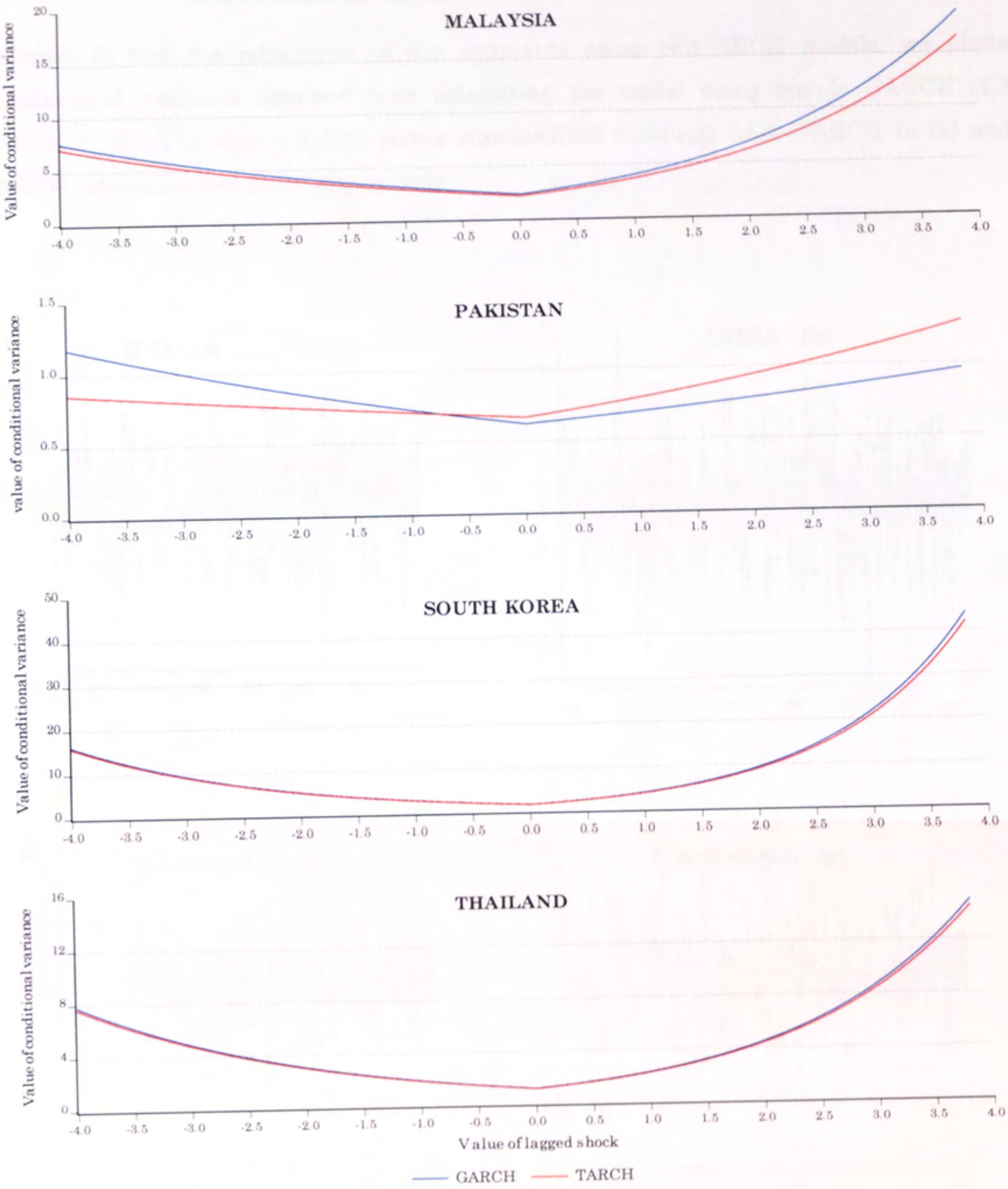


Fig 7.3 (concluded)

Standardized Residuals from GARCH and TARCH

In order to test the robustness of our estimates using two ARCH models, we plotted the standardized residuals obtained from estimating the model using simple GARCH (1,1) and TARCH (1,1) . The figures below shows standardized residuals from GARCH in (a) and from TARCH estimation and in (b) respectively.

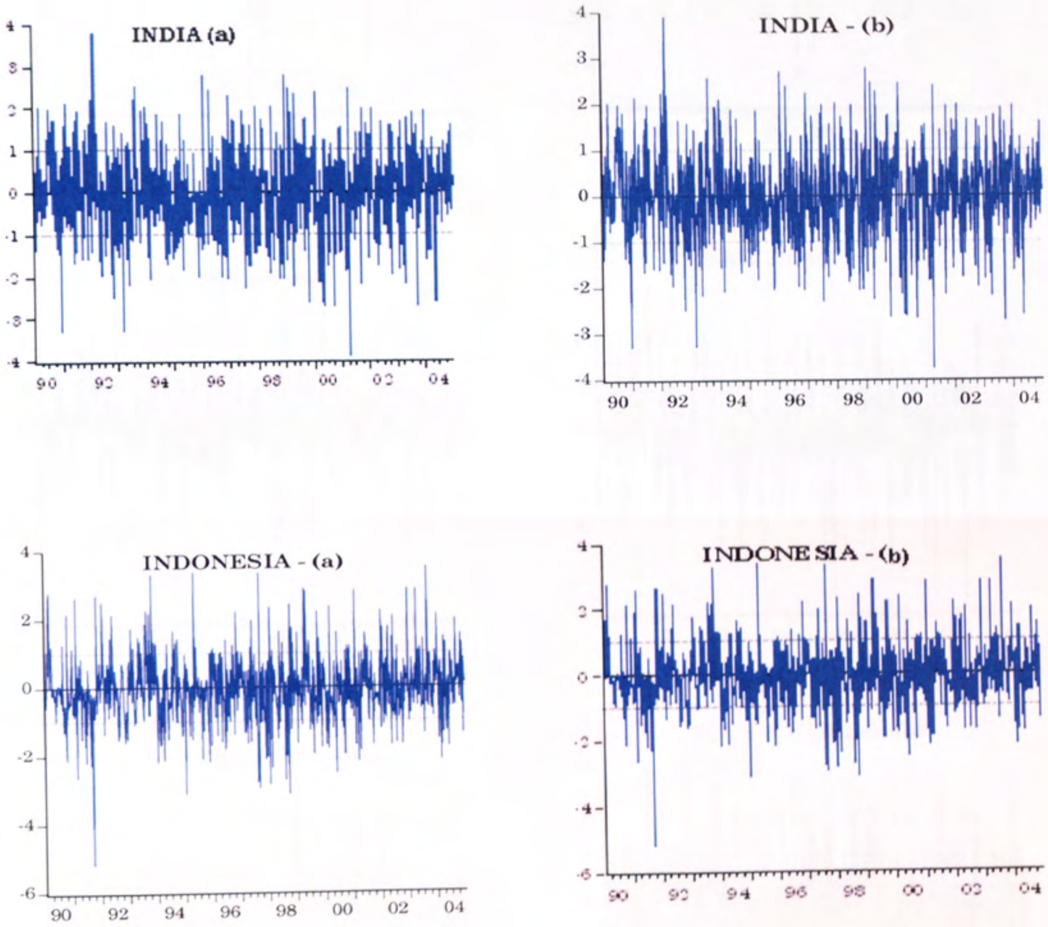


Fig 7.4 (continued...)

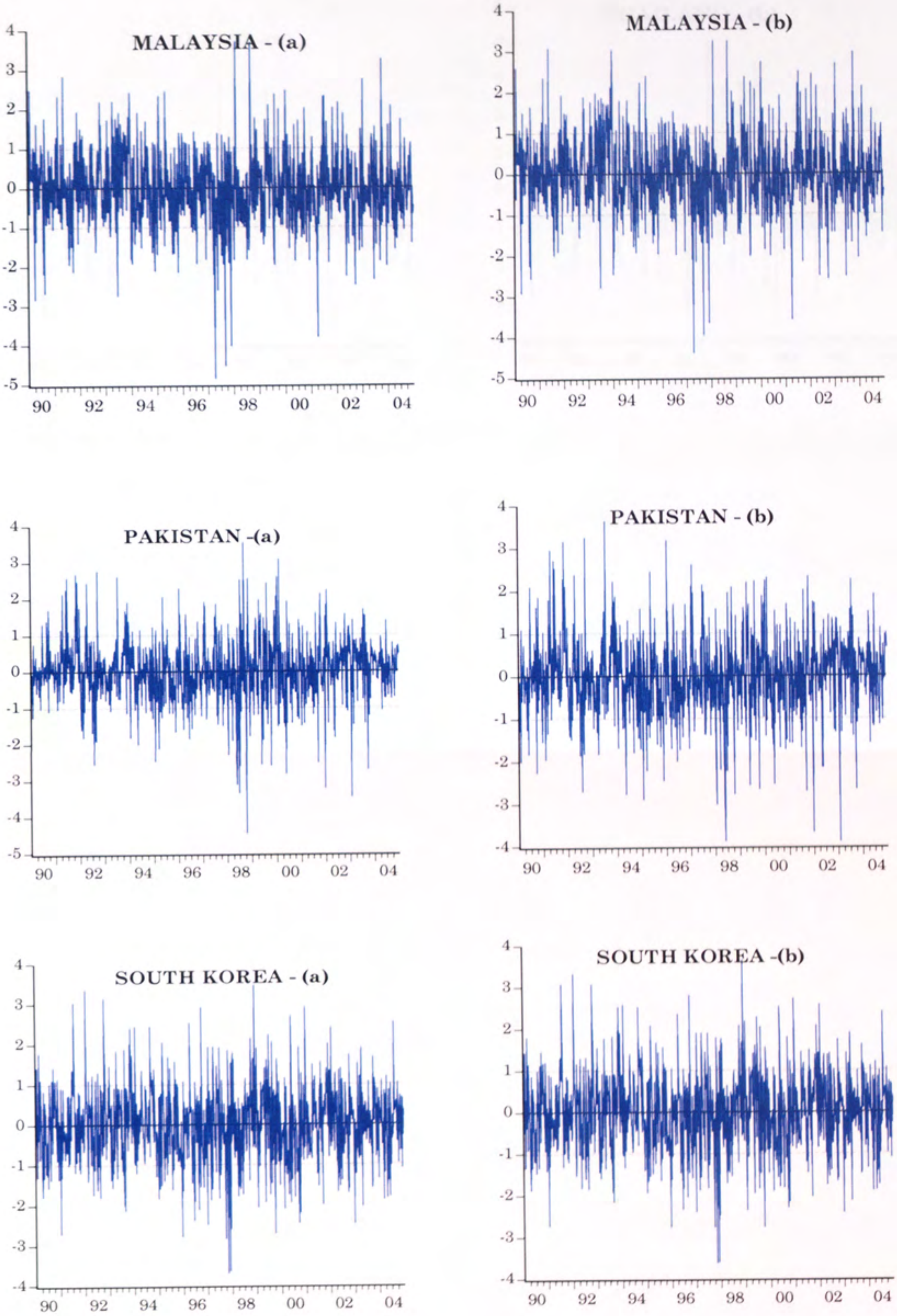


Fig 7.4 (continued...)

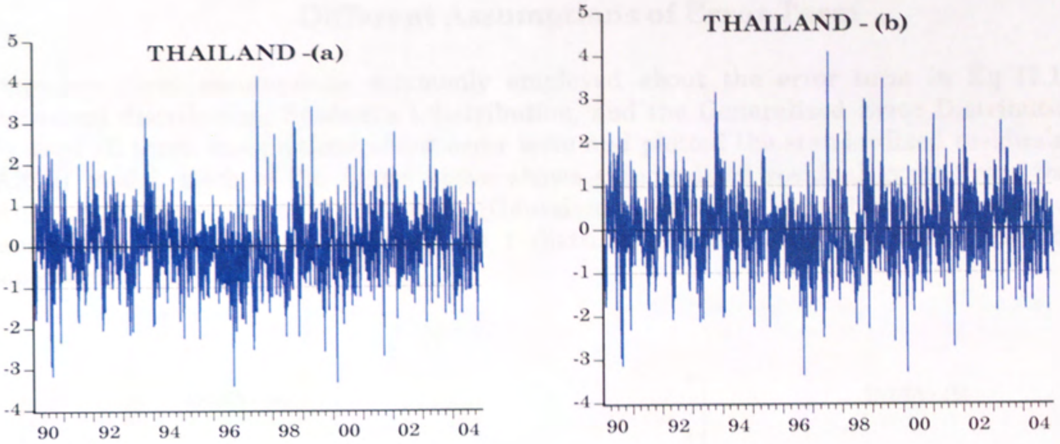


Fig 7.4 (concluded)

Standardised Residuals from TARCH Model
Different Assumptions of Error Term

There are three assumptions commonly employed about the error term in Eq (7.1): normal (Gaussian) distribution, Student's t-distribution, and the Generalized Error Distribution (GED). We used all three assumptions about error term and plotted the standardized residuals from the TARCH model. Each of the figure above shows standardised residual graph from the TARCH estimation of model where in (a) Normal (Gaussian) distribution is used for error distribution in (b) Generalized error and in (c) Student's t distribution with fixed parameter has been used respectively.

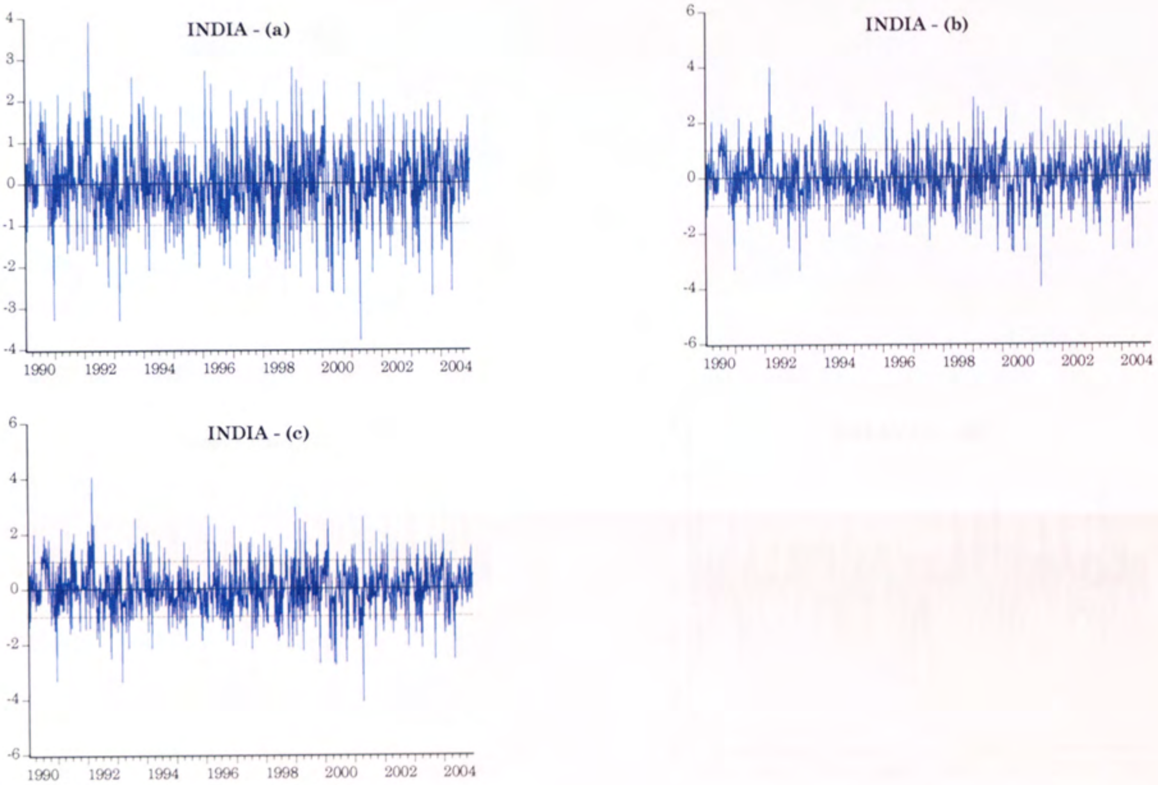


Fig 7.5 (continued...)

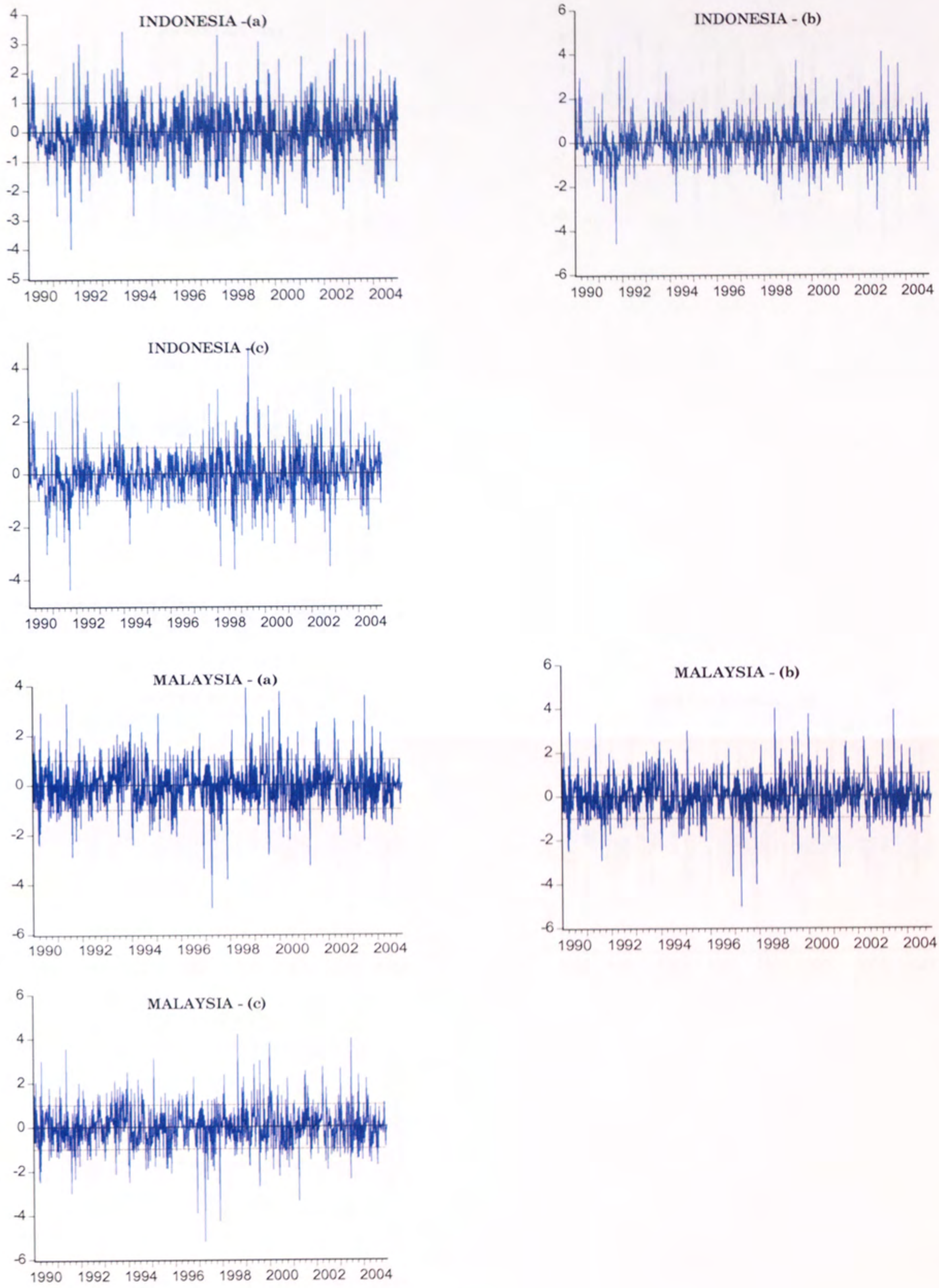


Fig 7.5 (continued...)

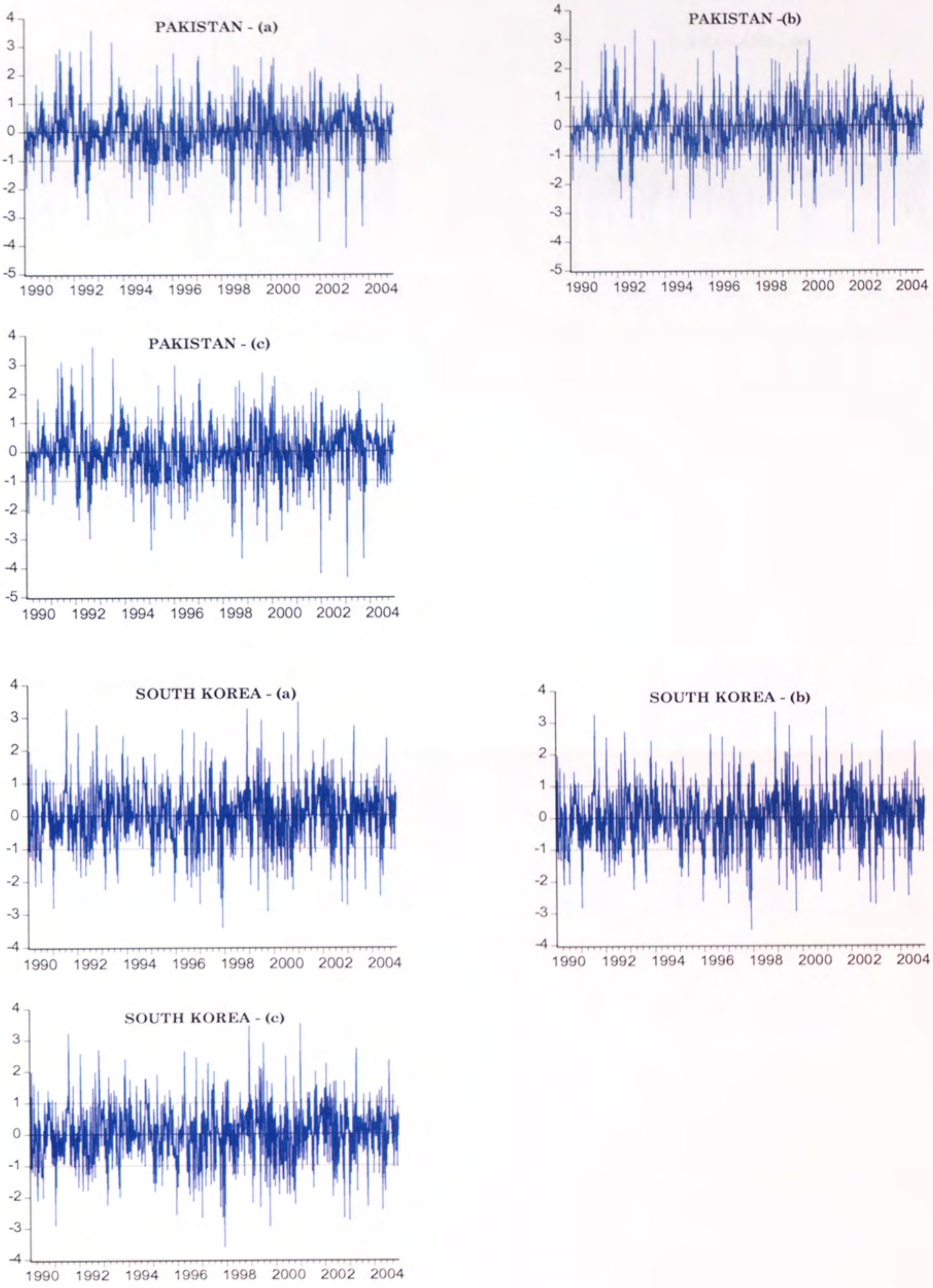


Fig 7.5 (continued…)

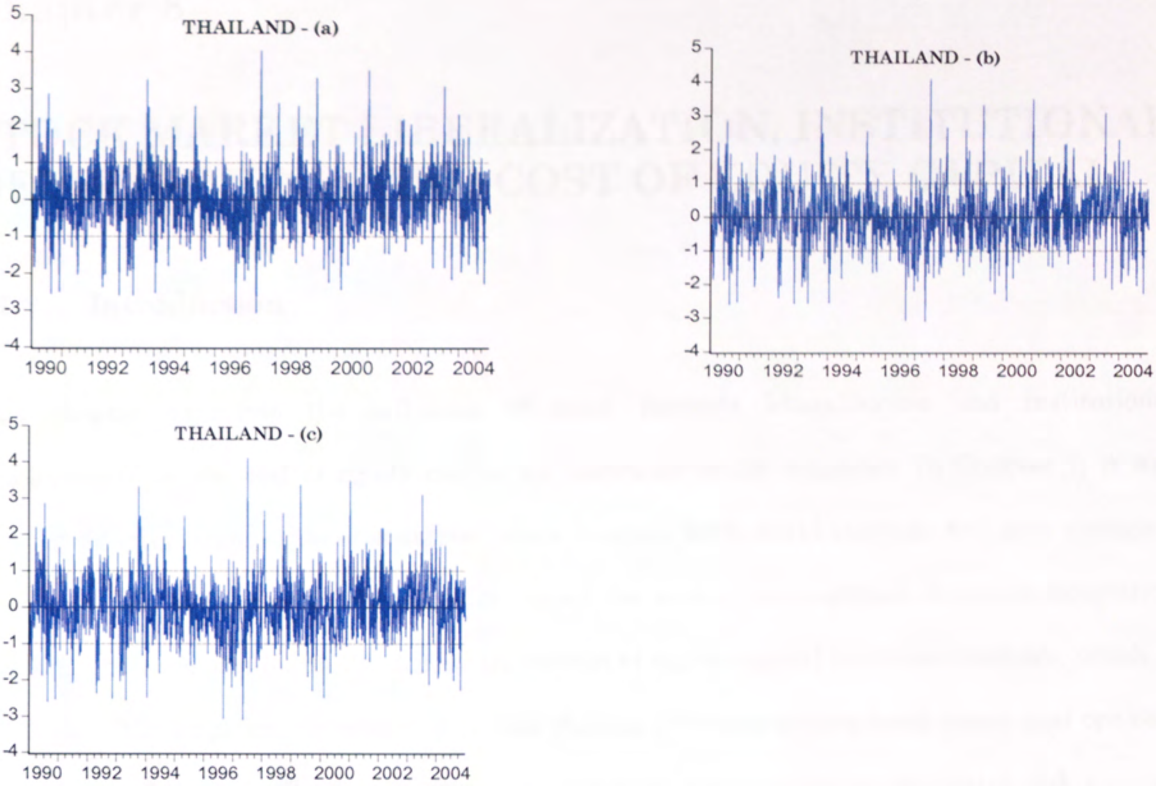


Fig 7.5 (concluded)

Chapter 8

STOCK MARKET LIBERALIZATION, INSTITUTIONAL DEVELOPMENTS AND COST OF EQUITY CAPITAL

8.1. Introduction

This chapter examines the influence of stock markets liberalization and institutional developments on the cost of equity capital for Southeast Asian countries. In Chapter 7, it was found that integration of these countries' stock markets with world markets has been changing over time._The stock market liberalization paved the way to international financial integration and it might have also led to the decline in the cost of equity capital for these countries, which is the focus of the empirical investigation in this chapter. Previous studies have shown that opening of stock markets i.e., allowing foreigners to purchase domestic shares facilitates risk sharing between domestic and foreign residents. Increased risk sharing should increase liquidity, reduce the equity risk premium and reduced equity premium will lead to lower cost of capital (Ahimud and Mendelson, 1986; Tesar, 1995; Stulz, 1999).

Previous studies have used event study methodology and stock returns data at country-level to investigate the influence of stock market liberalizations on the cost of equity capital (see Henry, 2000; Bekaert and Harvey, 2000)[1]. Most of these studies have used country-level data, empirical evidence at the firm-level has been very limited. Eichengreen (2001) suggests that there is need for more firm-level evidence from a micro-economic perspective. The hypothesis in this study is that some firms might be more responsive to the influence of the stock market liberalization than others. The effect of the institutional developments on the firm-level cost of equity capital might

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[1] The length of the estimation window varies from a low of 12 months Henry (2000) to a high of 3 years in Bekaert and Harvey (2000). Bekaert and Harvey (2000) used dividend yield as a proxy for the cost of equity capital and show that the cost of equity capital declined by 90 basis points at country-level. Henry (2000) report decrease in the discount rate in the post-liberalization ranging from 19% to 26% at country-level.

also vary across Southeast Asian countries due to temporal differences in the implementation of major institutional reforms.

An important empirical contribution of this chapter is the examination of the relationship between the cost of equity capital and institutional developments which has been ignored in the prior empirical studies[2]. The researcher argues that Southeast Asian countries have implemented new changes in the operations of financial markets during the liberalization period which need to be investigated independently of stock market liberalization. These reforms in the institutional framework might have influenced the operations of financial markets, stock market efficiency, and the firm-level cost of equity capital. It is suggested that these reforms might have fortified the securities market institutional framework and reduced the information risk of investing in these countries. Thus, the changes in the securities market infrastructure during the liberalization period across Southeast Asian countries will have an additional effect on the firm-level cost of equity capital.

The chapter is organized as follows: Section 8.2 provides a brief overview of the modelling approaches used in the finance literature to obtain the estimates of the cost of equity capital. This section is devoted to comparing the strengths and weaknesses of the specifications in the previous studies to estimate *ex post* and *ex ante* costs of equity capital. Section 8.3 illustrates alternative paradigms for modelling the *ex post* cost of equity capital, and discusses the estimates of cost of equity capital using two different methods. Section 8.4 describes the choice of data, estimation model and presents the estimation results. This section examines the impact of stock market liberalization and institutional developments after controlling for firm-specific factors. Section 8.5 explores the impact of depository receipts (DRs), analysts' coverage (COV) and insider ownership on the cost of equity capital. Section 8.6 concludes.

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[2] Most of the previous studies have focused on the influence of the disclosure and corporate governance variables on the cost of equity capital (see La Porta et al, 2006; Johnson et al, 2000; La Porta et al, 1997).

8.2 Measuring the Cost of Equity Capital

The cost of equity capital is unobservable. Different approaches have been used to estimate the unobservable cost of equity capital: the dividend growth model (DGM) (Gordon, 1962); the capital asset pricing model (CAPM) (e.g., Lintner, 1965; Sharpe, 1964); the arbitrage pricing model (APM) (Ross, 1976); the Three-factor model (Fama and French, 1993); the international asset pricing model (IAPM) (Bekaert and Harvey, 1995); and the techniques using analysts' forecasts of earnings and dividends (see e.g., Botosan and Plumlee, 2002; Easton and Monahan, 2003; Gode and Mohanram, 2003). These different models or techniques have provided 'reasonable' estimates of the cost of equity capital. However, it has been argued that the search for a model that is easy to use and provides accurate and stable estimates of the cost of equity capital estimates is not over yet (Madanoglu and Olsen, 2005; Fama and French, 1997).

In the main, the dividend growth model (DGM) has been used to estimate the cost of equity capital (see Henry, 2000 for arguments). However, Madanoglu and Olsen (2005) argue that a major difficulty in applying the DGM lies in determining the specific dividend growth rate, since in the model it has no clear interpretation i.e., to what extent should it be based on past values? Furthermore, dividend yield can only be calculated for those firms that pay regular dividends, thus leading to sample selection bias[3].

On the other hand, the CAPM assumes that cross-sectional variation in market beta alone drives the variation in a firm's cost of equity capital. Downe (2000) contends that industry factors are also important risk factors. Indeed, Madanoglu and Olsen (2005) suggest that industry factors should be included in CAPM-type models to improve their performance in explaining cross-sectional variations of stock returns[4]. The use of CAPM for developing countries is complicated, since there is no single government instrument that can be used as a proxy for risk free rate.

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[3] Gebhardt et al. (2001) model require the future dividend payout proxy by the historical three year median firm's pay out ratio, which limit the sample to only those companies which pay dividends.

[4] Madanoglu and Olsen (2005) include brand strength index and property ownership structure in the CAPM for the lodging industry.

Furthermore, the cost of capital using the CAPM is sensitive to the choice of base period selection for market returns and statistical average. It is not clear over what time period the market returns should be calculated, e.g., whether it should be 5, 10 or 25 years, and whether average returns should be reported as arithmetic or geometric means. Lakonishok (1993) concluded that at least 70 years of data would be required to show that even market beta is a statistically significant risk factor if average realized returns are used to proxy for the cost of equity capital.

The alternative estimation model, the APM, postulates that economic factors affect the systematic risk. Chen et al. (1986) identified five macro-economic factors that explain the asset returns in the APM[5] framework. However, the lack of agreement among the professionals and academics on the risk factors has limited the application of the APM[6]. The three-factor model of Fama and French (1993) is an extension of CAPM-type structure, and is presented as a multi-factor model which postulates that factors other than market and the risk free rate impact upon security prices. The three-factor model argues that investors should be compensated for taking on additional risk by investing in stocks of small capitalization firms and firms with high book-to-market value ratios[7]. Although Fama and French (1997) argue that this model explains more variation in the equity risk premium than the original CAPM model, their three-factor variant produces large standard errors[8]. Using the International CAPM instead of a domestic CAPM has also been recommended under the assumption of integrated financial and consumption goods markets (Koedijk et al, 2002). The ICAPM assumes equal access of investors to the world portfolio, irrespective of taxes, transaction costs and information risk. There are major problems, when applying the ICAPM in emerging markets these being, segmentation of markets (Harvey, 1995), and exchange rate volatility in returns. Harvey (1995) found that when regressing the stock returns (in US$) on the benchmark return of either the US portfolio or the world portfolio, the stock beta is either

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[5] Chen et al. (1986) identified five macro-economic factors: industrial production index; short term interest rates; short-term inflation; long term inflation; and default risk.

[6] Some studies have used principle components methods to estimate the common factors (Ferson et al, 1995).

[7] Fama and French (1993) report that the book-to-market factor (HML) produces an average premium which is large in practical and statistical sense.

[8] The Fama and French (1997) Three-factor model and CAPM model produced a standard error of more than 3% per year.

indistinguishable from zero or negative, and the cost of capital for many emerging markets is the US risk free rate or lower. A later version of the ICAPM introduced by Bekaert and Harvey (1995) is mathematically challenging and not easy to use due to its non-linear structure.

Besides using *ex post* techniques to estimate the cost of equity capital, recent studies (see e.g., Botosan and Plumlee, 2002, Easton and Monahan, 2003; Gode and Mohanram, 2003) have adopted analysts' forecasts into their valuation models to estimate the *ex ante* cost of equity capital. The basic premise of these models is to use analysts' forecast of share prices, dividends and earnings per share in the valuation models and back out the cost of equity capital as the internal rate of return that is equal to the current share price. The crucial assumption underlying these models is that analysts' forecasts and market expectations are similar, and therefore, the expected return required by the investors can be predicted using these forecasts[9]. However, the difficulty in using the *ex ante* method for the developing countries is that analysts' forecasts are not easily available for a large number of firms. Thus, the implied cost of equity capital could be biased or difficult to estimate (Lee et al., 2003). Another criticism of the *ex ante* methods is the difficulty in estimating future dividends or earnings growth. For example, should the price-earnings ratio be based on price-to-trailing earnings or forward earnings, and should the growth ratio, be based on one-year historical growth rate or average expected annual growth rate? Some argue that analysts overstate the long-term growth of earnings and dividends, and that their objectivity is questionable (Goedhart et al., 2002). Besides *ex post* and *ex ante* measures, other methods to measure the cost of equity capital have appeared in the literature, including the use of sovereign credit ratings (Erb et al. 1996)[10].

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[9] There are three main sources of analyst's forecasts identified in literature – I/B/E/S provides forecasts of earnings for the current year, for the next year, and for the short-run future. *Value Line* provides forecasts for the current year, for the next year, and a forecast of average earnings for three years thereafter. Bloomberg L.P. provides forecasts for next year and forecasts of earnings growth for the short-run.

[10] Erb et al (1996) found the expected returns for most emerging markets in Asia varied from 18.7% in Malaysia to 35.7% in Pakistan based on credit rating for year 1995,.

8.3. Alternative Paradigms for the Estimation of the Cost of Equity Capital

Having discussed the models for the estimation of the cost of equity capital, this study proposes in this section, that from theoretical perspectives, *ex post* measures of the cost of capital at firm-level are better than *ex post* measures at country-level obtained using aggregate stock returns in the CAPM, APM, and Three factor model framework. Theoretically, the influence of stock market liberalization on the cost of equity capital will vary across countries and firms due to the following reasons:

(1) When a country opens it stock market to international investors, the market segmentation is not completely reduced (Bekaert and Harvey, 1998) because a stock market can still be segmented, if there are informal barriers that restrict investment (Serra, 2003).

(2) The shift from closed to open stock markets has coincided with changes in economic policies in many Asian countries, in particular, privatization (Henry, 2000). Privatization of state-owned firms in certain sectors might also produce a heterogeneous effect of stock market liberalization on the firm-level cost of equity capital. When governments open up some sectors of the economy to private local and foreign investment, the risk and return characteristic of firms in such sectors is more affected compared to the non-privatized sectors.

(3) The ownership of firms (whether they are closely or widely-held) also bears upon the relationship between stock market liberalization and the cost of equity capital. Most of the recent country-level studies have ignored the fact that the shareholders of developing countries' firms are not widely dispersed and a homogenous group of relatively uninvolved absentee owners (McConnel and Serveas, 1990). Stulz (1988) argues that when equity ownership is concentrated in the hands of insiders, the market value of the firm first increases, then decreases. If the stock market is not open and the investor protection is also absent, then managers of closely-held firm can not diversify fully idiosyncratic risk. Consequently, the cost of capital of such firms includes

an additional premium for holding idiosyncratic risk. An extremely concentrated ownership structure could also cause speculative prices because of too little market liquidity. Therefore, it is argued that the results implied from the country-level studies in the liberalization context do not explain cross-sectional variation in the cost of equity capital due to above-mentioned heterogeneous characteristics of firms.

In this study the methods used by Goedhart et al. (2002) and Pomerleano and Zhang (1999) have been used to obtain estimates of the cost of equity at firm-level. The Goedhart et al. (2002) model assumes that expected growth in the firm-level earnings is equal to GDP growth rate adjusted for expected inflation rate. Pomerleano and Zhang (1999) assume that the past earnings growth can be used as a rough proxy for the estimation of the cost of equity capital for developing countries. These models do not require analysts' forecasts. A major advantage of using an *ex post* measure is that it provides longer time series data to gauge the gradual effect of stock market liberalization on the cost of equity capital.

The researcher believes that these two methods for estimating the cost of equity capital meet the criteria of ease of use and simplicity, and the strongest test of reliability of the estimates can be discerned from their relationship with the risk proxies used in previous studies. If the expected relationships hold, then it can be argued that these estimates are equally valid and reliable. However, there are some obvious caveats in using these models. Firstly, the estimate of the cost of equity capital is more likely to be sensitive to the inflation rate using the Goedhart et al. (2002) method. More specifically, for those countries, which have experienced higher inflation rates after their stock market openings, the estimates of the cost of equity capital will be biased upwards. Secondly, the assumption of the historical average of the real GDP growth rate as a proxy for the long-term corporate profit growth might be realistic, if and only if, the corporate profits tracks GDP. In other words, if the ratio of corporate profits to GDP follows the same pattern as the real GDP growth rate. On the other hand, in Pomerleano and Zhang (1999) method assumption of past earnings as proxy for future earnings is contestable as prospective earnings determines future cost of equity, non-availability of data on future earnings limit the use of future earnings in this study, therefore, given these limitations, Pomerleano and Zhang (1999) suggests that the estimates of the cost of equity should be seen as indicative of the order of the magnitude rather than as precise estimates.

This study used the model proposed by Goedhart et al (2002) to estimate the *ex post* cost of capital. This model is motivated using a standard perpetuity model:

$$P_t = \frac{CF_{t+1}}{k_e - g} \tag{8.1}$$

where P_t is the price of a share at time *t*, CF_{t+1}, is the expected cash flow per share at time *t+1*,*ke* is the cost of equity, and *g* is the expected growth rate of the cash flows. The cash flows, in turn, can be expressed as earnings, *E* multiplied by the payout ratio:

$$CF_{t+1} = E(payout)$$

Since the payout ratio is the share of earnings left after reinvestment, replacing the payout ratio with the reinvestment rate gives:

$$CF_{t+1} = E(1 - reinvestment\ rate)$$

The reinvestment rate, in turn, can be expressed as the ratio of the growth rate, *g*, to the expected return on equity:

$$reinvestment\ rate = \frac{g}{ROE}$$

And thus the cash flows can be expressed as:

$$CF = E(1 - \frac{g}{ROE}) \tag{8.2}$$

By combining Eq (8.1) and (8.2), we get the following:

$$\frac{P_t}{E_{t+1}} = \frac{1 - \frac{g}{ROE}}{k_e - g} \tag{8.3}$$

By rearranging Eq (8.3), we get the following formula to estimate cost of equity:

$$k_e = \frac{E_{t+1}}{P_t}\left(1 - \frac{gr}{ROE}\right) + gr \tag{8.4}$$

where *gr* is assumed to be earnings growth rate, and is equal to the sum of the real *GDP* growth rate plus the inflation rate. The expected inflation is the average inflation rate experienced over the past five years. The factors determining the cost of equity capital in Eq. (8.1) are: E_{t+1} / P_t ratio; real GDP growth rate and *ROE*. Other things being equal, the higher E_{t+1} / P_t ratio the lower the cost of equity capital. We solved Eq. (8.4), for each firm year over the sample period to obtain nominal cost of equity capital.

The second method used in this study is Pomerleano and Zhang (1999) model. This model uses the relationship between equity prices and the implied growth of future nominal earnings. This relationship is derived from the hypothesis that the current equity prices, P_t, equals the discounted present value of future earnings, $E_{t+j}, (j \geq 1)$, with discount factor k_e:

$$P_t = \sum_{j=1}^{\infty}\left[\frac{1}{1+k_e}\right]E_{t+j} \tag{8.5}$$

Assuming the future earnings grow at a constant rate, *g*, such that $E_{t+j+1} = (1+g)E_{t+j}$, then Eq. (8.5) becomes:

$$P_t = E_t \sum_{j=1}^{\infty}\left[\frac{1+g_t}{1+k_e}\right] \tag{8.6}$$

This implies the following relationship between current price-to-earnings rate (P/E), the discount factor, and the future earnings growth rate:

$$\frac{P_t}{E_{t+1}} = \frac{(1+g_t)}{(k_e - g_t)} \tag{8.7}$$

The Eq (8.7) is solved for the implied cost of equity:

$$k_e = \frac{(1+g_t)}{P/E_{t+1}} \tag{8.8}$$

where g is earnings growth rate and P/E is the contemporaneous price-earning ratio. Other things being equal, the greater the risk of a stock, the lower the P/E ratio, but high growth prospects may offset the risk and lead to a higher P/E ratio. Consequently, for rational investors, a higher P/E ratio will reduce the required rate of return. Using Eq. (8.8), Pomerleano and Zhang (1999) reported the real cost of equity to be 8% for India, 11% for Malaysia, 13% for South Korea, and 12% for Indonesia and Thailand respectively, over the period 1993-1998. In the next section, the estimates of the cost of equity capital are shown, using the models of Goedhart et al. (2002) and Pomerleano and Zhang (1999). We refer to the estimates obtained from using these models as K_{EG} and K_{EPZ} in the following sections respectively. By comparing the right hand side of Eq. (8.4) and Eq. (8.8), two models can be related to each other:

$$\frac{E_{t+1}}{P_t}(1-\frac{gr}{ROE})+gr=\frac{E_{t+1}}{P_t}(1+g)$$

$$(1-\frac{gr}{ROE})+\frac{P_t}{E_{t+1}}gr=(1+g)$$

$$\left(1-\frac{gr}{ROE}\right)+\frac{P_t}{E_{t+1}}gr=1+g$$

$$gr\left(\frac{P_t}{E_{t+1}}-\frac{1}{ROE}\right)=g$$

The last equation suggests that the growth rate in earnings, g, is effectively related to macro-economic fundamentals captured by gr (i.e., sum of inflation and real GDP growth rate). The term $\left(\frac{P_t}{E_{t+1}}-\frac{1}{ROE}\right)$, which reflects a firm value, translates macro growth into firm-level growth.

8.3.1 Estimates of the Cost of Equity Capital

Table 8.1 shows the time series of the average *ex post* cost of equity capital obtained by using the Goedhart et al. (2002) method denoted by K_{EG}. The average cost of equity capital varies from a low of 13.81% for Malaysia, to a high of 20.17% for Indonesia. There is variation in the firm-level cost of equity capital which is line with the IAPM prediction, which suggests that the cost of equity capital of firms from segmented markets should exhibit the following patterns:

(i) a high cost of equity capital in the pre-liberalization period, (ii) a low cost of equity capital during the liberalization period, reflecting the price increase i.e., revaluation effect, and (iii) a change in the cost of equity capital in the post- liberalization depending on the diversification potential of the stock market.

Table 8.1

Ex-post Cost of Equity Capital-I, 1991-2004

The table presents the time series of the average cost of equity capital (in %) calculated using the Goedhart et al. (2002) model :

$$K_{EG} = \frac{E_{t+1}}{P_t}\left(1 - \frac{gr}{ROE}\right) + gr$$

where K_{EG} is the nominal cost of equity, E_{t+1}/P is earning yield, *gr* is the sum of long-term real *GDP* growth rate plus inflation rate. Real *GDP* growth rate is a proxy for long-term corporate profit growth. The inflation rate in each year is measured as the average inflation rate experienced over the previous five years. *ROE* is the return on the total common equity at the end of year from 1991-2004. The firm-level accounting data was downloaded from *Datastream* and *Worldscope*. The macroeconomic data on real GDP and inflation rate was obtained from *IMF International Financial Statistics*. The last rows of the table report the overall Mean, Median, Maximum, Minimum and S.D. (standard deviation) of the cost of equity capital for each country, and the last column shows the cross-country mean.

	Country						
Year	India	Indonesia	Malaysia	Pakistan	South Korea	Thailand	Mean
1991	14.7660	14.4212	15.5530	16.5778	15.2943	14.8186	15.2385
1992	15.3991	16.4370	14.6379	23.8950	14.9753	17.3007	17.1075
1993	15.1867	15.8147	16.5970	21.0067	14.7643	17.0896	16.7432
1994	14.8838	17.0334	14.5023	17.4343	13.9537	16.0108	15.6364
1995	16.7004	17.3477	14.5702	19.8225	15.0735	15.0736	16.4313
1996	17.7190	18.8098	14.1680	20.1239	16.1375	15.1423	17.0168
1997	13.8406	18.9949	13.8956	21.7506	16.9546	19.1182	17.4258
1998	16.1712	28.5604	14.0250	21.0383	17.7018	20.3682	19.6442
1999	15.5504	23.8997	15.9653	22.6490	14.4501	18.8683	18.5638
2000	13.0719	25.2542	12.6759	20.0520	16.8345	17.5871	17.5793
2001	13.8731	27.7923	11.8690	24.8491	17.0459	21.2554	19.4475
2002	15.5392	24.5135	13.7054	18.9793	17.5182	18.5993	18.1425
2003	15.9946	17.5485	11.4993	12.1356	12.7660	13.3449	13.8815
2004	15.8275	16.0115	9.7399	14.7571	16.1497	12.6301	14.1860
Mean	15.3231	20.1742	13.8146	19.6479	15.6871	16.9434	
Median	15.4692	18.1792	14.0965	20.0880	15.7159	17.1952	
Max	17.7190	28.5604	16.5970	24.8491	17.7018	21.2554	
Min	13.0719	14.4212	9.7399	12.1356	12.7660	12.6301	
S.D	1.2107	4.7900	1.8469	3.4845	1.4559	2.5682	

Patterns of rise and fall in the cost of equity capital are observable in the case of India, Indonesia, Pakistan and Thailand. For some countries, such as Indonesia, the estimated cost of equity capital of 16% appears even lower than the commercial borrowing rate, which varied from 25% to 20% during 1991-1993[11]. The subsequent increase in K_{EG} was largely because of the inflation rate, which increased from 7.5% per year to 9.4% per year in 1996 and reached its peak level of 54% in 1997 for Indonesia. In other countries, such as Malaysia and South Korea, the low cost of equity capital seems to be the outcome of the revaluation effect as predicted by the IAPM. The launch of

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[11] The commercial borrowing rates for countries are obtained from different online sources.

the country fund, issuance of DRs and increase in the US$ net equity capital flows in 1993 seem to have contributed largely to the decrease in the cost of equity capital for Malaysia (see Table 3.1). The decline in the cost of equity capital for South Korea from 15.29% in 1991 to 13.95% in 1994 might be due to the increase in demand for domestic shares by international investors arising from relaxations in the percentage ownership limit for foreign investors. Similarly, the subsequent revaluation might have reduced the cost of equity capital for Thailand, which decreased from 17.30% to 15% in 1996.

In contrast, the cost of equity capital increased for India and Pakistan in 1992, when both countries opened stock markets. Despite a higher cost of equity capital of 15% for India, it was lower than the cost of commercial borrowing of 18%. The cost of equity capital decreased for Pakistan after 1992, an occurrence which can be attributed to a large increase in US$ net equity capital flows. These estimates for India and Pakistan seem to uphold the Errunza and Miller (2000) argument that segmented markets tend to have higher returns because of segmentation and the information risk premium. However, the opening of stock markets and other liberalization events such country funds and DRs, reduce stock market segmentation, and thus reduce the cost of equity capital.

Noticeably, for two of the six countries in the sample, the researcher's estimates of the cost of equity capital are similar to those reported by Hail and Leuz (2006) despite a difference in the calculation procedure. For instance, the average *ex post* cost of equity capital of 15% for India and South Korea, are very near to the average *ex ante* cost of equity capital for India of 14.01%, and for South Korea of 14.29% respectively, reported by Hail and Leuz (2006).

Table 2 shows the cost of equity capital using Pomerleano and Zhang (1999) measure of cost of equity capital denoted by K_{EPZ} using the same dataset as Table 8.1. It is noticeable that Pomerleano and Zhang (1999) measure underestimates the level of the cost of equity capital. The cost of equity capital decreased for most of the countries during 1992-1993.

Table 8.2
Ex-post Cost of Equity Capital-II (1991-2004)

The table presents the time series of the cost of equity capital (in %) calculated using the Pomerleano and Zhang (1999) model:

$$K_{EPZ} = \frac{(1+g)}{P/E}$$

where K_{EPZ} is the cost of equity, P/E is the price-to-earnings ratio; and g is earnings growth rate. The firm-level accounting data was downloaded from *Datastream* and *Worldscope*. The last rows of the table report the overall Mean, Median, Maximum, Minimum and S.D. (standard deviation) of the cost of equity capital for each country, and the last column shows the cross-country mean.

	Country						
Year	India	Indonesia	Malaysia	Pakistan	South Korea	Thailand	Mean
1991	14.1150	22.2955	10.0615	12.2141	13.4166	11.6954	13.9664
1992	6.9225	12.1410	6.8735	12.0112	8.7546	7.7430	8.5660
1993	6.0190	8.7465	7.2715	6.6589	6.3497	8.0935	7.1898
1994	9.0636	11.5116	5.1958	9.7987	7.8376	9.2024	8.7683
1995	10.6191	15.0350	5.2255	15.0351	9.7474	9.6605	10.8871
1996	13.6917	10.2657	7.6927	13.8645	8.1070	10.8255	10.7412
1997	12.3366	19.5817	5.5990	22.7041	9.2424	14.8504	14.0524
1998	12.4865	11.2584	8.9202	20.0805	10.6034	14.9507	13.0500
1999	15.9414	17.2283	7.9275	19.0471	20.5103	16.4283	16.1805
2000	12.8530	13.5203	12.2203	20.2896	18.2232	21.4185	16.4208
2001	14.9914	18.0163	11.1938	20.8418	15.5632	18.6615	16.5447
2002	17.1049	17.2800	11.0442	15.9994	25.2156	15.7278	17.0620
2003	15.8853	13.9915	7.8451	14.3654	18.3197	9.5928	13.3333
2004	15.5296	22.7211	12.4375	14.5720	18.0897	12.7533	16.0172
Mean	12.6828	15.2566	8.5363	15.5345	13.5700	12.9717	
Median	13.2723	14.5132	7.8863	14.8035	12.0100	12.2243	
Max	17.1049	22.7211	12.4375	22.7041	25.2156	21.4185	
Min	3.8726	8.7465	5.1958	6.6589	6.3497	7.7430	
S.D	3.4201	4.3962	2.3256	4.7858	5.8494	4.3269	

Overall, it seems that decrease in cost of equity capital for Malaysia and South Korea might have been due more global integration as found earlier, whereas, in the case of India, Indonesia and Pakistan, lack of stock market integration or weaker portfolio diversification advantage might have contributed to the increase in the cost of equity capital for latter countries. The increase in U.S. $ net equity capital flows have been associated with increase in the number of investable stocks in former countries[12]. The increase in the number of the investable stocks in a country not only increases liquidity of stocks but also coverage of such stocks. We explore the impact of DR programmes and firm-level coverage on the cost of equity capital in the subsequent sections.

The comparison of the estimates of the cost of equity capital reveals a large standard deviation for the estimates using K_{EPZ} rather than K_{EG}. Comparing the two estimates, K_{EG} and K_{EPZ} seem to indicate that when growth rate is assumed to follow the real GDP growth pattern, the cost of

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[12] The inclusion of new stocks into the major index coverage such as the *IFC Investable Index* and the *MSCI Index* is expected to enhance portfolio investment in these markets by international investors.

equity capital captures more country-specific influences, since the growth rate is the sum of the real GDP growth rate and inflation rate. On the other hand, when the growth rate is assumed to depend on earnings growth, the firm-specific factors seem to influence the estimated cost of equity capital across countries. Thus, models appear quite different in the estimates of the cost of equity capital. We prefer estimates based on Goedhart et al. (2002) model over the other model of Pomerleano and Zhang (1999) due to following reasons. Monetary and fiscal policies, through their affect on financial markets, have major significance for firms' cost of capital. Monetary and fiscal policies are also key determinates of inflation, which can generate business uncertainty, confound firm's accounting systems, and affect the relative prices that firms face. In addition, political instability or a general economic recession may significantly reduce demand for a firm's products. These factors have been at work in most of Southeast Asian countries during the sample period, in particular, the recession that started in 4 worst affect economies after the Asian financial crisis, therefore, our estimates of the cost of equity capital using Geodhardt are better for the sample countries than the estimates based on the Pomerleano and Zhang.

In general, we found evidence to suggest that there has been an uneven and time-varying effect of stock market liberalization events on the cost of equity capital across the Southeast Asian countries. The researcher argues that the conclusion drawn in the earlier studies (see Henry, 2000; Bekaert and Harvey, 2000) about the decline in the cost of equity capital after the stock market opening for the Southeast Asian countries (included in the emerging markets) only captures the one-off decrease in the cost of equity capital at country-level.

In the next section, firm-level accounting data and country-level macro data are used for firm-level analysis. It is worth indicating here that only a few recent papers (see Rouwenhorst, 1999; Collins and Abrahamson, 2006) appear to come close to the firm-level analysis reported in this study. Rouwenhorst (1999) used average return across 20 emerging markets included in the *IFC Index* to investigate whether the factors that explain the expected returns difference in developed equity markets also describe the cross-section of expected returns of emerging markets. Collins and Abrahamson (2006) investigated the impact of integration on the changes in the cost of capital at a sector level for a sample of African financial markets, whereas in this study, rather than providing a sector-level or country-level analysis, the researcher investigates the relationship between the cost of equity capital and stock market liberalization at the firm-level. Therefore, it is argued that this firm-level analysis for the Southeast Asian countries is new and expands the existing knowledge by using different measures of cost of equity capital to evaluate the impact of stock market liberalization.

8.4 Firm-level Analysis

8.4.1 Sample Selection and Descriptive Statistics

The sample comprises of listed non-financial firms in India, Indonesia, Malaysia, Pakistan, South Korea and Thailand over the period of 1990-2004. The firm-level data consisting of share price, earnings per share, P/E ratio, were downloaded from *Datastream, Worldscope* and the macro-economic data on the real GDP growth rate and inflation rate were obtained from the *IMF International Financial Statistics*. Information about changes in the stock market infrastructure was secured from the *Asian Development Bank* (ADB) country reports, stock exchange websites, Jain (2005), and calendar year data for stock market liberalization events from previous studies (Bekeart and Harvey, 2000; Levine and Zervous, 1996). Table 8.3 shows the sample selection process.

Table 8.3

Sample Selection for the Cost of Equity Capital Analysis

The table presents the number of firms used in the cost of equity capital analysis. We downloaded the accounting data from *Datastream* and *Worldscope* over the period of 1991-2004. The outliers consist of those values of firms' book-to-market ratio greater than 5 and debt to equity ratio of more than 3. Missing observations were related to non-availability of data on the closely held ownership and price volatility from *Worldscope* over the sample period.

	India	Indonesia	Malaysia	Pakistan	South Korea	Thailand
No of firms in sample	142	120	126	62	200	125
(less) estimate of cost of equity capital outside [0,0.60]	(10)	(11)	(8)	(4)	(40)	(6)
(less) missing control variables & outliers	(82)	(74)	(68)	(38)	(110)	(82)
No of firms in final sample[13]	50	35	50	20	50	37

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[13] Only those firms for which 9 years of data from 1991 to 2004 are available, are included.

Those firms for which the estimated values of the cost of equity capital were outside the range of [0, 0.60] over the entire sample period as in (Chen et al, 2004), were excluded. In some cases, where firm-level estimates are within the range for some years and outside for some years, only those firms were included for which at least five years of data on all variables required for estimation was available over the entire sample period. The firms' book-to-market ratio has also been winsorized to 5 and all firms with a debt to equity ratio of more than 3, have been excluded. This filtering process reduced the total number of observations for each country (Table 8.3). The time period and the number of firms in the final sample is given in the last row of the table. It is important to highlight the effect of the above selection criteria on the consistency of the sample used in the previous chapters and the current chapter. If the sample used here is to be completely new and different in characteristics, then empirical results will not be consistent across the study. The final sample used in this chapter for estimation turned out to be different only in the case of India mainly due to requirement that cost of equity capital estimates using K_{EG} should be in the range of [0, 0.60]. This selection criterion is justified on the theoretical grounds i.e., cost of equity capital cannot be negative and the extreme values of cost of equity capital might be due to mismeasurement of variables in the database.

8.4.2 Estimation Model and Explanatory Variables

Prior empirical studies have quite often used linear regression to investigate the cross-sectional determinants of the cost of equity capital. Botosan and Plumlee (2004) and Hail and Leuz (2003) use a cross-sectional regression of the cost of equity capital measure against a list of explanatory variables. For instance, Botosan and Plumlee (2004) use Ross's (1976) APT to motivate the estimation model to assess the relationship between risk premium and firm-specific risk factors[14].

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[14] The set of risk factors include firm's un-levered beta; size, book-to-market ratio.

A linear regression model with fixed effects was set up[15]. The prime rationale for using a linear regression model with fixed effects is that it allows for the use of all the data, while intercept is allowed to vary across firms, and in this way the effect of omitted variables can be captured in changing firms' intercept. Following, Botosan and Plumlee (2004), a linear regression specification that includes stock market liberalization; institutional development indicators and firm-specific risk factors, is used.

The study use two dependent variables: *ex post* measures of cost of equity capital denoted by K_{EG}, and dividend yield, *DY*. *DY* has been used not only to compare the findings with recent studies that have used it as a dependent variable (e.g., Henry, 2000; Bekaert and Harvey, 2000) but also to test the robustness of the relationship between this alternative measure of cost of equity capital and the stock market liberalization and new institutional development variables. Eq. (8.9) specifies the linear regression model. The dependent variables (K_{EG} and *DY*) are denoted by K_e.

$$\begin{aligned} Ke_{i,j,t} &= \alpha + \beta_1 SLIB_{i,j,t} + \beta_2 INST_{i,j,t} + \beta_3 BM_{i,j,t} \\ &\quad + \beta_4 VOL_{i,j,t} + \beta_5 DE_{i,j,t} + \beta_6 ATO_{i,j,t} + \beta_7 SIZE_{i,j,t} + \varepsilon_{i,j,t} \end{aligned} \tag{8.9}$$

where subscript i, j, and t denote firm, country, and time respectively. $\varepsilon_{i,j,t}$ is a random error term, $E(\varepsilon_{i..j,t}) = 0$. The standard assumptions about the distribution of error term hold. There is possibility that some variables on the right hand side in above equation might be collinear because earlier on in Chapter 4, we find size explain debt ratio and equity ratio, however, using VIF statistics, we did not find any evidence of multi-collinearity among variables.

Explanatory variables

The set of explanatory variables consist of stock market liberalization, institutional development variables, and the firm-specific risk factors/variables. The measurement of stock market liberalization denoted by *SLIB* has been described in Chapter 3 (see Table 3.1) with reference to

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[15] Hsio (1986) points out that in the presence of measurement error the fixed effects model can produce more biased estimators than simple pooling.

its impact on the optimal equity ratio. In the following section, only the impact of the stock market liberalization events (see Table 3.1 items 8-14) on the cost of equity capital is pointed out. On the other hand, firm-level stylized risk factors which affect firms' cost of equity capital are: book-to-market ratio, size, debt-to-equity ratio (see e.g., Chen et al, 2004; Hail and Leuz, 2006), price volatility, and management efficiency (see Singh and Nejadmalayeri, 2004). These variables have been used in previous studies and are found to have significant explanatory power.

Stock market liberalization variable (SLIB)

The stock market liberalization variable, *SLIB,* not only includes events such as DRs and country funds introduction used in previous studies (see e.g., Kim and Singal, 2000; Bekaert and Harvey, 2000; and Henry, 2000), but also includes events of the privatization of government-owned enterprises and incentives provided to foreign investors such as tax exemptions and repatriation of dividend income. There has been variation in the time and total number of privatization deals completed across countries[16]. The study used first DRs, cross listing, country fund dates in addition to the privatization, stock market opening and foreign investors' incentives announcement dates used in Bekaert and Harvey (2000) and Henry (2000). These latter events were included because previous studies have found these to have a significant effect on the cost of equity capital. The researcher argues that this scoping and modification to stock market liberalization variables captures not only the depth, e.g. increase in liquidity due to the opening of stock markets, but also the breadth of the stock market i.e., the increase in the number of listed firms after privatization.

It is argued that the stock market liberalization variable also overcomes the data availability problem because relying on just one indicator of stock market liberalization, such as the official date of liberalization, requires firm-level data before the date of official liberalization. Thus, for a country such as Malaysia, which opened its stock market in 1989, the cost of capital analysis requires firm-level data before 1989, and the non-availability of data before this date can severely

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[16] The number of completed privatization deals, for instance, in the manufacturing sector has been 22 in Indonesia; 45 in Malaysia; 14 in Thailand; 66 in India and 95 in Pakistan over the period of 1988-2003.

limit any useful investigation. The hypothesis is tested that there is a negative relationship between *SLIB* and the cost of equity capital. It is important to emphasize here that *SLIB* is a dummy variable not a continuous variable.

Institutional Development variable (INST)

The institutional development has to be investigated separately because standards in corporate governance, accounting and disclosure, and supervision of markets are critical to fostering an environment in which capital markets can develop and grow. Equity markets require strong regulatory frameworks and supportive legal infrastructure –equity instruments are private property instruments, which require robust and efficient mechanism to enforce legal ownership rights. The design of clearing and settlement system for securities is crucial factor in market development. Inefficient clearing and settlement system will impede development by driving cup the cost of investment, and tying up capital in the settlement process, thus, raising cost of equity finance. If shares are not fully transferable and questions of ownership arise, there will be negative impact on liquidity and a firm's ability to raise finance, thus, cost of equity capital. Furthermore, price discovery in the financial markets depend on adequate information disclosure. The accounting standards that underpin financial disclosure are crucial to establishing information credibility. The impact of improved corporate governance and disclosure standards can be illustrated by those large firms in emerging markets that have achieved listing on the NASDAQ, NSE, and FTSE.

The institutional development variable focuses on the securities market infrastructure for each country during the sample period. The securities market laws cover a wide spectrum of areas, including the distribution of securities, takeovers, stock market manipulations, insider trading, stock exchanges, and the activities of financial intermediaries (Daouk et al, 2006). Three dimensions of securities market - establishment of the securities market regulatory agency, shifts in trading technology, and changes in disclosure laws are focused upon, and it is argued that changes in these dimensions indicate a decrease in the information risk of investing in the emerging markets and the cost of equity capital.

Unlike previous studies that concentrate on only a few measures such as protection of outside shareholders, our measure *INST* captures the gradual nature of the securities market infrastructure development. For instance, Daouk et al. (2006) ranked India, Pakistan, Malaysia, Thailand and South Korea at the bottom of the list of 22 developed and 10 developing countries according to the quality of corporate governance in these countries[17]. On the contrary, La Porta et al. (2006) report the stronger public enforcement of securities laws in India, Malaysia and Pakistan using a public enforcement index. This research argues that the difference in opinion about the quality of securities laws in these countries does not give a clear indication about the quality of their internal and external corporate governance. It is also argued that there are differences in timing of the establishment of regulatory bodies, implementation of electronic trading, and changes in the insolvency and disclosure laws in these countries, which have been ignored in previous studies. For instance, South Korea was the first country in the sample to implement an electronic trading system in 1988, and the other countries adopted electronic trading later.

The establishment of regulatory bodies such as Securities and Exchange Commissions or Boards and Central Depository systems, promotes transparency and reduces information asymmetry. Public enforcers such as Securities and Exchange Commissions or Boards might be able to intervene *ex ante* by clarifying legal obligations or *ex post* by imposing their own penalties or bringing lawsuits. Such enforcement might work because the enforcer is independent and focused and thus able to regulate the market free from political intervention (La Porta et al., 2006). The Credit rating agencies are like stock analysts evaluating the risk profile of a firm and issuing a rating, which reduces the information asymmetry and also minimizes the cost of equity capital. Jain (2005) suggests that particularly in emerging markets, full automation and greater

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[17] Daouk et al (2006) used three aspects of securities market regulation to develop a corporate market governance (CMG) index, these are the earnings opacity, insider laws, and short-selling restrictions.

transparency can be an alternative way of reducing information asymmetry and can cause greater reduction in the cost of equity.

In a recent paper, Jain (2005) has empirically examined whether the implementation of electronic trading has reduced the equity risk premium. Using a dummy variable to indicate implementation of electronic trading, he finds that the advent of electronic trading is associated with a reduction in the cost of equity, with estimates ranging from 0.35% to 5.86% per annum[18]. This new empirical finding provides support to the argument in this thesis that distinct changes in the emerging markets financial market designs have relevance in explaining the decrease in the cost of equity capital. The importance of financial disclosure has already been examined in previous studies (see e.g., Chen et al, 2004; Botosan and Plumlee, 2002) in reducing the cost of equity capital.

Book to market ratio (BM)

Previous studies (see e.g., Fama and French, 1993; La Porta et al, 2002; Dechow et al, 2004) have shown that book-to-market ratio is an important valuation measure of a stock. A higher book-to-market ratio indicates that a stock is less risky and a lower ratio indicates the opposite. Chen et al. (2004) argue that book-to-market ratio is negatively related to the market capitalization of a firm, and therefore, it should be positively related to the cost of equity capital. Hail and Leuz (2006) find a negative relationship between book-to-market ratio and implied cost of capital. On the other hand, Erb et al. (1996) suggest that book-to-market is related to, and influenced by, a country's economic risk, and hence captures the impact of changes in the economic risk of investing in an emerging market. They find a negative relationship between the book-to-market ratio and economic risk rating of a country, which indicates that when a country's economic risk rating improves the book-to-market ratio decreases. An important implication of this finding is that, if capital flows to emerging markets are related to better economic fundamentals of emerging markets, the valuation of stocks reflects these upward improvements in economic fundamentals,

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[18] In a regression model with equity premium as the dependent variable and electronic trading as the key explanatory variable, Jain (2005) found that the reduction in the cost of equity capital is more pronounced in emerging markets than in developed markets in both absolute and proportional terms. The decline in the cost of equity capital was -3.67% for Thailand,-2.59% Indonesia, -2.36% Pakistan,-1.96% for South Korea; -1.88% India, -1.21% Malaysia.

and according to Erb et al (1996), there should be a negative relationship between the book-to-market ratio and cost of equity capital. The book-to-market ratio, *BM*, is calculated using the book value per share for each firm in *Datastream* divided by the market price at the end of each year. In the light of the above findings, the relationship between the book-to-market ratio and cost of capital is ambiguous.

Size (SIZE)

The size of a firm has an important interpretation in return, risk and asset pricing literature. Bloomfield and Michaely (2004) argue that the larger firms are less risky than smaller firms and provide higher returns, and therefore, there should be a negative relationship between size and the cost of equity capital. Chen et al. (2004) find a significant negative relationship between firm size and the implied cost of equity capital for emerging markets. Hail and Leuz (2006) also find a significant negative relationship between firm size and the cost of equity capital. In this study, a log of the market value of a firm's outstanding common stock at the end of each year, was used to measure firm size, denoted by *SIZE*. Chen et al (2004) and Hail and Leuz (2006) have used a similar measure. A negative relationship between *SIZE* and the cost of equity capital is expected.

Debt-to-equity ratio (DE)

The finance literature stresses a non-linear relationship between the debt-to-equity ratio and the cost of equity capital of a firm, the argument being that the weighted average cost of capital (WACC) decreases with an increase in debt-to-equity ratio due to tax shield TO a certain point, and the additional financial risk outweighs the lower nominal cost of debt. The increase in the debt-to-equity ratio increases the financial risk of a firm and chances of the bankruptcy. Since shareholders are the residual claimants, the threat of bankruptcy forces them to demand a required rate return, and therefore, beyond a certain point, the cost of equity capital will increase with high level of debt. The researcher used the debt-to-equity ratio variable, *DE*, similar to Botosan and Plumlee (2004). *DE* is defined as total debt to total market value of equity ratio at the end of year. A positive relationship between *DE* and cost of equity capital is expected.

Price volatility

Price volatility is related to the information asymmetry between the managers and shareholders, and it also affects the required rate of return. In the stock market liberalization context, if an emerging market becomes more integrated with the world markets, then it should become less subject to the local market risk, and become more exposed to the world factors. If the integration with the world markets makes the equilibrating process more efficient for stocks in the emerging markets, it is reasonable to expect a drop in the stock return volatility, and a concomitant drop in the expected return. This implies a positive relationship between volatility and cost of capital. Previous studies have found a decrease in the stock return volatility for the Southeast Asian countries after the opening of their stock markets to foreigners (see e.g., Kim and Singal, 2000; Bekaert and Harvey, 1997). On the contrary, Bae et al. (2004) argue that some stocks might become more volatile than others due to the accessibility to international investors, consequently implying from this assumption, that the cost of capital of such stocks would also be different from those stocks which remain non-ingestible. These authors found that non-investable emerging market portfolios offer lower volatility than the highly investable portfolios, which suggests cross-sectional variation in return volatility after liberalization.

In this study, a price volatility measure, *VOL*, reported in *Worldscope*, which defines a stock's annual price movement to a high and a low from a mean price for each year, was adopted. A stock's price volatility of 20%, for instance, indicates that the stock annual high and low price has shown a historical variation of +20% to -20% from its annual average. We expect a positive relationship between *VOL* and the cost of equity capital.

Managerial efficiency

It has also been argued that managerial efficiency in the utilization of firm resources provides another effect on the firm-level cost of equity capital (Singh and Nejadmalayeri, 2004). The recent evidence of corporate cronyism in the Asian countries seems to indicate that political connections (see Johnson and Mitton, 2003) and expropriation by managers is reflected in the performance of firms (see Joh, 2002). The controlling shareholders have greater incentives and means to expropriate firms' resources than do their counterparts in independent firms. In addition, firms affiliated with business groups can suffer more, as their controlling shareholders have more tools to divert firm resources through the transfer of assets from one subsidiary to another. In this study, asset turnover ratio, *ATO*, defined as total sales divided by average total assets, as an indicator of managerial efficiency to test the influence of managerial efficiency on the cost of equity capital, was used. We expect a positive relationship between *ATO* and the cost of equity capital to find support for the hypothesis that managerial expropriation increased the shareholders' required return of return due to information asymmetry. The impact of the difference in ownership structure on the cost of equity capital was also tested.

8.4.3. Descriptive Statistics

Table 8.4 provides descriptive statistics of explanatory variables (see Panel A). The mean cost of equity capital of 11.97% using K_{EPZ} is lower than 16.52% using K_{EG}. The magnitude of cost of equity capital is larger, which seems to suggest noise in *ROE* and macro-economic data, which has generated higher expected returns.

Table 8.4
Descriptive Statistics and Correlations

The table presents the descriptive statistics and correlations of different measures of the cost of equity capital and control variables. The firm-level accounting data was downloaded from *Datastream and* Worldscope over the period 1991-2004. Panel A shows the descriptive statistics for the explanatory variables: *BM* is the book-value per share divided by market price at the end of year; *SIZE* is the log of total market value of the firm at the end of each year; *DE* is the total debt to total market value of equity ratio at the end of year; *VOL*, is a stock's annual price movement to a high and a low from a mean price for each year and *ATO* is total sales divided by average total assets at the end of each year. Panel B shows the correlation coefficient between the estimates of the cost of equity capital and the explanatory variables.

Panel –A Descriptive statistics

					Percentiles			
Variables	Mean	Std	Min.	Max.	10%	25%	75%	90%
K_{EG}	0.1652	0.0993	0.0007	0.5948	0.0703	0.1068	0.1915	0.2867
BM	1.0811	0.8891	0.0000	3.9889	0.2029	0.4152	1.4958	2.4431
DE	0.7595	0.7667	0.0010	2.9992	0.0160	0.1235	1.2044	1.9859
VOL	0.1188	0.1882	0.0000	0.7246	0.0000	0.0000	0.2835	0.4354
ATO	0.8279	0.5656	0.0001	8.6452	0.2483	0.4674	1.0571	1.4976
SIZE	4.7863	0.8115	0.0000	7.7566	3.8276	4.2749	5.3045	5.8159

The mean book-to-market ratio is 1.08 indicating that the Southeast Asian firms in the sample tend to trade at discount and are value stocks. The mean debt to equity ratio is 0.75 indicating a higher level of debt in capital structure as found in earlier studies (see Booth et al, 2001).

Panel –B Correlation matrix

	K_{EG}	*BM*	*VOL*	*DE*	*ATO*	*SIZE*
K_{EG}	1.0000					
BM	0.0964	1.0000				
VOL	-0.0558 [a]	0.1902 [a]	1.0000			
DE	0.0421	0.4839 [a]	0.0371 [a]	1.0000		
ATO	0.1628 [a]	-0.1697 [a]	-0.0252 [a]	-0.1687 [a]		
SIZE	-0.1153 [a]	-0.4082 [a]	-0.0053	-0.2622 [a]	-0.0783 [a]	1.0000

[a], [b], [c] shows significance at 1%, 5%, and 10% level of significance respectively

The results show a negative correlation between *VOL* and K_{EG} (*p-value* < 0.01). *ATO* is positively correlated with the cost of equity capital K_{EG} (*p-value* < 0.01) which seems to support the view that an increase in managerial opportunism increases the shareholder expected return, due to a high level of information asymmetry between managerial and shareholders' objectives. The correlation between K_{EG} and *DY* of 0.048 is smaller in level than the significant correlation between K_{EPZ} and *DY* of 0.1841 (*p-value* < 0.01).

8.4.4 Empirical Results

The researcher conducted two experiments to gauge the influence of stock market liberalization on the cost of equity capital. In the first experiment, the parameters in Eq. (8.3) were estimated by dividing the sample period into three periods denoted as *PRE*, *POST* and *AFTER*[19]. These periods are defined as: *PRE* (three years pre-stock market liberalization); *POST* (three years post-stock market liberalization before the Asian financial crisis), and *AFTER* (from the Asian financial crisis to the end of the sample period).

In the second experiment, the parameters in Eq. (8.3) were estimated over the entire sample period. The specification *F*-test (*OLS vs. F.E.*) was used to test whether the inclusion of the country-fixed effect adds to the explanatory power of the model. Two *Wald* tests on the null hypotheses of no significance of stock market liberalization, institutional development and firm-specific risk variables, are also reported. The specification test shows that country-fixed effects

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[19] Division of the sample period into three different windows has been done to compare results with Bekaert and Harvey (2000).

capture the unobserved country-level factors. The *Wald* tests show that these variables have statistically significant explanatory power. The country dummies are not significant.

The results in Table 8.6 show that the cost of equity capital decreased in the *PRE* period using K_{EG} and *DY*. However, a positive coefficient is found on the variable *SLIB* using *DY* as the dependent variable. This result is similar to the previous findings, for instance, Henry (2000) also shows an increase in the *DY* in the shorter window of four months prior to liberalization for a sample of emerging markets. During the *POST* stock liberalization period, there has been a significant decrease in the cost of equity capital using K_{EG} and *DY* (p-value <0.01 and 0.10). The significant negative coefficient of *SLIB* (p-value <0.01) seems to suggests that the decline in the cost of equity capital was of 1% compared to more than 3% in the *PRE* period. This finding shows that stock liberalizations led to the adjustment in market valuations.

Prior to liberalization, the local price of risk (variance) is higher than the global price of risk (covariance), but after opening of the stock market to foreign investors, holding future cash flows constant, the fall in equity premium will cause a permanent decrease in the cost of equity capital and an attendant revaluation of the aggregate equity price index. Similarly, Bekaert and Harvey (2000) point out that an increase in the correlation between stock markets and world markets in the post-liberalization period leads to greater revaluation effect.

Table 8.5

Stock Market Liberalization and Firm-level Cost of Equity Capital

The table presents the estimation results of the Eq. (8.9):

$$Ke_{i,j,t} = \alpha + \beta_1 SLIB_{i,j,t} + \beta_3 BM_{i,j,t} + \beta_4 VOL_{i,j,t} + \beta_5 DE_{i,j,t} + \beta_6 ATO_{i,j,t} + \beta_7 SIZE_{i,j,t} + \varepsilon_{i,j,t}$$

The dependent variables (K_{EG} and *DY*) are denoted by K_e. *SLIB* is a stock market liberalization variable that equals to 1 for each country when *SLIB* >5 and otherwise 0; *BM* is the book-value per share divided by market price at the end of year; *VOL*, is a stock's annual price movement to a high and a low from a mean price for each year; *DE* is the total debt to total market value of equity ratio at the end of year; *ATO* is the total sales divided by average total assets at the end of each year; *SIZE* is the log of total market value of the firm at the end of each year. The results are reported using fixed effect. Wald Test 1 is *F*-test for stock market liberalization variable; Wald Test 2 is *F*- test for firm specific risk factors/variables; *F Test* is *OLS* vs. *F.E.* is a specification Test. The White period standard errors are reported in parentheses which are robust to arbitrary serial correlation and time-varying variances in the disturbances.

	PRE *Dependant variable*		*POST* *Dependant variable*		*AFTER* *Dependant variable*	
Variable	K_{EG}	*DY*	K_{EG}	*DY*	K_{EG}	*DY*
SLIB	-0.0349	0.0692 ^{a}	-0.0187 ^{c}	-0.0186 ^{a}	0.0224	-0.0402 ^{a}
	(0.0215)	(0.0265)	(0.0092)	(0.0085)	(0.0192)	(0.0150)
BM	0.0204^{c}	0.0345 ^{b}	-0.0125	0.0701 ^{a}	-0.0036	0.0662 ^{a}
	(0.0188)	(0.0182)	(0.0091)	(0.0219)	(0.0069)	(0.0189)
VOL	-0.0701	-0.0742 ^{c}	0.0064	0.0131	-0.0143	0.1734 ^{a}
	(0.0568)	(0.0401)	(0.0322)	(0.0681)	(0.0208)	(0.0578)
DE	-0.0176	0.0384	0.0122	0.0369 ^{c}	0.0140 ^{b}	-0.0224
	(0.0134)	(0.0248)	(0.0083)	(0.0198)	(0.0061)	(0.0145)
ATO	0.0164 ^{c}	0.0168	0.0201 ^{a}	-0.0015	0.0234 ^{a}	0.0017
	(0.0093)	(0.0148)	(0.0059)	(0.0077)	(0.0061)	(0.0175)
SIZE	0.0076	-0.0241	0.0079	-0.0175 ^{b}	-0.0076	-0.0599 ^{b}
	(0.0084)	(0.0203)	(0.0062)	(0.0078)	(0.0062)	(0.0199)
N	172	191	215	225	469	515
Fixed effect	YES	YES	YES	YES	YES	YES
Adj. R^2	0.2521	0.3927	0.1774	0.5639	0.1876	0.5039
Wald Test 1	2.6344	6.7811 ^{a}	4.0176	0.1781	1.3638	7.1710 ^{a}
Wald Test 2	1.5913	4.1910 ^{a}	3.9899 ^{a}	4.1377 ^{a}	4.2468 ^{a}	6.6168 ^{a}
F Test	13.8719 ^{a}	4.1871 ^{a}	17.617 ^{a}	163.2580 ^{a}	19.5037 ^{a}	232.0076 ^{a}

^{a}, ^{b}, ^{c} shows significance at 1%, 5%, and 10% level of significance respectively.

In the *AFTER* period the negative coefficient of the variable *SLIB* shows that the cost of equity capital has continued to decrease after liberalization. In particular, average *DY* fell significantly as shown by the change in the coefficient of the variable *SLIB* from 0.0692 in the *PRE* to -0.0402 in the *AFTER* period[20]. Among the firm-specific risk variables, we find that *ATO* has a significant positive coefficient; *BM* and *VOL* also have positive coefficients in the *POST* and *AFTER* periods; and the *SIZE* variable has a significant negative coefficient.

In particular, the impact of the *SIZE* in the post-liberalization period has increased considerably compared to the pre-liberalization period, in two of the regressions (see Table 8.6). *BM* has significant positive coefficient in the post-liberalization period, this result is supported by findings of Chen et al. (2004) but opposite to suggestion of Erb et al. (1996). In sum, these results also seem to suggest that firm-specific risk factors, which explain the difference in the expected returns for the developed equity markets, also describe the cross-section of expected returns of the emerging markets.

In a second experiment, the entire sample period was used to draw inferences about the influence of the stock market liberalization and institutional developments on the cost of equity capital. Table 8.7 reports the results from regressing three measures of the cost of equity capital on *SLIB*, *INST* and firm-specific factors across countries. A significant negative coefficient on *SLIB* (*p-value* < 0.01) is found, supporting the hypothesis that the stock market liberalization has been associated with a reduction in the cost of equity capital ranging from 1% to 4% per annum for Southeast Asian firms. The coefficient on firm-specific control variables generally bears signs consistent with those cited in prior studies.

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[20] Henry (2003) reports that aggregate dividend yield fell by roughly 240 basis points, from an average of 5% in the five year prior to liberalization to an average of 2.6% in the five years following the liberalization (using the date when foreigners could first hold domestic shares).

Table 8.6

Stock Market Liberalization, Institutional Developments Cost of Equity Capital

The table presents the estimation results of the Eq. (8.9):

$$Ke_{i,j,t} = \alpha + \beta_1 SLIB_{i,j,t} + \beta_2 INST_{i,j,t} + \beta_3 BM_{i,j,t} + \beta_4 VOL_{i,j,t} + \beta_5 DE_{i,j,t} + \beta_6 ATO_{i,j,t} + \beta_7 SIZE_{i,j,t} + \varepsilon_{i,j,t}$$

The dependent variables (K_{EG} and *DY*) are denoted by K_e. *SLIB* is a stock market liberalization variable that equals to 1 for each country when *SLIB* >5 and otherwise 0; *INTS* is an institutional development variable that equals to 1 for each country when *INST* > 5 and otherwise 0; *BM* is the book-value per share divided by market price at the end of year; *VOL*, is a stock's annual price movement to a high and a low from a mean price for each year; *DE* is the total debt to total market value of equity ratio at the end of year; *ATO* is the total sales divided by average total assets at the end of each year; *SIZE* is the log of total market value of the firm at the end of each year. The firm-level accounting data was downloaded from *Datastream* and *Worldscope*. The results are reported using fixed effect. Wald Test 1 is *F*-test under the null hypothesis that stock market liberalization and institutional development variables has no effect on cost of equity capital ; Wald Test 2 is *F*- test under the null hypothesis that firm specific explanatory variables have no effect on cost of equity capital; *OLS* vs. *F.E.* is a specification Test. The White period standard errors are reported in parentheses which are robust to arbitrary serial correlation and time-varying variances in the disturbances.

	Dependant variable		*Dependant variable*	
Variables	K_{EG}	*DY*	K_{EG}	*DY*
SLIB	-0.0173 ^{a}	-0.0463 ^{a}	--	--
	(0.0063)	(0.0015)		
INST	--	--	-0.0104**	-0.0406 ^{a}
			(0.0055)	(0.0121)
BM	0.0028	0.0684 ^{a}	0.0014	0.0681 ^{a}
	(0.0051)	(0.142)	(0.0051)	(0.0145)
VOL	0.0057	0.2261 ^{a}	0.0064	0.2487 ^{a}
	(0.0160)	(0.0496)	(0.0166)	(0.0542)
DE	0.0112 ^{b}	0.0137	0.0117 ^{b}	0.0142
	(0.0047)	(0.0117)	(0.0047)	(0.0117)
ATO	0.0233 ^{a}	0.0015	0.0238 ^{a}	0.0006
	(0.0040)	(0.0114)	(0.0040)	(0.0011)
SIZE	-0.0018	-0.0354 ^{a}	-0.0016	-0.0399 ^{a}
	(0.0037)	(0.0119)	(0.0040)	(0.0127)
Fixed effect	YES	YES	YES	YES
Adj. R^2	0.1807	0.4570	0.1785	0.4563
Wald Test1	7.5722 ^{a}	16.0421 ^{a}	3.5461 ^{b}	11.2098 ^{a}
Wald Test 2	7.8249 ^{a}	10.1188 ^{a}	8.0287 ^{a}	9.9483 ^{a}
F Test	40.1548 ^{a}	5.9016 ^{a}	39.0361 ^{a}	10.2857 ^{a}
N	856	931	856	928

^{a}, ^{b}, ^{c} shows significance at 1%, 5%, and 10% level of significance respectively.

It is found that the coefficients on *BM* and *VOL* are only significantly positive when using *DY* as a dependent variable, whereas the coefficients of *DE*, *ATO* and *SIZE* are significantly positive and negative respectively across two dependent variables. The positive coefficient of *DE* seems to suggest that the increase in the financial risk has been associated with the increase in the cost of equity capital.

Table 8.7 also reports the results from regressing two measures of the cost of equity capital on *INST* and firm-specific factors. The results indicate that the changes in the securities market institutional framework of these countries have also reduced the firm-level cost of equity capital. The coefficient on *INST* is significant and negative (*p-value* < 0.01). The combined effect of institutional changes seems to suggest a decrease in the cost of equity capital of 1% to 4% over the entire sample period. This finding supports the hypothesis i.e., with the implementation of new securities' rules/regulations, and transparency in firm disclosure, firms were able to access capital markets and reduce their cost of equity capital. The coefficients on the firm-specific control variables have consistent signs (see Table 8.7).

The consistent negative relationship between the stock market liberalization and institutional development variable and two measures of the cost of capital, prove that the results are robust to differences in proxy measures of the cost of equity capital even at firm-level. For example, using dividend yield (measured in US$), the estimated decline of 4% is line with reports by Jain (2005) and Bekaert and Harvey (2000) for the emerging markets. Despite the overall decrease in the firm-level cost of equity, it is argued that the DR issuance, analysts' coverage of firms, and ownership of the firms, will have different effects on the firm-level cost of equity capital. The hypothesis is that stock market liberalization will have a heterogeneous effect across firms even in the same country.

8.5 Depository Receipts, Analyst Coverage and Insider Ownership

8.5.1 Effect of Analyst Coverage

It has been suggested that analysts' coverage in emerging markets also matters because it reduces information asymmetry inherent in investing in these opaque markets. The main argument is as follows: the foreign ownership of domestic stocks in the emerging markets is absent due to the capital controls imposed by the governments. However, as the intensity of capital controls declines, free-float of firms increases i.e. numbers of shares that can be purchased by the foreigners. The increase in analysts' coverage of such stocks provides useful information to foreign investors[21], providing them with portfolio diversification advantage and at the same time integrating the once-segmented domestic stock markets[22] in global markets. The increase in the risk sharing between domestic and foreign investors may reduce the country's cost of capital.

In order to investigate the impact of analyst coverage on the cost of equity capital, it was assumed that the *MSCI* country indices represent only those stocks which have available free-float and are covered by the foreign analysts. Such stocks were searched for in respect of each country in the sample in the *Datastream*. The search included only the stocks of non-financial firms in operation, and firms that had suspended trading but were included in the *MSCI* country index for a country any time during the sample period, were excluded. The search showed that the coverage of stocks in the *MSCI* country indices varies from a high number of 59 firms in Malaysia to a low of 25 firms in Pakistan. Therefore, the level of analysts' coverage shows the restriction on foreign investment in the Southeast Asian countries. A higher number of stocks in the analysts' coverage for Malaysia show a lesser restriction on the foreign ownership of local stocks compared to other countries.

A dummy variable *COV* equal to 1 to denote a firm-year when a firm is included in *MSCI* index of that country and 0 otherwise, was used. The hypothesis is tested that there is a negative relationship between *COV* and the cost of equity capital.

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[21] Besides private analysts' forecasts, private firms such as *I/B/E/S*, *Value Line*, and major indices such as *MSCI* and *S & P* also follow stocks in emerging markets, which indices include only those stocks which are liquid, having free float and high market capitalization on an emerging market's stock exchange. Most of the previous studies (see Hail and Leuz, 2006; Chen et al, 2004) have explicitly used analysts' forecasts about future earnings, growth and dividends of firms to estimate the *ex ante* cost of equity capital.

[22] Edison and Warnock (2003) have used free-float to indicate intensity of capital controls in a sample of emerging markets in Latin America and East Asia, and using this information developed a variable of foreign ownership in each country. The variable foreign ownership varies from 1 to 0, where 0 represents a completely open market with no restrictions, and a value of 1 indicates that the market is closed completely for any foreign investment.

8.5.2 Effect of Introduction of Depository Receipts

Depository receipts (DRs) are negotiable securities that represent equity or debt of a non-US based firm[23]. The DRs provide numerous advantages to the non-US firms including raising capital in the most liquid markets such as NYSE, NASDAQ and FTSE, enhancing the visibility and image for the company's product. Errunza and Miller (2000) consider the introduction of DRs as a particular form of liberalization. One of the main benefits of the DRs is the reduction in the segmentation of capital markets. After stock market opening to international investors in many Asian countries, the local firms received encouragement from their governments to use DRs. Theoretically, local firms want to list abroad because of smaller and less liquid home markets. The capital account liberalization provided a window of opportunity as interpreted in market timing literature to the emerging market firms to raise capital from the foreign markets. From an international investor's perspective, DR offerings from emerging markets' firms provide them with immense portfolio diversification advantage with minimal transaction costs, as a result of which, the demand for DRs by international investors increased after liberalization (Henderson et al, 2005; Errunza and Losq, 1985). From the emerging market firm perspective, the listing in the foreign capital markets reduces the expected risk premium and cost of equity capital[24].

In order to evaluate the impact of DRs on a firm's cost of equity capital, information was obtained about different types of DR Programmes from *The Bank of New York* and *London Stock Exchange* websites. The total number of DR Programmes introduced by firms in the sample increased from a low of 23 in 1991 to high of 101 by the end of 1996. There is also cross-country variation in the

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[23] Depository receipts traded inside the US are known as ADRs, while DRs traded outside the US are called Global Depository Receipts (GDRs). There are different types of DRs: SEC Rule 144A / Regulation (S) Depositary Receipts and sponsored DRs. The sponsored Level-II and III ADRs programme allows a non-US firm to raise capital in a US stock market such as NYSE, AMEX or NASDAQ. Rule 144A DRs allows a non-US firm to raise new equity capital through private placement. Generally, firms that choose either Level II or Level III DRs will attract a significant number of US investors (Bank of New York, 2005).

[24] Miller (1999) found a significant difference in the abnormal returns of firms that list on major US exchanges such as NYSE or NASDAQ, rather than on over-the-counter (OTC) 'pink sheet' or PORTAL after the announcement of DR. Bekaert and Harvey (2000) show that the introduction of five ADRs (Level-II and III or OTC DR and 144A DRs) listed on NYSE/NASDAQ/AMEX or FTSE100 resulted in the decrease of 40 basis points in dividend yield a proxy for the cost of equity capital. They do not make any distinction between different types of DRs and their effect on the cost of equity capital.

number and type of DR programmes[25]. A dummy variable *DR* equal to 1 to denote a firm-year when a firm launched a *DR* and 0 otherwise was used. The hypothesis is tested that there is a negative relationship between *DR* and the cost of equity capital.

Table 8.7

Effect of DRs and MSCI Coverage on the Cost of Equity Capital

The table presents the estimation results of the Eq. (8.9):

$$Ke_{i,j,t} = \alpha + \beta_1 DR_{i,j,t} + \beta_2 COV_{i,j,t} + \beta_3 INST + \beta_4 BM_{i,j,t} + \beta_5 VOL + \beta_6 DE + \beta_7 ATO + \beta_8 SIZE + \varepsilon_{i,j,t}$$

The dependent variables (K_{EG} and *DY*) are denoted by K_e. *DR* is a dummy variable that takes on the value of 1 for each firm in a year when it initiated any DR programme; *COV* is a dummy variable that takes on the value of 1 for each firm in a year when it is included in the MSCI country index; *SLIB* is a stock market liberalization variable that equals to 1 for each country when the total number of liberalization measures exceeds 5 or 6 in a year; *INTS* is an institutional development variable that equals to 1 for each country when the total number of institutional development measures exceeds 5 in a year; *BM* is the book-value per share divided by market price at the end of year; *VOL*, is a stock's annual price movement to a high and a low from a mean price for each year; *DE* is total debt to total market value of equity ratio at the end of year; *ATO* is total sales divided by the average total assets at the end of each year; *SIZE* is the log of total market value of the firm at the end of each year. The results are reported using fixed effect. Wald Test 1 is *F*-test for testing null of no impact of *DRs* and *COV* on the cost of equity capital; Wald Test 2 is *F*- test for null of no impact of firm-specific risk factors on the cost of equity capital; *OLS* vs. *F.E.* is a specification Test .The White period standard errors are reported in parentheses which are robust to arbitrary serial correlation and time-varying variances in the disturbances.

	Dependant variable		*Dependant variable*	
Variable	K_{EG}	*DY*	K_{EG}	*DY*
DR	-0.0128	-0.1483^{a}	-0.0104	-0.1656^{a}
	(0.0135)	(0.0622)	(0.0133)	(0.0651)
COV	-0.0042	-0.0140	-0.0053	-0.0195
	(0.0048)	(0.0138)	(0.0048)	(0.0143)
INST	--	--	-0.0066	-0.0417^{a}
			(0.0057)	(0.0115)
SLIB	--	--	-0.0152^{c}	-0.0341^{a}
			(0.0092)	(0.0116)
BM	0.0010	0.0616	-0.0038	0.0698^{a}
	(0.0050)	(0.0135)	(0.0052)	(0.0150)
VOL	0.0149	0.1976^{a}	0.0008	0.2642^{a}
	(0.0154)	(0.0474)	(0.0167)	(0.0570)
DE	0.0113^{b}	0.0172	0.0108^{b}	0.0146
	(0.0046)	(0.0108)	(0.0046)	(0.0114)
ATO	0.0232^{b}	0.0010	0.0232^{a}	0.0063
	(0.0040)	(0.0054)	(0.0040)	(0.0117)
SIZE	-0.0054	-0.0424^{a}	-0.0054	-0.0416^{a}
	(0.0046)	(0.0120)	(0.0046)	(0.0124)
Fixed effect	YES	YES	YES	YES
Adj. R^2	0.1751	0.4584	0.1792	0.4595
Wald Test1	0.8094	4.3206^{b}	0.8739	4.9761^{a}
Wald Test 2	7.8962^{a}	11.1724^{a}	7.8962^{a}	10.6485^{a}
F-Test	8.5837^{a}	335.1432^{a}	37.0605^{a}	290.9868^{c}
N	856	931	856	931

^{a}, ^{b}, ^{c} shows significance at 1%, 5%, and 10% level of significance respectively.

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[25] For instance, total number of DRs Programmes varied from a low of 6 in Pakistan to a high of 148 in India The number of Level-II and III DRs was the highest for India and the majority of the firms used DRs during 1994-1996. This period coincides with full stock liberalization period as defined by this study.

Table 8.8 shows the estimation results after the inclusion of *DR* and *COV* in the regression model. It is found that the coefficients of *DR* and *COV* are negative using two measures of the cost of equity capital but significant only using *DY* (p-value <0.01). The results seem to support the hypotheses that a decrease in the cost of equity capital is associated with the issuance of DRs and firm-level *MSCI* coverage, even after controlling for stock market liberalization, institutional development and firm-specific factors.

We can see that the coefficient of the variable *COV* is negative but not significant which might be due to the overlapping effect. For instance, it is possible that a firm which had a DR Programme in the past has also been included in the *MSCI* coverage, and therefore, it might have an overlapping effect on the cost of equity capital. However, despite weak results which might be due to the overlapping effect, the decrease in the cost of equity capital of 1% is similar to prior results in this study. The results are robust to the inclusion of even *SLIB* and *INST* and later variables have a significant negative relationship with the cost of equity capital (*p-value* < 0.05, 0.01).

8.5.3 Comparison of DRs and MSCI Coverage Firms with Non-DRs and Non-coverage Firms

The study is not able to empirically discriminate the issuance effect of different types of DRs on the cost of equity capital[26]. Those firms with a *DR* and *COV* were compared with firms not having a *DR* and *COV*, and in this way, the impact of *DR* and *COV* on the cost of equity capital was examined more precisely. The results are reported in Table 8.9. The *SIZE* variable is not included in order to avoid the overlapping effect. The comparison of *DR* and *NDR* in Panel–A indicates that the cost of equity capital of a firm having a DR decreased by 1% to 2% compared to the 2% increase for a *NDR* firm. Although *SLIB* is not significantly negative for both *DR* and *NDR* firms but results show that despite the overall decrease in the cost of equity capital due to stock market liberalization, the issuance of a DR provides the advantage of a lower cost of capital compared to those counterpart domestic firms without a DR.

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[26] There are only 38 firms having LEVEL II and III DRs compared to 196 firms that have other types of DRs.

Table 8.9

Comparative Analysis DR vs. NDR and COV vs. NCOV

This table compares the firms with Depository Receipts (DRs) and MSCI Coverage firms with no Depository Receipts (DRs) and MSCI Coverage firms.

$$Ke_{i,j,t} = \alpha + \beta_1 DR_{i,j,t} + \beta_2 COV_{i,j,t} + \beta_3 INST + \beta_4 BM_{i,j,t} + \beta_5 VOL + \beta_6 DE + \beta_7 ATO + \beta_8 SIZE + \varepsilon_{i,j,t}$$

The dependent variables (K_{EG} and *DY*) are denoted by K_e. *DR* is a dummy variable equal to 1 for a firm-year when a firm initiates any DR programme; *NDR* is a dummy variable equal to 1 for a firm-year if a firm does not have any DR programme; *COV* is a dummy variable equal to 1 for a firm-year when a firm is included in the *MSCI* country index; *NCOV* is a dummy variable equal to 1 for a firm-year if a firm is not included in the *MSCI* country index; *SLIB* is a stock market liberalization variable that equals to 1 for a country-year when the total number of liberalization measures exceeds 6 in a year; *INST* is an institutional development variable equal to 1 for a country-year when the total number of institutional development measures exceeds 5 in a year; *BM* is the book-value per share divided by market price at the end of year; *VOL*, is a stock's annual price movement to a high and a low from a mean price for each year; *DE* is total debt to total market value of equity ratio at the end of year; *ATO* is total sales divided by average total assets at the end of each year; *SIZE* is the log of total market value of the firm at the end of each year. The results are reported using fixed effect. *F-Test* is *OLS* vs. *F.E.* specification Test. The White period standard errors are reported in parentheses which are robust to arbitrary serial correlation and time-varying variances in the disturbances. Panel –A reports results for *DR vs. NDR* and Panel-B reports results for *COV vs. NCOV*.

Panel-A	*DR vs. NDR*				Panel-B		*COV vs. NCOV*	
	Dependant variable		*Dependant variable*		*Dependant variable*		*Dependant variable*	
Variables	K_{EG}	*DY*	K_{EG}	*DY*	K_{EG}	*DY*	K_{EG}	*DY*
DR	0.0052 (0.0110)	-0.0283 (0.0579)	-	-	-	-	-	-
NDR	-	-	0.0030 (0.0108)	0.0293 (0.0572	-	-	-	-
COV	-	-	-	-	0.0031 (0.0045)	-0.0438 ^{a} (0.0149)	-	-
NCOV	-	-	-	-	-	-	0.0035 (0.0062)	0.0035 (0.0062)
SLIB	0.0145 ^{b} (0.0064)	-0.0576 ^{a} (0.0121)	0.0164 ^{b} (0.0065)	-0.0574 ^{a} (0.0122)	0.0164 (0.0065)	-0.0595 ^{a} (0.0125)	0.0163 ^{b} (0.0065)	-0.0591 ^{a} (0.0125)
INST	0.0075 (0.0057)	-0.0253 ^{a} (0.0108)	0.0088 (0.0057)	-0.0251 ^{a} (0.0109)	0.0089 (0.0058)	-0.0262 ^{b} (0.0110)	0.0086 (0.0058)	-0.0262 ^{a} (0.0110)
BM	-0.0015 (0.0045)	0.0957 ^{a} (0.0152)	-0.0044 (0.0045)	0.0954 ^{a} (0.0154)	-0.0043 (0.0045)	0.0926 ^{a} (0.0151)	-0.0048 (0.0045)	0.0933 ^{a} (0.0151)
VOL	0.0006 (0.0166)	0.2696 ^{a} (0.0542)	0.0037 (0.0168)	0.2703 ^{a} (0.0535)	0.0025 (0.0167)	0.2837 ^{a} (0.0556)	0.0047 (0.0169)	0.2785 ^{a} (0.0549)
DE	0.0113 ^{b} (0.0044)	-0.0073 (0.0104)	0.0075 (0.0044)	-0.0078 (0.0098)	0.0072 (0.0044)	-0.0051 (0.0099)	0.0077 (0.0044)	-0.0060 (0.0099)
F-Test	49.5131 ^{a}	307.366 ^{a}	60.297 ^{a}	314.163 ^{a}	60.477 ^{a}	318.402 ^{a}	60.249 ^{a}	60.2497 ^{a}
Adj. R^2	0.1806	0.4679	0.1632	0.4681	0.0170	0.4697	0.1638	0.4693
N	857	929	857	929	857	929	857	929

^{a}, ^{b}, ^{c} shows significance at 1%, 5%, and 10% level of significance respectively.

Likewise, the comparison of *COV vs. NCOV* shows that firms that have been included in the *MSCI* County index have experienced a significant decline of 4% in the cost of equity capital (*p-value* <0.01) in the *DY* regression (Panel-B). The coefficient of the variables *SLIB* and *INST* are negative, suggesting that the decrease in the cost of equity capital of these firms was also associated with stock market liberalization and institutional developments. The significant negative coefficients of the variables *SLIB* and *INST* (*p-value* <0.01) seem to suggest that the cost of equity capital of *NCOV* firms decreased mainly because of the stock market liberalization and institutional developments.

8.5.4 Effect of Insider Ownership

It has been argued that insider ownership also influences the cost of equity capital (Himmelberg et al, 2002), the argument being that due to the lack of investor protection in the emerging markets, insiders or owners of firms are not able to fully diversify risk. Consequently, the cost of capital of firms that remain closely held includes an additional premium for holding idiosyncratic risk which is absent when investor protection allows insiders to diversify completely. Increased ownership concentration (any kind of owner) decreases financial performance because it raises the firm's cost of capital as a result of decreased market liquidity or decreased diversification opportunities on behalf of the investor (Fama and Jensen, 1983).

Similarly, Johnson et al. (2000) argue that expropriation by insiders influences the cost of equity capital. Such insider expropriation is related to market conditions. Specifically, insiders are expected to expropriate more when the market is bad, and less when it is good. Thus, a negative relationship between expropriation and market condition can magnify the firm's systematic risk, which must be interpreted with a higher cost of capital.

In order to test the effect of insider ownership on the cost of equity capital, information was collected about the percentage of closely held shares by insiders from *Worldscope* for all the firms in the sample[27]. The firms were divided into four categories: closely-held shares less than 5%; closely-held shares between 5%-20%, closely-held shares between 25%-50%, and closely-held shares more than 50%[28]. The researcher created dummy variables *CSHARE1* equal to 1 for closely- held shares between 5%-20%, and 0 otherwise. Likewise, *CSHARE2* equal to 1 for closely-held shares between 25%-50%, *CSHARE3* equal to 1 for closely-held shares more than 50%, and 0 otherwise.

Table 8.10 shows a significant negative coefficient on *CSHARE1, CSHARE2* (*p-value* <0.05, 0.01) and a *positive* coefficient on *CSHARE3*, using *DY* as dependent variable which is in line with the hypothesis that firms with a less concentrated ownership structure have less idiosyncratic risk compared to tightly-held firms, and therefore, a lower cost of equity capital. The coefficients of *CSHARE1* suggest a decline in the cost of equity capital of firms of 3% to 4%, and the coefficients of *CSHARE2* show a decline in the cost of equity capital of 4% to 6% using *DY* measures of the cost of equity capital. Weak results of a decrease in the cost of equity capital are found using *ex post* measure. There is no significant decrease in the cost of equity capital of firms which are mostly closely-held, as indicated by coefficients on *CSHARE3*.

After controlling for the influence of *SLIB* and *INST*, the results seem to suggest that although the cost of equity capital decreased for all firms irrespective of ownership classification, the cost of equity capital decreased more for relatively less closely-held firms (between 5%-20%, and 25%-50%) as compared to firms with high ownership concentration (>50%). The results show that the ownership structure of Southeast Asian firms also influenced the expected returns required by the investors to hold stocks of firms in these countries. Thus, it can be argued that country-level studies have not explored this heterogeneity in the ownership structures of firms within countries, and the results at aggregate country-level might be biased and the generalizability of results across the firms or even industries, can be called into question.

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[27] The percentage of closely-held shares is not sub-divided into shares held by the founding family, relatives, CEO, and managers.

[28] McConnell and Servaes (1990) have used a similar classification of closely-held firms to examine the relationship between equity ownership of the US firms and corporate value.

Table 8.9
Effect of Insider Ownership on the Cost of Equity Capital

The table presents the estimation results of the model:

$$Ke_{i,j,t} = \alpha + \beta_1 CSHARE1_{i,j,t} + \beta_2 CSHARE2_{i,j,t} + \beta_3 CHSARE3_{i,j,t} +$$
$$\beta_4 SLIB_{i,j,t} + \beta_5 INST_{i,j,t} + \beta_6 BM_{i,j,t} + \beta_7 VOL_{i,j,t} + \beta_8 DE_{i,j,t} + \beta_9 ATO_{i,j,t} + \beta_{10} SIZE_{i,j,t+}\varepsilon_{i,j,t}$$

The dependent variables (K_{EG} and *DY*) are denoted by K_e. The firm-level ownership is defined with reference to the number of shares closely held. A dummy variable *CSHARE1* equal to 1 if closely held between 5%-20%, and 0 otherwise, was created. Likewise, *CSHARE2* equal to 1 if closely held between 25%-50%, *CSHARE3* equal to 1 if closely held between >50%, and 0 otherwise. *SLIB* is a stock market liberalization dummy variable that takes on the value of 1 for each country when the total number of liberalization measures exceeds 6 in a year; *INTS* is an institutional development variable that equals to 1 for each country when the total number of institutional development measures exceeds 5 in a year. The explanatory variables are *BM* measured as book-value per share divided by market price at the end of year; *SIZE* is the log of total market value of the firm at the end of each year; *DE* is the total debt to total market value of equity ratio at the end of year and *ATO* is defined as total sales divided by the average total assets at the end of each year. *OLS* vs. *F.E.* is a specification Test. The White period standard errors are reported in parenthesis, which are robust to arbitrary serial correlation and time-varying variances in the disturbances.

	Dependant variable		*Dependant variable*	
Variables	K_{EG}	*DY*	K_{EG}	*DY*
CSHARE1	0.0142	-0.0304 ^{b}	0.0160	-0.0420 ^{a}
	(0.0144)	(0.0135)	(0.0145)	(0.0160)
CSHARE2	0.0010	-0.0476 ^{a}	0.0020	-0.0618 ^{a}
	(0.0133)	(0.0165)	(0.0133)	(0.0192)
CSHARE3	0.0060	0.0026	0.0065	-0.0025
	(0.0132)	(0.0124)	(0.0132)	(0.0144)
SLIB	--	--	0.0090	-0.0564 ^{a}
			(0.0070)	(0.0141)
INST	--	--	0.0131 ^{b}	-0.0434 ^{a}
			(0.0066)	(0.0146)
BM	0.0032	0.0493 ^{a}	-0.0011	0.0652 ^{a}
	(0.0076)	(0.0147)	(0.0056)	(0.0156)
VOL	0.0200	0.1933 ^{a}	0.0002	0.3002 ^{a}
	(0.0180)	(0.0514)	(0.0198)	(0.0652)
DE	0.0116 ^{b}	-0.0217	0.0105 ^{b}	-0.0097
	(0.0071)	(0.0132)	(0.0049)	(0.0127)
ATO	0.0269 ^{a}	-0.0185	0.0258 ^{a}	-0.0197
	(0.0045)	(0.0137)	(0.0045)	(0.0141)
SIZE	0.0012	-0.0468 ^{b}	0.0009	-0.0595 ^{a}
	(0.0049)	(0.0136)	(0.0049)	(0.0154)
Fixed effect	YES	YES	YES	YES
Adj. R^2	0.2083	0.4861	0.2124	0.5001
Wald Test	1.2903	2.1949 ^{b}	0.8541	3.5269 ^{a}
F-Test	34.4030 ^{a}	323.1571 ^{a}	34.9521 ^{a}	292.5454 ^{a}
N	732	863	732	844

^{a}, ^{b}, ^{c} shows significance at 1%, 5%, and 10% level of significance respectively.

8.6 Conclusion

In this chapter, the researcher hypothesized that if stock market liberalization removes barriers to foreign portfolio investments and allows firms to access foreign capital markets, then the cost of equity capital will fall. To test this hypothesis, two measures of the cost of equity were used, and it was found that the decrease in the cost of equity capital has been associated with stock market liberalization. Similarly, it was observed that the economic impact of institutional developments on the cost of equity capital has been favorable in the form of lower cost of equity capital.

The researcher also investigated the effect of DR issuance and analysts' coverage on the cost of equity capital in two separate hypotheses. The results indicate that the launch of DRs, and the analysts' coverage, reduce the cost of equity capital even after controlling for stock market liberalization, institutional development, and firm-specific factors. It is shown that a firm having a DR programme experienced a significant decrease in the cost of equity capital compared to *NDR* firms. With increased globalization, firms also have the choice of timing the markets globally in the sense that they can choose both the location and time of issues based on market conditions.

In sum, the results suggest an association between stock market liberalization and the cost of equity capital. However, there is a possibility that the stock market liberalization measure might not capture other significant changes such as fiscal exemptions on capital gains, dividend incomes and tax holidays for firms seeking listing, might also have influenced the cost of equity capital for firms. Hence, it is suggested that this is a useful area of investigation for future research.

Nevertheless, the results have significant policy implications for a country with a closed or partially-liberalized stock market. The decision to open a stock market not only provides domestic firms with an alternative to bank finance, but also increases the liquidity of the domestic stock market. This increase in liquidity provides a portfolio diversification advantage to local and international investors and lowers the firm-level cost of capital. An important question that emerges from these findings is, what is the economic effect of stock market liberalization on physical investment and the efficiency of investment allocation? The decrease in cost of equity capital has economic implications because this it is an important component of the discount rate used for investment decisions. Therefore, analysis of the firm-level investment behaviour also warrants empirical investigation, and this has been undertaken in Chapter 9.

Chapter 9

DYNAMICS OF FIRM-LEVEL INVESTMENT

9.1 Introduction

There has been a resurgence of interest in the study of firm-level investment in the context of financial liberalization. In a repressed financial system, a firm's investment is more sensitive to internal cash flow and negatively related to external finance because of the higher cost of external finance. The financial liberalization process introduces measures such as a reduction in policy-based lending that increase access of the firms to external finance in domestic financial markets. Those firms with profitable investment opportunities should be able to access external finance at competitive market rates. Thus, the liberalization process should reduce the sensitivity of the firm-level investment to internal finance and increase investment (Henry, 2000).

This chapter investigates firm-level investment behaviour for six Southeast Asian countries. Specifically, firms' adjustment to capital stock in a time-varying framework has not been undertaken in the previous studies, and hence, this research evaluates the economic impact of financial liberalization on the financing constraints of firms, over (under) investment and allocative efficiency of investment. Over investment and excessive external borrowing were highlighted as the root problems of the Asian financial crisis but there is very little firm-level evidence on the level of over (under) investment and efficient (inefficient) use of external financing.

The rest of the chapter is organized as follows. Section 9.2 reviews the investment models. Section 9.3 describes the sample. Section 9.4 contains the empirical results using linear OLS, GMM and non-linear PSTR specifications. Section 9.5 discusses the efficiency in the allocation of investment, and Section 9.6 concludes.

9.2 Investment Models

The empirically testable models of firm investment include the neo-classical model, the sales accelerator model[1], Tobin's q-ratio model, and the Euler equation. The latter two empirical models have been mostly used in the financial liberalization context[2]. According to Tobin's q model[3], under the assumption of a perfectly competitive output market, linear homogenous technology, and capital as the only quasi-fiscal fixed input, the market valuation of capital relative to its replacement value explains firm-level investment (Hu and Schiantarelli, 1998). Tobin's q-ratio captures the expectation of future profitability and is a forward-looking market valuation measure (Goergen and Renneboog, 2001). According to the pecking order theory, information asymmetries and costly contract enforceability generate agency costs that result in outside investors demanding a premium on debt or equity issued by a firm, and cause external finance to be an imperfect substitute for internal funds. In such a situation, the internally-generated funds (cash flows) for investment are available at lower cost than external finance.

In the absence of market imperfections, a firm's investment decision is explained by market indicators of expected future profitability or shadow cost of capital. The firm perceives the opportunity cost of internal funds to be market interest rates, and it can borrow and lend in the capital market. All else being equal, an improvement in investment opportunity increases the desired capital stock and investment. This story assumes that no information asymmetry exists, as decision-makers in the firm and external suppliers of capital to firms have the same information about the firm choice and use of inputs, investment opportunities, risk of project and profit (Hubbard, 1998). These assumptions are not realistic as market imperfections create information asymmetry between the borrowers and lenders, which leads to a gap in the cost of

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[1] In the neo-classical model, the relative cost of capital is the main determinant of firm investment. On the hand, the sales accelerator model assumes that investment grows with total sales after controlling for the influence of internal finance.

[2] see Leaven (2003) and Schiantarelli (1998)

[3] This model also assumes that a firm can only finance itself either through retentions or new shares and marginal q is equal to the average q.

external and internal finance. In such circumstance, a firm with high information asymmetry faces the high cost of external finance and is more reliant on internal finance for investment. This argument has led to the accepted view that firm-level investment is not only determined by expected future profitability but also by the firm's net worth. All else being equal, an increase in net worth leads to greater investment, whereas, a decrease in net worth leads to lower investment.

The models of investment also stress the cross-sectional differences in investment due to information asymmetry, and therefore, suggest discrimination between the investment decisions at any point in time of 'constrained' and 'unconstrained' firms (Hubbard, 1998). Most studies have classified firms this way, and the results suggests that investment decisions of firms that are more financially constrained are more sensitive to firm liquidity than those of less constrained firms (Cleary, 1999).

The pecking order theory predicts that in any period, a sub-set of firms may be in a regime in which their investment expenditure is constrained by the availability of internally-generated funds (Bond and Meghir, 1994). The firms are constrained because of non-negativity constraints on dividend payment, ceiling on leverage, and inability to issue new shares (see Jaramillo et al, 1996). In order to test whether a constraint is binding for a particular group of firms or not, the Euler equation has been used in previous studies (Bond and Meghir, 1994). The main intuition of model is that the marginal cost of investing today is equal to the discounted marginal cost of postponing investment until tomorrow, which is equal to the sum of the foregone marginal benefit of an extra unit in capital plus an adjustment cost and price of investment tomorrow.

The suitability and efficiency of both approaches has been evaluated in the literature (Love, 2003; Schiantarelli, 1996), where it has been argued that error in the measurement of the q-ratio might produce disappointing results because marginal q-ratio is unobservable. Average q-ratio has been used as a proxy for marginal q-ratio (e.g., Fazzari et al, 1988) on the premise that the market valuation of capital is equal to the manager's valuation. In reality, this assumption may not hold true if the stock market displays excessive volatility relative to the fundamental value of the firms. The degree of divergence in this valuation is likely to be related to the degree of market imperfection that is related to the level of financial development (Love, 2003). In particular in the case of low income countries, where capital markets tend to be imperfect, the *q*-model of investment is likely to be specified incorrectly (Laeven, 2003). Furthermore, if the cash flow variable is included along with the average *q-ratio* in an estimation model, the cash flow variable may still be made up of expectations not captured by the *q*-ratio. Consequently, the average *q*-ratio might have little explanatory power compared to variables such as cash flow, sales and output in the model (Erickson and Whited, 2000).

On the other hand, the Euler equation approach has the advantage that it controls for the influence of expected future profitability on investment spending whilst no explicit measure of expected demand or expected costs is required as future values are approximated by instrumental values (Goergen and Renneboog, 2001). The problem with the Euler equation is that constraints and instrumental values selection is subjective and tedious. Schiantarelli (1996) argues that this approach may fail to detect the presence of financial constraints if the tightness of constraints is constant over time.

The efficiency of the investment models also depends on the classification used to sort out firms into 'constrained' and 'unconstrained' groups. Previous studies have used different criteria to identify firms that are more likely to suffer from financial distress, such as the bond rating of a firm (Whited, 1992), dividend pay-out ratio (Fazzari et al, 1988; Bond and Meghir, 1994), and age of a firm (Jaramillo et al, 1996) have all been used for the division of a sample into 'constrained' and 'unconstrained' firms.

However, firm size has been the most commonly used criterion (see Love, 2003; Laeven, 2003; Harris et al, 1994) because this is inversely related to a firm's degree of financial distress and ownership concentration. Likewise, a firm association with a business group has also been used to effect this division, on the assumption that business groups allow the formation of an internal capital market that supplements the capital allocation function of the external market. Another reason why group-associated firms might not be financially constrained might be the close connection between banks and large firms. Thus, a firm belonging to a group will be less financially constrained than an independent firm (Lensink et al, 2003; Hoshi et al, 1991). Recently, Deshmukh and Vogt (2005) find that investment spending to be less sensitive to cash flow for hedgers and when the extent of hedging is high.

Although the results using the above-mentioned sorting criterion have provided useful insight into the investment behaviour of different firms, the pre-estimation sorting approach has two major shortcomings. Firstly, the distinction between 'constrained' and 'unconstrained' firms is arrived at without reference to any economic model, and based on arbitrary selected variables, which might be also endogenous, of which firm size is a perfect example. Secondly, in most of the studies, the distinction between the firms remains fixed for the complete sample period, in the sense that firms are not allowed to switch groups over time (Cleary, 1999; Gonzalez et al., 2005).

Some authors have suggested using quantitative and qualitative information about the financial constraints faced by firms (Kaplan and Zingales, 1997; Cleary, 1999) and others (Nabi, 1989; Hu and Schiantarelli, 1998) have developed regime switching models to solve the classification problem. The probability of being constrained or unconstrained is determined by a switching function that is a function of firm characteristics and macro-economic conditions. Recently, Gonzalez et al. (2005) have suggested that the Panel Smooth Transition Regression (PSTR) model can be used to describe firms' investment decisions in the presence of capital market imperfections. In this study, besides linear investment model used in the literature a non-linear PSTR estimation model has been used.

9.3 Sample Selection and Estimation Methodology

9.3.1 Sample Selection

The sample of firms is non-random but consistent with earlier Chapters 4, 5, 6 and 8 in that firm-level accounting data were downloaded from two databases *Datastream* and *Worldscope*. The sample is non-random, first, due to selection of firms that meet the criteria of having data available for at least 9 consecutive years over the period of 1991-2004. Second, firms with extreme values of the variables were eliminated. The outlier detection criterion in this chapter is purposely matched with the outlier criterion in Love (2003) and Laeven (2003) to compare the results. For instance, theses studies argue that investment analysis of developing countries require exclusion of firms with Sales to Capital ratio greater than 20 because such firms might have monopolistic power in the markets. The elimination of firms resulted in a relatively reduced number of firms compared to Chapter 4 and 8.

Table 9.1
Structure of Sample for Firm-level Investment Analysis

This table shows the sample of firms for each country obtained from *Datastream* and *Worldscope*. The number of firms in the last column was used in the estimation of the models.

Country	Years	Number of firms	Final Sample
India	1991-2004	142	94
Indonesia	1991-2004	120	82
Malaysia	1991-2004	126	110
Pakistan	1991-2004	58	36
South Korea	1991-2004	191	105
Thailand	1991-2004	112	92
Total		749	519

Table 9.2 shows distribution of firm investment and firms' total investment in levels for each country. The table indicates that most of the firms have an investment ratio below 5% (see Panel A) and a relatively high number of firms have an investment ratio of more than 20% in the case of India, Indonesia, Malaysia, and South Korea. There has been a small fraction of firms with a large investment ratio, which shows very little evidence of lumpy investment.

Panel B shows firms' investment in levels (US$ mill) according to investment share denoted by *I-Share*. Theoretically, in perfect capital markets, firms with better investment opportunities should have a high share of investment and their investment in magnitude should be higher compared to firms with no investment opportunities. The table shows that the magnitude of investment of firms with *I-Share* <=5% have been relatively higher than the firms with *I-Share* <=10% across countries. This preliminary description shows that firms with high *I-Share* <=20% made a small level of investment. No conclusion regarding over-investment behaviour can be drawn from these preliminary statistics, however, it will be explored in subsequent section. To examine within-country variation in the firm-level investment, firms' end of year sales were used to divide firms into four size quartiles i.e., small, medium, large and very large.

Table 9.2
Distribution of Investment and Share of Total Investment

This table presents the distribution of non-zero firm-level investment (Panel A) and the share of total investment in levels (US$) (Panel B) over the period 1991-2004 for the entire population of firms. the date on firm-level investment and capital stock was obtained from *Worldscope*. *I-Share* is a ratio of a firm's total capital expenditure in levels denoted by I_t divided by the sum of total capital investment expenditure of all firms in a country denoted by I_T over the period of 1991-2004.

	Country					
	India	Indonesia	Malaysia	Pakistan	South Korea	Thailand
	A. Number of firms with non-zero investments					
$0.00 < (I/K)_{i,t} <= 0.05$	49	41	45	20	62	57
$0.05 < (I/K)_{i,t} <= 0.10$	32	36	37	19	75	34
$0.10 < (I/K)_{i,t} <= 0.20$	27	26	27	15	30	13
$0.20 < (I/K)_{i,t} <= 0.30$	17	5	8	4	15	8
$0.30 < (I/K)_{i,t} <= 0.40$	6	4	3	2	6	5
$0.40 < (I/K)_{i,t} <= 0.50$	5	3	2	1	5	3
$(I/K)_{i,t} > 0.50$	6	5	4	1	7	5
N	142	120	126	62	200	125
I-Share	B. Total firm-level investment I_t (in U.S.$)					
$0.00 < (I_t/I_T) <= 0.01$	40,315.89	12,783.77	31,971.16	2,741.55	108,089.46	8,845.89
$0.01 < (I_t/I_T) <= 0.05$	33,012.49	11,908.84	33,995.22	2,144.61	145,252.79	17,033.17
$0.05 < (I_t/I_T) <= 0.10$	16,166.77	10,363.12	10,654.14	743.58	56,161.97	6,485.56
$0.10 < (I_t/I_T) <= 0.20$	11,464.65	5,382.92	16,164.40	2,186.51	82,269.76	9,384.58
$(I_t/I_T) > 0.20$	3,511.37	6,317.70	9,476.08	3,958.29	47,294.25	8,091.25
Total Investment	104,471.17	46,756.35	102,261.0	11,774.54	439,068.23	49,840.45

Table 9.3 shows that the large firms dominated the medium and small size firms in terms of average investment across countries. The data show that the level of investment of large firms increased for India, Indonesia, and South Korea during 1995-1996. The difference in the level of investment of medium and large firms has reduced over time in most of the countries. The impact of the Asian financial crisis on firm-level investment has been striking. For instance, the average investment of very large, medium and small firms decreased by more than 30% for India and Malaysia, 50% for Indonesia, and 20% for Thailand respectively.

Table 9.3

Firm-level Investment – Size Quartiles

The table presents the average firm-level investment for each country over four distinct time periods. The firm-level investment (in property, land and equipment) data was obtained from cash flow statements downloaded from *Worldscope* database. The size quartiles are calculated using firm sales in US$ at the end of each year. The number in parenthesis shows the total number of firms in each size quartile.

	India					Pakistan				
Year	Q1	Q2	Q3	Q4	N	Q1	Q2	Q3	Q4	N
1993-1994	0.1564(39)	0.1770(60)	0.1645(23)	0.1389(20)	142	0.2609(25)	0.1283(22)	0.1391(7)	0.1182(8)	62
1995-1996	0.2648(37)	0.2856(61)	0.2698(24)	0.2618(20)	142	0.1725(32)	0.1178(13)	0.1497(12)	0.1236(5)	62
1997-1998	0.1673(36)	0.1954(57)	0.2451(27)	0.1878(22)	142	0.0858(25)	0.0899(19)	0.1018(5)	0.1496(13)	62
1999-2000	0.1096(39)	0.1685(53)	0.1379(20)	0.1404(30)	142	0.0748(28)	0.0612(15)	0.1542(14)	0.0779(5)	62
2001-2002	0.1278(47)	0.1191(45)	0.1342(32)	0.0961(18)	142	0.0439(24)	0.1039(23)	0.0947(9)	0.0619(6)	62
2003-2004	0.0880(39)	0.1557(50)	0.1240(37)	0.1117(16)	142	0.0620(20)	0.1368(18)	0.1518(14)	0.0981(10)	62
	Indonesia					South Korea				
1993-1994	0.1562(23)	0.3039(42)	0.1997(29)	0.2092(26)	120	0.1979(49)	0.1131(82)	0.1381(45)	0.1209(24)	200
1995-1996	0.1770(21)	0.2524(52)	0.2157(26)	0.4012(21)	120	0.2304(50)	0.1866(57)	0.2115(47)	0.3124(46)	200
1997-1998	0.0824(36)	0.1187(35)	0.1551(29)	0.1948(20)	120	0.1220(35)	0.1146(15)	0.1487(75)	0.1730(75)	200
1999-2000	0.0520(40)	0.0571(35)	0.0812(25)	0.0829(20)	120	0.1172(65)	0.1003(55)	0.0872(45)	0.1150(35)	200
2001-2002	0.1095(42)	0.1259(32)	0.0937(28)	0.1050(18)	120	0.1288(75)	0.0954(69)	0.0954(40)	0.0886(16)	200
2003-2004	0.0617(48)	0.0577(31)	0.0992(25)	0.1612(16)	120	0.0992(85)	0.1067(80)	0.1320(25)	0.0988(10)	200
	Malaysia					Thailand				
1993-1994	0.1767(32)	0.1822(42)	0.2024(35)	0.1751(11)	126	0.2208(28)	0.2286(33)	0.1584(32)	0.2021(32)	125
1995-1996	0.1697(19)	0.2522(48)	0.2618(38)	0.2383(16)	126	0.1850(22)	0.1665(18)	0.2594(46)	0.2592(39)	125
1997-1998	0.1021(23)	0.1521(53)	0.1606(30)	0.1837(13)	126	0.0624(48)	0.0855(54)	0.1347(11)	0.2019(12)	125
1999-2000	0.0878(38)	0.0992(63)	0.1002(13)	0.0763(12)	126	0.0362(60)	0.0795(42)	0.0692(13)	0.0837(10)	125
2001-2002	0.0743(43)	0.0835(59)	0.1053(12)	0.0764(12)	126	0.0610(40)	0.0829(57)	0.0833(23)	0.1086(5)	125
2003-2004	0.0423(45)	0.0751(48)	0.0866(16)	0.0819(17)	126	0.0572(48)	0.0883(54)	0.1165(13)	0.1232(10)	125

The substantial fall in the investment level of large firms in other countries might have been due to firms' inability to roll-over short-term debt might have constrained their future investments. This preliminary description suggests that firm-level investment dynamics might be different within each country during the period of financial liberalization, financial integration, and after the Asian financial crisis.

9.3.2 Empirical Model and Estimation

We obtain an empirical model of investment by assuming that firm maximizes its present value, which is equal to the expected value of future dividends, subject to capital accumulation and external financing constraints. Following Laeven (2003) and Bond and Meghir (1994), we ignore taxes. We ignore taxes due to three main reasons: first, the time variation in taxes might not be exogenous because governments tend to institute investment incentives when aggregate investment is perceived to be low and remove them when aggregate investment is perceived to be high. Second, corporate tax brackets tend to change often, it is difficult to judge what a firm's expected tax treatment is in any given year. Indeed, Graham (1996) points out that calculation of marginal tax rate is quite difficult. Lastly, data on the corporate tax is not available for all the firms in sample. We follow Gilchrist and Himmerlberg (1998) and introduce a non-negativity constraint on dividends, which implies that there is a shadow cost associated with raising new equity due to information asymmetry. Then the manager's problem is

$$V(K_t, B_t, \xi_t) = \max_{\{I_{t+s}, B_{t+s}\}_{s=0}^{\infty}} Div_t + E_t\left[\sum_{s=1}^{\infty} \beta_{t+s} Div_{t+s}\right] \tag{9.1}$$

Subject to

$$Div_t = \Pi(K_t, \xi_t) - C(I_t, K_t) - I_t + D_t + (1 + r_t)(1 + \eta(D_t, K_t, \xi_t))D_t \tag{9.2}$$

$$K_{t+1} = (1 - \delta)K_t + I_t \tag{9.3}$$

$$Div_t \geq 0, \tag{9.4}$$

where K_t, I_t and D_t are defined as a firm's capital stock, investment and net total debt at the beginning of period t, Div_t is total dividends paid out to shareholders. ξ_t is a productivity shock to the firm's capital stock. The risk neutral debt-holders demand external finance premium $\eta_t = \eta(K_t, B_t, \xi_t)$, which is increasing in the amount borrowed due to agency costs. We assume that the gross rate of return on debt is $(1+r_t)(1+\eta(D_t, K_t, \xi_t))_t$, r_t is the risk free rate of return; $\Pi(K_t, \xi_t)$ is profit function and $C(I_t, K_t)$ denote the adjustment cost of installing units of capital. $E_t[.]$ is the expectations operator conditional on time t information, and $\beta_{t+s} = \prod_{k=1}^{s}(1+r_{t+k})^{-1}$ is the period discount factor, which discount period t+s to t. then, letting λ_t be the Lagrange Multiplier for the non-negatively constraint on dividends, then Euler equation for investment I_t is:

$$1+\frac{\partial C(I_t,K_t)}{\partial I_t} = E_t\left[\beta_{t+1}\left(\frac{1+\lambda_{t+1}}{\lambda_t}\right)\{\frac{\partial \Pi(K_{t+1},\xi_{t+1})}{\partial K_{t+1}} + (1-\delta)\left(1+\frac{\partial C(I_{t+1},K_{t+1})}{\partial I_{t+1}}\right)\}\right] \qquad (9.5)$$

Now we suppose that MPK_t denote the marginal profit function and β_{t+1} is constant over time and across firms, then the first order condition for investment I_t can be written as:

$$1+\frac{\partial C(I_t,K_t)}{\partial I_t} = E_t\left[\sum_{s=1}^{\infty}\beta^s(1-\delta)MPK_{t+s}\right] + \phi E_t\left[\sum_{s=1}^{\infty}\sum_{k=1}^{s}\beta^s(1-\delta)^s FIN_{t+k}\right] \qquad (9.6)$$

Where FIN_{t+k} is a financial variable that affects the shadow discount term $\frac{1+\lambda_{t+1}}{1+\lambda_t}$. We specify $C(I_t,K_t) = \frac{\alpha}{2}\left(\frac{I_t}{K_t} - \gamma\frac{I_{t-1}}{K_{t-1}} - v\right)$ as adjustment cost function. This relationship show that in the absence of perfect market conditions, current investment depends on lagged investment since firms often take time to adjust. Thus, the relationship between investment I_t, present value of FIN_t, and the present value of MPK_t is given by Eq. (9.7):

$$\frac{I_t}{K_t} = c + g\frac{I_{t-1}}{K_{t-1}} + \frac{1}{\alpha}E_t[\sum_{s=1}^{\infty}\beta^s(1-\delta)^s MPK_{t+s}] + \frac{\phi}{\alpha}E_t[\sum_{s=1}^{\infty}\sum_{k=1}^{s}\beta^s(1-\delta)^s FIN_{t+k}\} \qquad (9.7)$$

Laeven (2003) proves that since these present value of FIN_t and MPK_t are linear combinations of the underlying variables FIN_{it} and MPK_{it} for a firm i at time t. Thus, we can specify a reduced form model of investment that is linear in FIN_{it} and MPK_{it}. We assume that $\left({}^{S}\!/_{K}\right)_{i,j,t}$ and $\left({}^{CF}\!/_{K}\right)_{i,j,t}$ as proxy for FIN_{it} and MPK_{it} in Eq. (9.7). In the face of imperfect financial markets, the degree of leverage of the firm may deter the availability of external financing, thus, we introduce $\left({}^{D}\!/_{K}\right)_{i,j,t}$ is measure of leverage in our final model which we estimate as follows:

$$\begin{aligned}\left({}^{I}\!/_{K}\right)_{i,j,t} &= \alpha + \beta_1\left({}^{I}\!/_{K}\right)_{i,j,t-1} + \beta_2\left({}^{I}\!/_{K}\right)^2_{i,j,t-1} + \beta_3\left({}^{S}\!/_{K}\right)_{i,j,t-1} + \beta_4\left({}^{CF}\!/_{K}\right)_{i,j,t-1} + \\ &\quad \beta_5\left({}^{D}\!/_{K}\right)^2_{i,j,t-1} + f_{i,j} + d_t + \varepsilon_{i,j,t}\end{aligned} \tag{9.8}$$

For the ith firm in the jth country, I denotes the total investment on property, plant and equipment; K denotes the beginning-of-period capital stock of property plus plant and equipment and less depreciation plus current investment; CF denotes the firm's internal cash flows defined as earnings before interest, taxes and depreciation; D denotes total debt; S denotes total sales; f_i denotes firm-specific fixed effects for controlling unobservable firm effects (see Love, 2003; Laeven, 2003), while d_t denotes time-dummies to capture unobserved macro-economic shocks. Unlike studies for liberalized economies (see, e.g., Laeven, 2003 and Koo and Maeng, 2005), we include $\left({}^{D}\!/_{K}\right)_{i,j,t\text{-}1}$ in the model.

Under the null hypothesis of no information asymmetry and perfect capital market, the coefficient on the lagged investment $\beta_1 > 1$ and the coefficient on the lagged investment squared $\beta_2 > -1$ i.e., investment, follow the optimal path and are persistent (see Bond and Meghir, 1994); $\beta_3 \geq 0$ i.e., firm investment spending responds positively to the change in sales. Financing constraints are non-binding and, therefore, we should expect $\beta_4 < 0$, and $\beta_5 > 0$ i.e., external finance is readily available to supplement the internal finance for firm-level investment. It also controls for non-separability between investment and borrowing decisions, contrary to the irrelevance theorem of Modigliani and Miller (1958). The researcher adopted the ordinary least square (in levels) and the

Generalized Method of Moments estimator developed by Arellano and Bond (1991) that uses orthogonal deviation proposed by Arellano and Bover (1990) to eliminate unobservable fixed effects. The estimation results are reported in the following sections,

9.4 Empirical Results

9.4.1 Ordinary Least Square

Table 9.4 reports the results using *OLS* estimation. The diagnostic tests of m_1 indicate that no evidence of first-order serial correlation. The coefficients on the lagged investment are less than 1 but significant for Indonesia, Pakistan and Thailand (p-value <0.01, 0.05), and show persistence in firms' investment is not strong. These coefficients seem to suggest that investment did not follow its optimal path similar to the earlier findings of Laeven (2003) for the emerging markets over the period of 1988-1998. The magnitude of coefficients on the lagged investment for Indonesia, Pakistan and Thailand is higher than other countries and also compared to the recent results reported for emerging markets in Love (2003). The coefficients of lagged investment squared are negative for all countries (except India). Taken together, the estimated coefficients on the lagged investment and lagged investment squared seems to suggest that dynamics implied by the structural adjustment costs model are not rejected as in Bond and Meghir (1994).

The coefficient on the cash flow variable is positive and significant for Pakistan and South Korea (p-value <0.01) (see Table 9.4, Panel A). Hence, hypothesis $\beta_4 < 0$ is rejected for these two countries. The significant negative coefficient on the debt ratio variable (p-value <0.05, 0.01) in the case of Pakistan and South Korea seems to indicate that firms faced a high premium on external debt and were, therefore, unable to attract external finance for investment. The coefficient on the lagged Sales to capital ratio is negative for all countries (except Pakistan and South Korea) and different from the findings of previous studies (Love, 2003; Laeven, 2003), who found a significant positive coefficient on the Sales to capital ratio for emerging markets. However, in the case of South Korea, the positive coefficient is similar to the findings of Koo and Maeng (2005).

The effect of size on firms' investment was also investigated (see Panel B). A dummy variable *Small* which is equal to 1 if a firm's sale is less than the median of sales and 0 otherwise is created. The coefficient on the interaction term i.e., *Small*CF*, shows that the investment of small firms has been significantly sensitive to the availability of internal finance compared to large firms in the case of South Korea (p-value <0.10). On the contrary, the significant negative coefficients in the case of Indonesia (p-value < 0.10) show that firm-level investment was not constrained to the availability of internally generated funds. The hypothesis $\beta_4 < 0$ that financing constraints are non-zero for the small firm is rejected only in the case of South Korea. There is no significant support for the investment-financing relationship in respect of the small firms. The coefficients of the interaction term $Small^{*}\left(D/K\right)^2_{t-1}$ are positive (though not significant) which seem to suggest that external debt has been used by the firms to supplement internally-generated funds for investment.

Panel C shows the results for the investment-cash flow relationship with the interaction term reflecting the influence of financial liberalization on the small and large firms. For this purpose, the banking sector liberalization variable (see section Chapter 3 for measurement of variable *BLIB*) was multiplied by the right hand side explanatory variables in Equation (9.7). The results show that since banking sector liberalization, the smaller firms have been significantly less financially constrained in the case of India, and Indonesia, as indicated by the negative coefficient on the triple interaction term of the *CF*Small* BLIB*. The sensitivity of investment to internal cash flow has been significantly reduced in the case of Indonesia. This result supports the previous finding that financial reforms reduced the investment and cash flow sensitivity (Harris *et al.*, 1994).

Table 9.4

Ordinary Least Squares Estimation

The table presents the estimation results of investment model in Eq. (9.8) using ordinary least squares estimation.

$$\left(\frac{I}{K}\right)_{i,j,t} = \alpha + \beta_1\left(\frac{I}{K}\right)_{i,j,t-1} + \beta_2\left(\frac{I}{K}\right)^2_{i,j,t-1} + \beta_3\left(\frac{S}{K}\right)_{i,j,t-1} + \beta_4\left(\frac{CF}{K}\right)_{i,j,t-1} + \beta_5\left(\frac{D}{K}\right)^2_{i,j,t-1} + f_{i,j} + d_t + \varepsilon_{i,j,t}$$

where dependent variable *I* is total investment in plant, property and equipment; *CF* is the earnings before interest, taxes, amortization and depreciation; *D*, is total debt. The dependent and explanatory variables are divided by capital stock; *K*. The sample period is 1991-2004. To assess whether small firms in sample countries are more financially constrained than large firms, we use a zero/one dummy variable, labelled *Small*, which is equal to one for firms with total sales below sample median and 0 otherwise (see Panel B). To assess the impact of financial liberalization on the firms, we multiplied *BLIB* with all right hand side variables in Eq. (9.7) the estimation results are shown in Panel C. The standard errors are shown in parenthesis and are robust to heteroskedasticity. Wald Test is joint test for significance of explanatory variables. m_1 and m_2 are values of LM *F*-version test for the absence of first-order and second order serial correlation in the residuals respectively.

Panel A	Country					
Variables	India	Indonesia	Malaysia	Pakistan	South Korea	Thailand
constant	0.1113^{a}	0.1308^{a}	0.1307^{a}	-0.0027	0.0870^{a}	0.1030^{a}
	(0.0373)	(0.0188)	(0.0248)	(0.0465)	(0.0141)	(0.0235)
$\left(\frac{I}{K}\right)_{t-1}$	0.2686	0.4268^{a}	0.1703	0.3837^{c}	0.1697^{c}	0.3535^{b}
	(0.1857)	(0.1541)	(0.1320)	(0.2200)	(0.1046)	(0.1376)
$\left(\frac{I}{K}\right)^2_{t-1}$	0.0102	-0.0829b	-0.0153^{a}	-0.2584	-0.0916^{b}	-0.0556
	(0.1102)	(0.0332)	(0.0048)	(0.3010)	(0.0371)	(0.0385)
$\left(\frac{S}{K}\right)_{t-1}$	-0.0018	-0.0117	-0.0019	0.0101	0.0002	-0.0047
	(0.0247)	(0.0173)	(0.0020)	(0.0093)	(0.0001)	(0.0074)
$\left(\frac{CF}{K}\right)_{t-1}$	0.2183	-0.0246	0.0002	0.0864^{c}	0.0618^{b}	- 0.0006
	(0.2331)	(0.0252)	(0.0011)	(0.0484)	(0.0250)	(0.0165)
$\left(\frac{D}{K}\right)^2_{t-1}$	-0.0145	0.0004	0.0000	-0.1525^{b}	-0.0003^{a}	0.0000
	(0.0172)	(0.0004)	(0.0011)	(0.0678)	(0.0001)	(0.001)
Specification Test						
m_1	0.0156	2.6999c	0.0410	0.8425	0.5753	0.4022
m_2	1.4793	9.4438^{a}	14.6120^{a}	9.3578^{a}	7.6303^{b}	0.5784
Wald Test	8.9989^{a}	3.4624^{a}	3.8641^{a}	1.6447^{a}	240.851^{a}	2.7291^{b}
Adj. R^2	0.2684	0.2657	0.0700	0.3132	0.2665	0.2166
No of firms	77	82	120	32	105	92
N	669	785	1288	282	1103	902

^{a}, ^{b}, ^{c} shows significance at 1%, 5%, and 10% level of significance respectively.

Table 9.4 (continued...)

Panel : B	Country					
Variables	India	Indonesia	Malaysia	Pakistan	South Korea	Thailand
constant	0.1035^{b}	0.1319^{a}	0.1479^{a}	0.0204	0.1015^{a}	0.1011^{a}
	(0.0366)	(0.0198)	(0.0211)	(0.0496)	(0.0152)	(0.0243)
$\left(\frac{I}{K}\right)_{t-1}$	0.3700^{b}	0.3486^{b}	-0.0090	0.5255^{c}	0.2099	0.1399
	(0.1818)	(0.1533)	(0.0861)	(0.2812)	(0.1690)	(0.0970)
$\left(\frac{I}{K}\right)^{2}_{t-1}$	-0.3729	-0.0895c	-0.0040	-0.2920	-0.0786	-0.0344
	(0.3366)	(0.0519)	(0.0082)	(0.4368)	(0.1891)	(0.0228)
$\left(\frac{S}{K}\right)_{t-1}$	-0.0004	-0.0276^{b}	-0.0080	-0.0001	-0.0011	0.0108
	(0.0191)	(0.0124)	(0.0085)	(0.0067)	(0.0033)	(0.0092)
$\left(\frac{CF}{K}\right)_{t-1}$	0.1996	0.0217	-0.0014	0.0608	0.0142	-0.0126
	(0.2251)	(0.0269)	(0.0145)	(0.0585)	(0.0280)	(0.0258)
$\left(\frac{D}{K}\right)^{2}_{t-1}$	-0.0181	-0.0006	0.0003	-0.1365^{b}	-0.0035	0.0002
	(0.0205)	(0.0006)	(0.003)	(0.0679)	(0.0045)	(0.0002)
$\left(\frac{I}{K}\right)_{t-1}$ **Small*	-0.0500	0.2493	0.1399	-0.5037	-0.0608	0.4116
	(0.2366)	(0.1923)	(0.1967)	(0.3110)	(0.1518)	(0.3252)
$\left(\frac{I}{K}\right)^{2}_{t-1}$ **Small*	0.3699	-0.0175	0.1758^{c}	0.4095	-0.0091	-0.0933
	(0.3216)	(0.0467)	(0.0925)	(0.6118)	(0.1735)	(0.1231)
$\left(\frac{S}{K}\right)_{t-1}$ **Small*	-0.0171	0.0196^{c}	0.0080	0.0434^{c}	0.0010	-0.0206
	(0.0320)	(0.0118)	(0.0081)	(0.0245)	(0.0033)	(0.0134)
$\left(\frac{CF}{K}\right)_{t-1}$ **Small*	0.0640	-0.0788^{c}	0.0021	-0.0436	0.0623^{c}	0.0171
	(0.1148)	(0.0415)	(0.0151)	(0.0690)	(0.0341)	(0.0391)
$\left(\frac{D}{K}\right)^{2}_{t-1}$ **Small*	0.0148	0.0014	-0.0002	-0.0543	0.0031	-0.0001
	(0.0327)	(0.0009)	(0.0003)	(0.1384)	(0.0046)	(0.0002)
Specification Test						
m_1	0.0545	4.8677^{b}	0.0314	1.7492	0.8916	1.0314
m_2	1.5680	9.5734^{a}	13.8681^{a}	9.9203^{a}	7.2212^{a}	1.0380
Wald Test	25.0633^{a}	3.2282^{a}	248.0186^{a}	4.9256^{a}	96.6764^{a}	3.1754^{a}
Adj. R^2	0.2661	0.2835	0.0861	0.3469	0.2674	0.2250
No of firms	77	82	120	32	105	92
N	669	785	1288	282	1103	902

^{a}, ^{b}, ^{c} shows significance at 1%, 5%, and 10% level of significance respectively

Table 9.4 (continued...)

Panel: C	Country					
Variables	India	Indonesia	Malaysia	Pakistan	South Korea	Thailand
constant	0.0904	0.1223^{a}	0.1476^{a}	0.0211	0.1032^{a}	0.0928a
	(0.0658)	(0.0180)	(0.0212)	(0.0499)	(0.0151)	(0.0232)
$\left(\frac{I}{K}\right)_{t-1}$	0.2669	0.3875^{a}	-0.0106	0.5308^{c}	0.2065	0.1506c
	(0.1865)	(0.1329)	(0.0854)	(0.2803)	(0.1683)	(0.0906)
$\left(\frac{I}{K}\right)^{2}_{t-1}$	-0.2581	-0.0971^{b}	-0.0039	-0.3115	-0.0732	-0.0380^{c}
	(0.2713)	(0.0490)	(0.0082)	(0.4343)	(0.1873)	(0.0225)
$\left(\frac{S}{K}\right)_{t-1}$	-0.0330^{a}	-0.0288	-0.0081	-0.0001	-0.0009	0.0122
	(0.0181)	(0.0124)	(0.0085)	(0.0065)	(0.0032)	(0.0085)
$\left(\frac{CF}{K}\right)_{t-1}$	0.1749^{c}	0.0270	-0.0013	0.0597	0.0120	-0.0123
	(0.1034	(0.0277)	(0.0148)	(0.0594)	(0.0268)	(0.0266)
$\left(\frac{D}{K}\right)^{2}_{t-1}$	-0.0250	-0.0008	0.0003	-0.1380^{b}	-0.0037	0.0002
	(0.0249)	(0.0006)	(0.0003)	(0.0672)	(0.0044)	(0.0003)
$\left(\frac{I}{K}\right)_{t-1}$ **Small*	0.2080	0.2412	0.1734	-0.5513^{c}	-0.0632	0.4129
	(0.2431)	(0.1981)	(0.1890)	(0.2945)	(0.1549)	(0.3217)
$\left(\frac{I}{K}\right)^{2}_{t-1}$ **Small*	0.2129	-0.0159	0.1594^{c}	0.3393	-0.0140	-0.0787
	(0.2618)	(0.0476)	(0.0843)	(0.5854)	(0.1738)	(0.1248)
$\left(\frac{S}{K}\right)_{t-1}$ **Small*	0.0577^{c}	-0.1213^{a}	0.0062	-0.0306	0.0008	0.0159
	(0.0358)	(0.0157)	(0.0110)	(0.0433)	(0.0033)	(0.0278)
$\left(\frac{CF}{K}\right)_{t-1}$ **Small*	-0.2515	0.6226a	-0.0212	0.1597	0.0515	-0.0983
	(0.1609)	(0.0384)	(0.0161)	(0.1127)	(0.0619)	(0.0850)
$\left(\frac{D}{K}\right)^{2}_{t-1}$ **Small*	0.0232	-0.1348^{a}	-0.0003	0.2608	0.0035	0.0002
	(0.0278)	(0.0273)	(0.0003)	(0.2752)	(0.0043)	(0.0003)
$\left(\frac{CF}{K}\right)_{t-1}$ **Small*BLIB*	-0.1097^{b}	-0.7149^{a}	0.0021	0.0762^{b}	0.0039	-0.0414
	(0.0485)	(0.0402)	(0.0045)	(0.0367)	(0.0499)	(0.0367)
$\left(\frac{S}{K}\right)_{t-1}$ **Small*BLIB*	0.3776b	0.1434^{a}	0.0232^{a}	-0.2039	0.0000	0.1429
	(0.1925)	(0.0145)	(0.0056)	(0.0960)	(0.0001)	(0.0891)
$\left(\frac{D}{K}\right)^{2}_{t-1}$ **Small*BLIB*	-0.0410	0.1365^{a}	0.0001	-0.3751	0.0000	-0.0003
	(0.0703)	(0.0272)	(0.0005)	(0.2583)	(0.0030)	(0.0002)
Specification Test						
m_1	0.0616	3.1216^{c}	0.0310	0.8134	1.0553	0.7765
m_2	1.5810	9.8282^{a}	13.7000^{a}	6.5943^{b}	8.1549^{a}	0.7779
Wald Test	2.3340^{a}	7.3004^{a}	40.5668^{c}	8.4842^{a}	67.2578^{a}	3.5203^{a}
Adj. R^2	0.2623	0.3148	0.0844	0.3451	0.2663	0.2341
No of firms	77	82	120	32	105	92
N	669	785	1288	282	1103	902

In terms of magnitude, all else being equal, a 10% decline in cash flow of small firms implied a decline in investment by about 6.2% before liberalization and 7.1% increase for small firms in the post-liberalization in the case of Indonesia, in other words, financial liberalization reduces financing constraints by 14% for small firms in the case of Indonesia. The coefficient of the triple interaction term is significantly positive in the case of Pakistan, and not significant in the case of Malaysia and South Korea.

It was found that small firms responded significantly to an increase in sales indicated by a positive sign on the triple interaction term of *S*Small*BLIB*. This result is similar to Laeven (2003) but the size of the coefficient is larger compared to those reported by Laeven (2003) for emerging markets. One possible explanation for this result might be the sub-optimal investment allocations by large firms. Shin and Stulz (1998) have shown that resource allocation in diversified firms is different from that in focused firms. Scharfstein and Stein (1997) argue that investment patterns of the conglomerate firms appear to result in some form of sub-optimal 'socialist' reallocation of resources. This pattern of resource allocation (investment) is consistent with the function of the internal capital market in large diversified firms. The coefficient on the interaction with debt ratio is only significant in the case of Indonesia.

The estimation results for Malaysia seem unusual and different from the rest of countries, which might suggest that the interaction of banking sector liberalization variable did not induce significant structural changes in the Euler equation using OLS estimation. Bond and Meghir (1994) point out that since the lagged values of the dependent variable in Eq. (9.8) might be correlated with firm-specific effects which could cause significant autocorrelation, as we found significant second order autocorrelation in the case of Malaysia (see Table 9.3). Taken together these results, it can be argued that either GMM estimation method should be used or, better proxy variable other than size, for the identification of financial constraints faced by the firms are required, or may be simple linear framework might be inadequate and that non-linear specification might be useful to explain dynamics of investment. These are considered next.

9.4.2 GMM Estimation

Dynamic investment models are likely to suffer from an endogeneity problem arising from the presence of unobserved firm-fixed effects, therefore, GMM estimation procedure was used to test the robustness of the results. Bond and Meghir (1994) point out that since the lagged values of the dependent variable in Eq. (9.8) are necessarily correlated with firm-specific effects, and we should allow other right hand variables to be potentially correlated with firm specific effects i.e., all explanatory variables are not strictly exogenous and they are assumed to correlated with future realizations of the error term in Eq. (9.8). Bond and Meghir (1994, p. 209) proposed that dynamic investment model in Eq. (9.8) should be estimated using GMM method developed by Arellano and Bond and using forward differencing procedure outlined in Arellano and Bover (1990), i.e.,

$$x_{it}^{*} = \left[x_{i,t-1} - \frac{1}{T-t+1}(x_{it} + x_{i,t-1} + \ldots + x_{iT}) \right] \left[\frac{T-t+1}{T-t+2} \right]^{1/2}$$

This transformation is applied to every right hand side variable in Equation (9.7) *for t=2, 3,…T*, where *T* is the number of time periods. This transformation affirms that if x_{it} (a right hand side variable) is serially uncorrelated, then $x_{i,t-s}$ will be uncorrelated with x_{it}^{*} for $s \geq 2$. Therefore, if error term in Eq. (9.8) is uncorrelated, the transformed error term will have the same property and the right hand side variables dated *t-s* will be uncorrelated with new transformed error term for $s \geq 2$; and these lagged valued can be valid instruments in the transformed model and GMM estimator can be formed which optimally exploits the (linear) moment restrictions specified by the model. All the right side variables and some additional variables such as cash, cost of goods sold at *t*-1, *t*-2 were used as instruments. To test the over identifying restriction of the model, we report the Sargan *J*-statistic. This statistic has an asymptotic chi square distribution with degrees of freedom equal to the difference in the number of instruments and regressors.

The results show that the coefficients on the interaction term *CF*Small*FLIB* is significantly negative (*p*-value <0.01) (see Panel D). This finding suggests that increase in the liberalization measures have reduced the financing constraints of the small firms. More specifically, financial liberalization has reduced the estimated effect of the cash flow on the investment of firms in the case of Indonesia, Pakistan and Thailand. In addition, the comparison of the results with earlier OLS estimation (see Panel C) shows difference in the signs for this interaction term. The coefficients are either significantly positive (South Korea) or negative (India, Indonesia, Pakistan and Thailand). Here, all else being equal, a 10% decrease in cash flow implied a decline of smaller firm investment by about 4% to 5% in the case of Indonesia, Pakistan and Thailand before liberalization. However, after liberalization, a 10% decrease in cash flow implied an increase of 5% in investment of smaller firms. The estimated coefficient of this interaction term is higher in the magnitude than those reported in Laeven (2003). However, at the same time, the results for some countries are quite different such as South Korea. Only in the case of Malaysia, there is no significant impact of financial liberalization on the investment-cash flow sensitivity. It might be due to the fast that, when the firms are pushed into financial distress and are able to make only the absolutely essential investments. Any further cutback in investment in response to further declines in cash flow is impossible, so that investment–cash flow sensitivity is very low. But on the other hand, it is quite intriguing that most of the estimated coefficients are now significant in the case of Malaysia compared to other countries._There is no significant effect of the increase in the external debt on the investment except Malaysia. A few possible reasons that can be driving the different results for Malaysia might be ability of model to capture more unobserved effect which was not explained using linear estimation. The other reason might be the data for Malaysian firms has been more balanced compared to other countries, which have been affected by outliers and may be sample selection criterion. Thus, GMM estimation results even though solve the problem of auto-correlation in the residuals but for other countries may be models might not be correctly specified. To summarize, the results lend credence to the fact that liberalization does matter in reducing financing constraints of firms.

GMM Estimation Results

Panel: D	Country					
Variables	India	Indonesia	Malaysia	Pakistan	South Korea	Thailand
$\left(I/K\right)_{t-1}$	0.2700	0.1471^{b}	0.2898^{a}	0.1198^{b}	0.3899^{a}	0.2853
	(0.3328)	(0.0823)	(0.0099)	(0.0586)	(0.1445)	(0.8177)
$\left(I/K\right)^{2}_{t-1}$	-0.7684	0.0597	0.1604^{a}	0.2230	-0.8826^{a}	-0.2702
	(1.2950)	(0.0584)	(0.0319)	(0.1859)	(0.1891)	(0.9136)
$\left(S/K\right)_{t-1}$	0.1597	0.0407	0.0450^{a}	0.0062	0.0647	-0.0600
	(0.2148)	(0.0145)	(0.0007)	(0.0055)	(0.1309)	(0.0788)
$\left(CF/K\right)_{t-1}$	-0.4018	-0.0122	-0.0702^{a}	0.0437	-0.0176	0.1105
	(0.4387)	(0.0466)	(0.0026)	(0.0248)	(0.0296)	(0.1262)
$\left(D/K\right)^{2}_{t-1}$	0.1033	0.0005	-0.0195^{a}	0.0075	-0.0286^{a}	0.0000
	(0.0787)	(0.0040)	(0.0008)	(0.0176)	(0.0059)	(0.0003)
$\left(I/K\right)_{t-1}$ *$Small$	0.5325	0.0386	0.2319^{a}	-0.4348^{b}	0.6809	-0.4384
	(0.4901)	(0.1360)	(0.0683)	(0.1893)	(2.9621)	(0.5048)
$\left(I/K\right)^{2}_{t-1}$ *$Small$	0.4287	-0.0799	-0.9562^{a}	0.0635	1.0627	0.4944
	(1.8967)	(0.0776)	(0.1270)	(0.3001)	(5.5288)	(0.8276)
$\left(S/K\right)_{t-1}$ *$Small$	-0.0799^{a}	-0.0546^{b}	-0.0304^{a}	-0.1099	0.0735	-0.0904
	(0.0257)	(0.0266)	(0.0096)	(0.0462)	(0.1154)	(0.1715)
$\left(CF/K\right)_{t-1}$ *$Small$	0.3374	0.4455^{a}	0.0439^{b}	0.4798^{a}	-0.3671	0.4852
	(1.4110)	(0.1444)	(0.0214)	(0.1002)	(0.2232)	(0.3097)
$\left(D/K\right)^{2}_{t-1}$ *$Small$	-0.5073	0.0088	0.0196^{a}	0.1206	0.0308^{a}	-0.0347
	(1.4917)	(0.0291)	(0.0008)	(0.1196)	(0.0059)	(0.1700)
$\left(CF/K\right)_{t-1}$ *$Small$*$FLIB$	-0.1885	-0.4167^{a}	0.0231	-0.5045^{a}	0.3672^{c}	-0.5961^{c}
	(1.3532)	(0.0140)	(0.0208)	(0.0957)	(0.2186)	(0.3534)
$\left(S/K\right)_{t-1}$ *$Small$*$FLIB$	0.0299^{c}	0.0673^{a}	-0.0031	0.1408^{a}	-0.0673	0.1602
	(0.0231)	(0.0250)	(0.0097)	(0.0459)	(0.0493)	(0.1758)
$\left(D/K\right)^{2}_{t-1}$ *$Small$*$FLIB$	0.3913	-0.0092	0.0002^{a}	-0.1232	-0.0036	0.0339
	(1.4916)	(0.0286)	(0.0001)	(0.1322)	(0.0024)	(0.1654)
Specification Test						
m_1	-0.0199	-0.0250	-0.0012	-0.3421	-0.3630	-0.3061
m_2	-0.1180	-0.0201	-0.0131	-0.2411	-0.1950	-0.0521
J- Test	0.9486	71.2133	64.9400	83.7596	0.6378	0.8301
Wald Test	0.6580	39.8415^{a}	1169.753^{a}	2.4018^{a}	8.7113^{b}	2.8230^{c}
No of firms	54	81	120	32	105	80
N	581	785	1288	282	1103	902

^{a}, ^{b}, ^{c} shows significance at 1%, 5%, and 10% level of significance respectively

Table 9.4 (concluded)

9.4.3 Over (under) Investment Hypothesis

This section further explores whether the cash flow effect on investment found in the previous section has been the outcome of over (under) investment. Miguel and Pindado (2001) suggest that in a context of asymmetric information, over (under) investment problems emerge due to the changing levels of cash flows and debt. The former process arises from the conflict between managers and shareholders, whereas the latter occurs because of the conflicts between creditors and shareholders (current and prospective). According to Morgado and Pindado (2003, p.166) the over-investment hypothesis is confirmed whenever the positive relationship between investment and cash flow is maintained for firms whose investment opportunities are of low quality. On the contrary, for firms with valuable investment opportunities, a positive relationship indicates an under-investment problem. These two processes affect firm value because when a firm becomes affected by an under-investment problem, if additional investment is made the market value should increase. If the problem is one of over-investment, any additional investment must negatively affect the wealth of the shareholders.

To test the over (under) investment hypothesis, previous studies have used different approaches. For example, Lang et al. (1996) used the measure of indebtedness of firms to test the over-investment hypothesis; others have used *q-ratio* as a proxy for investment opportunities (Hoshi et al, 1991; Morgado and Pindado, 2003), and test whether the investment of firms with poor investment opportunities have been sensitive to the cash flow.

In this study, we adopt the latter approach and used q-ratio to identify a firm with over (under) investment. More specifically, for a firm if its q-ratio is less than 1, a dummy variable denoted by $DummyQ$, which is equal to 1 for this firm and 0 otherwise, was used. Thus, firms having a q-ratio less than 1 are classified as non-valuable project firms (hereafter NVP), otherwise these are classified as valuable project firms (VP).

The investment model in (9.8) is then modified by incorporating $DummyQ$ that interacts with the cash flow as follows.

$$\begin{aligned}(I/K)_{i,j,t} = \alpha_0 + \beta_1 (I/K)_{i,j,t-1} + \beta_2 (I/K)^2_{i,j,t-1} + (\phi_1 + \phi_2 DummyQ)(CF/K)_{i,j,t-1} + \\ \beta_5 (D/K)^2_{i,j,t-1} + f_{i,j} + d_t + \varepsilon_{i,j,t}\end{aligned} \quad (9.9)$$

The coefficient $\phi_1 + \phi_2$ in the above equation holds special importance. We can expect the $\phi_1 + \phi_2$ >0 to support the over-investment hypothesis and <0 otherwise.

We estimated the model in Eq. (9.9) using Dynamic Panel GMM estimation by taking the first difference of explanatory variables and using the second lag of these variables as instruments. The estimation results in Table 9.5 confirm the over-investment hypothesis for India, Indonesia, and South Korea i.e., we substituted the values of the coefficients, ϕ_1 and ϕ_2 in Equation (9.9) and the sum of these coefficients has been greater than 0 for these countries. For example, ϕ_1=0.3174 and ϕ_2= -0.2450 in the case of India, and $\phi_1 + \phi_2$= 0.0724. While in the case of South Korea ϕ_1=-0.0147 and ϕ_2= 0.1014, thus, $\phi_1 + \phi_2$= 0.0867. Thus, the results show that cash flow effect on the tangible fixed investment has been the outcome of over-investment in these countries. It is interesting to note that when growth opportunities of firms are taken into account cash flow coefficient has become significant compared to non-significant reported earlier. These results demonstrate that the mechanisms used to align interest between shareholders and managers have not been present in these countries. As a result, managers used the free cash flows to undertake non-valuable projects due to weak corporate governance. The finding of over-investment in the case of South Korea is similar to the result obtained by Driffield and Pal (2001). The cash flow effect for VP firms has been negative in the case of Pakistan, and Thailand. For example, ϕ_1= -0.1555 and ϕ_2= -0.0120 in the case of Thailand, and $\phi_1 + \phi_2$= -0.1675.

These results have economic implication in that, when firms exceed the optimum level of the investment, firms face over-investment problems, which occur due to the divergence of interests between shareholders and managers, and consequently destroy the value of the firms.

Table 9.5

Over (under) Investment Hypothesis

The table presents the estimation results for the over(under) hypothesis using the Eq. (9.9).

$$\left({}^{I}\!/_{K}\right)_{i,j,t} = \alpha_0 + \beta_1\left({}^{I}\!/_{K}\right)_{i,j,t-1} + \beta_2({}^{I}\!/_{K})^2_{i,j,t-1} + (\phi_1 + \phi_2 DummyQ)({}^{CF}\!/_{K})_{i,j,t-1} + \beta_6({}^{D}\!/_{K})^2_{i,j,t-1} + f_{i,j} + d_t + \varepsilon_{i,j,t}$$

where I is total investment on property, plant and equipment, CF is equal to the earnings before interest, taxes, amortization and depreciation. D is total debt. The standard errors are shown in parenthesis robust to heteroskedasticity. *DummyQ* is equal to 1 for those firms which have q-ratio less than 1 and 0 otherwise. m_1 and m_2 are value of LM *F-version* test for the absence of first-order and second-order serial correlation in the first difference residuals respectively.

	Country					
	India	Indonesia	Malaysia	Pakistan	South Korea	Thailand
$({}^{I}\!/_{K})_{i,t-1}$	0.5227^{a}	0.2462^{a}	0.1776^{a}	0.5772	-0.0524	0.1706^{a}
	(0.0290)	(0.0183)	(0.0472)	(0.4943)	(0.0405)	(0.0366)
$({}^{I}\!/_{K})^2_{i,t-1}$	0.1455^{c}	-0.0188^{a}	-0.0176	-0.3637	0.2504^{a}	-0.0397
	(0.0701)	(0.0047)	(0.0832)	(0.7231)	(0.0540)	(0.0259)
$({}^{CF}\!/_{K})_{i,t-1}$	0.3174^{a}	0.1399^{a}	0.0034	-0.0348	-0.0147	-0.1555^{b}
	(0.1124)	(0.0080)	(0.0115)	(0.1056)	(0.0112)	(0.0669)
$DummyQ({}^{CF}\!/_{K})_{i,t-1}$	-0.2450a	-0.1232^{a}	0.0026	-0.0308	0.1014^{a}	-0.0120
	(0.0842)	(0.0128)	(0.0025)	(0.0748)	(0.0078)	(0.0155)
$({}^{D}\!/_{K})^2_{i,t-1}$	-0.0273	-0.0037c	0.0626^{a}	0.1271	-0.0037	-0.0027
	(0.0229)	(0.0020)	(0.0074)	(0.1353)	(0.0003)	(0.0028)
Specification Test						
m_1	10.1802^{a}	0.1150	0.0980	4.6757^{b}	6.2042^{b}	0.5699
m_2	3.6421^{c}	0.2880	0.0053	0.4420	1.0993	0.7707
Sargan Test	25.7289	55.5056	62.0978	21.9050	67.0538	47.7481
Wald Test	8.9989^{a}	3.4624^{a}	3.8641^{a}	1.6447^{a}	240.851^{a}	2.7291^{a}
No of firms	50	82	102	27	104	81
N	171	701	480	116	703	451

^{a}, ^{b}, ^{c} shows significance at 1%, 5%, and 10% level of significance respectively

9.5. Smooth Transition Regression Estimation

Smooth transition from one regime to another was originally proposed by Bacon and Watts (1971), and applied by Greenaway et al. (1997) as an estimation procedure for examining the growth pattern during the liberalization episodes. Bacon and Watts (1971) argue that smooth transition analysis is more appealing in the liberalization context because the effect of liberalization will be gradual rather than automatic. In the case of Southeast Asian countries, sequenced liberalization has been more common, and therefore, it is suggested that smooth transition analysis offers the facility to examine the transition of investment from one state to another.

The Panel Smooth Transition Regression (PSTR) model is a fixed-effects model with exogenous explanatory variables. It may be considered as a linear heterogeneous panel model with coefficients that vary across the individual firms and over time. The heterogeneity in the regression coefficients is allowed for by assuming that these coefficients are a continuous function of an observable variable through a bounded function of this variable, called the transition function. This function fluctuates between two 'extreme regimes'. As the transition variable is individual, firm-specific and time varying, the regression coefficients for each individual firm in the panel are changing over time. The basic *PSTR* model with two regimes is defined as:

$$I_{i,t} = \mu_i + \beta_0 X_{i,t} + \beta_1 X_{i,t} F(s_{i,t};\gamma,c) + \upsilon_{i,t} \qquad (9.10)$$

where $I_{i,t}$ is the firm-level investment on property, plant and equipment for firm $i=1....N$ and $t=1,...,\ T$. $X_{i,t}$ is a k-dimensional vector of time-varying exogenous variables, μ_i represent the fixed firm effect and $\nu_{i,t}$ is the error term. The transition function $F(s_{i,t};\gamma,c)$ is a continuous function of the transition variable denoted by $s_{i,t}$. The transition variable $s_{i,t}$ can be a lagged dependent variable or any other exogenous variable. It determines the value of $F(s_{i,t};\gamma,c)$ and thus, the effective regression coefficients $\beta_0 + \beta_1 F(s_{i,t};\gamma,c)$ for individual firm i at time t. There are two widely-used specifications of the transition function in Eq. (9.10). These are the Logistic Smooth Transition and Exponential Smooth Transition defined respectively in Eq. (9.11) and (9.12) below:

$$F_L(s_{i,t};\gamma,c) = (1+\exp\{-\gamma \prod_{j=1}^{m}(s_{i,t}-c)\})^{-1} \text{with } \gamma > 0 \text{ and } c_1 \leq c_2 \leq \ldots \leq c_m \qquad (9.11)$$

$$F_E(s_{i,t};\gamma,c) = (1+\exp\{-\gamma(s_{i,t}-c)\})^2 \text{ with } \gamma > 0 \text{ and } c_1 \leq c_2 \leq \ldots \leq c_m \qquad (9.12)$$

The transition function in Eq. (9.11) is monotonically increasing in the transition variable with $F_L(s_{i,t};\gamma,c) \to 0$ as $(s_{i,t}-c) \to -\infty$ and $F_L(s_{i,t};\gamma,c) \to 1$ as $(s_{i,t}-c) \to +\infty$. γ is a slope parameter, which determines the speed of the transition from 0 to 1 and $c = (c_1 \ldots c_m)'$ is an m-dimensional vector of location parameters, and determines when the transition occurs. The restriction $\gamma > 0$ and $c_1 \leq c_2 \leq \ldots \leq c_m$ is imposed for identification purposes. The study has used the model because regimes of the Logistic model can capture the changing nature of financial constraints, whereas in the Exponential model Eq. (9.12), the regimes are associated with small and large absolute values of the transition variable relative to c. As a first step in estimation of the PSTR model, a linear investment model with four variables $\left(Q/K\right)_{i,j,t}$, $\left(D/K\right)_{i,j,t}$, $\left(CF/K\right)_{i,j,t}$ and $\left(S/K\right)_{i,j,t}$ was specified as follows:

$$\left(I/K\right)_{i,j,t} = \alpha + \beta_1\left(Q/K\right)_{i,j,t-1} + \beta_2(S/K)_{i,j,t-1} + \beta_3(CF/K)_{i,j,t-1} + \beta_4(D/K)_{i,j,t-1} + d_t \qquad (9.13)$$

Then, the linearity of the investment model in Eq. (9.13) was tested against the non-linearity of PSTR defined in Eq. (9.10) using $\left(Q/K\right)_{i,j,t}$, $\left(D/K\right)_{i,j,t}$, $\left(CF/K\right)_{i,j,t}$ and $\left(S/K\right)_{i,j,t}$ as transition variables for each country respectively. A variable was identified as a transition variable if it had the highest $LM2_F$ statistic and the lowest associated p-value (see Appendix 9 for technical detail of this test). Table 9.6 shows that the linearity of the model in Eq. (9.13) against the non-linearity of PSTR is rejected for all countries. The variables $\left(Q/K\right)_{i,j,t}$, $\left(D/K\right)_{i,j,t}$, $\left(CF/K\right)_{i,j,t}$ appear to be most systematically non-linear.

Table 9.6
Linearity Test

The table presents the results of the linearity tests where *(a) without year dummies* and *(b) with year dummies* using Q the sum of market value and book-value of debt; CF earnings before interest, taxes, amortization and depreciation; D sum of long-term and short-term debt. All the variables are normalized by the beginning of the year capital stock. The reported values are p-values for the homogeneity test using $LM1$ Chi-square and $LM2$ F version test are described as:

$LM1_{\chi} = \frac{(T)(RSS_0 - RSS_1)}{(RSS_1)}$ which is asymptotically χ^2 distributed with mk degree of freedom, m is the number of regimes in the transition model, here $m=2$; k is the number of parameters in the auxiliary regression (see Appendix). T is the number of observations. The F-version of the above test denoted by $LM2_F$ is:

$LM2_F = \frac{LM_{\chi}}{mk}$ which has an approximate F distribution with degree of freedom $(mk, TN - N - M(k+1)$ .The F-version of the linearity test is the most suitable of the LM test statistic because these have better size properties than the χ^2 variant defined as $LM1_{\chi}$, which may be heavily oversized. The choice of transition variable is based on the largest F statistic and smallest p-value.

	$LM1_{\chi}$		$LM2_F$	
	(a)	(b)	(a)	(b)
INDIA				
$(^{S}/_{K})$	12.5651^{b} (0.0504)	11.3459^{c} (0.0782)	0.6980 (0.8166)	0.6303 (0.8789)
$(^{CF}/_{K})$	2.3299 (0.8869)	2.3118 (0.8890)	0.1294 (1.0000)	0.1284 (1.0000)
$(^{D}/_{K})$	23.0199^{a} (0.0007)	22.1799^{b} (0.0011)	1.2788 (0.1901)	1.2322 (0.2244)
$(^{Q}/_{K})$	17.8779^{a} (0.0000)	16.4893^{b} (0.0113)	0.9932 (0.4638)	0.9160 (0.5584)
Indonesia				
$(^{S}/_{K})$	12.2796^{b} (0.0561)	10.9724^{c} (0.0892)	0.6822 (0.8323)	0.6095 (0.8953)
$(^{CF}/_{K})$	70.4882^{a} (0.0000)	70.2198^{a} (0.0000)	3.9166^{a} (0.0000)	3.9011^{a} (0.0000)
$(^{D}/_{K})$	92.9406^{a} (0.0000)	89.6556^{a} (0.0000)	5.1633^{a} (0.0000)	4.9808^{a} (0.0000)
$(^{Q}/_{K})$	99.9846^{a} (0.0000)	98.8954^{a} (0.0000)	5.5547^{a} (0.0000)	5.4921^{a} (0.0000)
Malaysia				
$(^{S}/_{K})$	309.0589^{a} (0.0000)	307.6778^{a} (0.0000)	17.1699^{a} (0.0000)	17.0931^{a} (0.0000)
$(^{CF}/_{K})$	251.9717^{a} (0.0000)	250.0905^{a} (0.0000)	13.8939^{a} (0.0000)	14.0606^{a} (0.0000)
$(^{D}/_{K})$	259.7937^{a} (0.0000)	262.4533^{a} (0.0000)	14.4329^{a} (0.0000)	14.5807^{a} (0.0000)
$(^{Q}/_{K})$	385.2798^{a} (0.0000)	385.5384^{a} (0.0000)	21.4044^{a} (0.0000)	21.4743^{a} (0.0000)
Pakistan				
$(^{S}/_{K})$	12.3991^{c} (0.0536)	13.5605^{b} (0.0349)	0.6888 (0.8255)	0.7533 (0.7569)
$(^{CF}/_{K})$	12.7471^{b} (0.0472)	16.2832^{b} (0.0123)	0.7081 (0.8060)	0.9046 (0.5728)
$(^{D}/_{K})$	10.3486 (0.1107)	12.0243^{c} (0.0614)	0.5749 (0.9196)	0.6680 (0.8456)
$(^{Q}/_{K})$	13.9712^{b} (0.0299)	15.6811^{b} (0.0155)	0.7761 (0.7306)	0.8711 (0.6147)
South Korea				
$(^{S}/_{K})$	85.1434^{a} (0.0000)	83.7433^{a} (0.0000)	4.7301^{a} (0.0000)	4.6524^{a} (0.0000)
$(^{CF}/_{K})$	48.5991^{a} (0.0000)	48.9874^{a} (0.0000)	2.6999^{a} (0.0001)	2.7215^{a} (0.0001)
$(^{D}/_{K})$	98.8369^{a} (0.0000)	95.9344^{a} (0.0000)	5.4909^{a} (0.0000)	5.3296^{a} (0.0000)
$(^{Q}/_{K})$	90.7807^{a} (0.0000)	87.7127^{a} (0.0000)	5.0433^{a} (0.0000)	4.8729a (0.0000)
Thailand				
$(^{S}/_{K})$	17.5845^{a} (0.0073)	29.0456^{a} (0.0000)	0.9769 (0.4834)	1.6136^{b} (0.0480)
$(^{CF}/_{K})$	3.7490 (0.7105)	16.9543^{a} (0.0094)	0.2082 (0.9998)	0.9419 (0.5263)
$(^{D}/_{K})$	17.4988^{a} (0.0076)	29.6748^{a} (0.0000)	0.9721 (0.4891)	1.6486^{b} (0.0406)
$(^{Q}/_{K})$	12.9531^{a} (0.0437)	24.8659^{a} (0.0003)	0.7196 (0.7942)	1.3811 (0.1289)

^{a}, ^{b}, and ^{c} show significance at 1%, 5% and 10% respectively.

Table 9.6 shows that $\left(Q/K\right)_{i,j,t}$ has the highest $LM2_F$ statistic and lowest associated *p*-value in the case of Indonesia and Malaysia, $\left(CF/K\right)_{i,j,t}$ for Pakistan, and $\left(D/K\right)_{i,j,t}$ for India, South Korea and Thailand respectively. Therefore, these variables have been used as transition variables for the estimation of the *PSTR* model. More specifically, the transition variable is $\left(Q/K\right)_{i,j,t}$ for Indonesia and Malaysia; $\left(CF/K\right)_{i,j,t}$ for Pakistan and $\left(D/K\right)_{i,j,t}$ for India, South Korea and Thailand in the Investment PSTR Model as follows:

$$\begin{aligned}(I/K)_{i,j,t} &= \alpha_{i,j} + d_j + \delta_{0,1}(Q/K)_{i,j,t} + \delta_{0,2}(S/K)_{i,j,t} + \delta_{0,3}(CF/K)_{i,j,t} + \delta_{0,4}(D/K)_{i,j,t} \\ &+ \{\delta_{1,1}(Q/K)_{i,j,t} + \delta_{1,2}(S/K)_{i,j,t} + \delta_{1,3}(CF/K)_{i,j,t} + \delta_{1,4}(D/K)_{i,j,t}\}F_L(s_{i,j,t};\gamma,c) + \upsilon_{i,j,t}\end{aligned} \tag{9.14}$$

$$F_L(s_{i,t-1};\gamma,c) = (1+\exp\{-\gamma \prod_{j=1}^{m}(s_{i,t-1}-c)\})^{-1} \text{ with } \gamma > 0 \tag{9.15}$$

where d_t denotes the vector of year dummies, and the exogenous variables are lagged once and normalized by capital stock. The linear terms are included following Gonzalez et al. (2005) in both regimes i.e., same set of variables are used in the lower and higher regimes.

9.5.1. Non-linear Estimation using PSTR

The researcher used the non-linear least square (*NLS*) for estimating the model. Before reporting the results, the performance of the investment–PSTR model using the *LM* specification tests of no remaining heterogeneity and parameter constancy is reported (see Appendix 9 for detail of these *LM* tests). Additionally, a report is given of the ARCH test for conditional heteroscedasticity in the residuals. The *LM* tests results in Table 9.6 show that the investment-PSTR model capture the heterogeneity in the regression coefficients for Malaysia and Pakistan. However, it does not completely capture the heterogeneity in the regression coefficients across firms for India, Indonesia and Thailand. This is also supported by a significant ARCH (2) (*p*-value <0.01) for these countries. On the other hand, the test for parameter constancy has been rejected for all countries significantly (*p*-value < 0.01) except India and Pakistan. These specification tests show that the non-linear PSTR model has been able to explain firm investment dynamics implied by the recent literature.

Table 9.7

Panel Smooth Transition Regression Estimation

The table presents the estimates of parameters using the *PSTR* model.

$$(I/K)_{i,j,t} = \alpha_{i,j} + d_j + \delta_{0,1}(Q/K)_{i,j,t} + \delta_{0,2}(S/K)_{i,j,t} + \delta_{0,3}(CF/K)_{i,j,t} + \delta_{0,4}(D/K)_{i,j,t}$$
$$+ \{\delta_{1,1}(Q/K)_{i,j,t} + \delta_{1,2}(S/K)_{i,j,t} + \delta_{1,3}(CF/K)_{i,j,t} + \delta_{1,4}(D/K)_{i,j,t}\}F_L(s_{i,j,t};\gamma,c) + \upsilon_{i,j,t}$$

$$F_L(s_{i,t-1};\gamma,c) = (1+\exp\{-\gamma \prod_{j=1}^{m}(s_{i,t-1}-c)\})^{-1}$$

The LM tests of no remaining heterogeneity *LM4*, parameter constancy *LM6* (see Appendix 9), ARCH Tests are reported. The year dummies are not reported. The standard errors shown in parenthesis are robust to heteroskedasticity.

Panel A

	Country					
Variables	Indonesia	Malaysia	India	South Korea	Thailand	Pakistan
	1	2	3	4	5	6
Transition variable, $s_{i,t}$	$s_{i,t} = (Q/K)_{i,t-1}$	$s_{i,t} = (Q/K)_{i,t-1}$	$s_{i,t} = (D/K)_{i,t-1}$	$s_{i,t} = (D/K)_{i,t-1}$	$s_{i,t} = (D/K)_{i,t-1}$	$s_{i,t} = (CF/K)_{i,t-1}$
β_{01}	-0.0029 (0.0084)	0.0352^{a} (0.0187)	0.0294^{a} (0.0056)	-0.0670^{a} (0.0205)	0.0165^{a} (0.0038)	0.0565^{b} (0.0223)
β_{02}	-0.0015 (0.0018)	-0.0060 (0.0045)	-0.0131^{a} (0.0039)	0.0119^{a} (0.0035)	-0.0017^{c} (0.0009)	-0.0705 (0.0824)
β_{03}	-0.0208 (0.0138)	-0.0700 (0.0694)	-0.0759^{a} (0.0169)	-0.0300^{a} (0.0090)	-0.0456^{a} (0.0131)	0.2292 (0.1063)
β_{04}	-0.0167 (0.0087)	-0.1137^{a} (0.0358)	0.0118^{a} (0.0035)	-0.0074 (0.0090)	0.0087^{a} (0.0032)	-0.0005 (0.0124)
Transition function $(\beta_{11}\left(Q/K\right)_{i,t-1} + \beta_{12}\left(D/K\right)_{i,t-1} + \beta_{13}\left(CF/K\right)_{i,t-1} + \beta_{14}\left(S/K\right)_{i,t-1})F_L(s_{i,t-1};\gamma,c)$						
β_{11}	0.0071 (0.0086)	-0.0334 (0.0189)	-0.0249^{a} (0.0058)	0.0857^{a} (0.0207)	-0.0157^{a} (0.0388)	-0.0359 (0.0222)
β_{12}	0.0006 (0.0019	0.0059 (0.0045)	0.0128^{a} (0.0039)	-0.0019^{a} (0.0004)	0.0015 (0.0009)	0.0494 (0.1264)
β_{13}	0.0520^{a} (0.0207	0.0971 (0.0731)	0.0982^{a} (0.0197)	0.0246^{c} (0.0114)	0.0501^{a} (0.0171)	-0.1313^{c} (0.0725)
β_{14}	0.0174^{c} (0.0093)	0.1067^{a} (0.0363)	-0.0117^{c} (0.0058)	0.0171 (0.0106)	-0.0008 (0.0061)	0.0106 (0.0075)
γ	10.0006 (27.0483)	2.6258 (3.7185)	10.0187 (31.2473)	9.9862^{b} (4.7158)	10.0180 (30.1250)	9.9993^{c} (5.6724)
c	0.6706 (1.4687)	0.8572 (2.2833)	0.5065 (0.5324)	0.4112 (0.3619)	1.2032^{c} (0.7010)	0.8315 (0.5218)
Specification Tests						
$LM4_F$	3.6041^{a}	1.2510	4.3607^{b}	1.5412	4.3345^{a}	0.6421
$LM6_F$	6.8540^{a}	2.4650^{b}	0.6609	10.0871^{a}	2.3884^{b}	1.1979
ARCH(1)	18.4591^{a}	1.5493	6.3862^{a}	2.0396	5.3023^{a}	1.0806
ARCH(2)	16.3790^{a}	2.2986	19.6856^{a}	13.7610^{a}	22.5149^{a}	0.8657
Adj. R^2	0.1384	0.2281	0.2510	0.2225	0.2292	0.3240
No of firms	82	120	92	105	92	32
N	711	1128	886	1064	887	269

^{a}, ^{b}, and ^{c} show significance at 1%, 5% and 10% respectively.

The reported coefficients β_{0j} and β_{1j} (where j=1 … 4) correspond to the coefficients in the regimes associated with $F_L(s_{i,t-1};\gamma,c) = 0$, and 1 in Table 9.7. The results are discussed, using $\left(Q/K\right)_{i,j,t}$ as the transition variable for Indonesia and Malaysia (in Column 2), $\left(D/K\right)_{i,j,t}$ for India, South Korea and Thailand (Column 3-5), and $\left(CF/K\right)_{i,j,t}$ for Pakistan (Column 6). For Malaysia and Indonesia, the estimated parameters $\beta_{01}, \beta_{02}, \beta_{03}$, and β_{04}, are for LOW Q regime and $\beta_{01}, \beta_{02}, \beta_{03}$, and β_{04}, for HIGH Q regime. The results imply investment behaviour of firms that might have switched over time between these regimes and at any time might be referred to as LOW Q firms and HIGH Q firms.

The estimated parameters of β_{01} andβ_{02} show that LOW Q firms did not respond to growth opportunities (proxy by Q/K ratio), and demonstrate increased leverage for Indonesia and Malaysia (see Table 9.6, column 2 and 3). The comparison of β_{02}, and β_{12} indicate that LOW Q firms and HIGH Q firms chose lower leverage to avoid the risk of being more financially distressed. The parameters of $\beta_{03}$and β_{13} show that investment of HIGH Q firms has been significantly influenced by internal cash flows compared to LOW Q firms. The investment-cash flow sensitivity of the HIGH Q firms has been 2.5 times that of the LOW Q firms. This finding seems to suggest that the asymmetric information problems have led to higher investment cash flow sensitivity rather than a managerial discretion problem for Indonesia and Malaysia[4]. In sum, the relationship between I and CF indicated by the coefficients β_{03}, and β_{13} shows that LOW Q firms faced less financing constraints during the liberalization period as indicated by the negative relationship between investment and cash flow. The estimates of γ are large for Indonesia compared to Malaysia (though not significant).

The estimated parameters for India, South Korea and Thailand (see Table 9.6 columns 4, 5, 6) are related to LOW *D* and HIGH *D* regimes and the firms switch over time between these regimes and at any time might be referred to as LOW Debt firms and HIGH Debt firms. The parameters of $\beta_{03}$and β_{13} show that LOW Debt firms are significantly less financially constrained compared to HIGH Debt firms (*p*-value <0.01). This result is line with findings of Hu and Schiantaeralli (1998). They used a switching regression approach for examining the investment dynamics of the U.S firms. It is evident that the coefficient on cash flow β_{03} is significantly negative for LOW Debt firms compared to the coefficient on cash flow β_{13}, which is significantly positive for the HIGH Debt firms. According to Hu and Schiantaeralli (1998), this result indicates that HIGH Debt firms face high premium on external debt and are more sensitive to the availability of internal finance. In addition, the HIGH Debt firms also do not invest in response to an increase in sales compared to LOW Debt firms. In terms of magnitude, the estimated γ is larger for India, South Korea, and are significant for Thailand (*p*-value <0.05).

Lastly in the case of Pakistan, comparison of $\beta_{03}$and β_{13} seems to suggest that LOW CF firms have been more financially constrained than HIGH CF firms (though not significant). This finding is supported the pecking order theory that suggests that firms facing low future prospects rely more on internal finance for investment. The LOW CF firms also face a high debt premium and, therefore, do not rely on the external finance like HIGH CF firms, as indicated by trade-off theory.

In sum, the estimation of *PSTR* model and the Euler investment equation are somewhat similar in explaining investment and cash flow sensitivity. To the best of researcher's knowledge, *PSTR* approach to examine investment dynamics has not been undertaken for the emerging markets in the financial liberalization context. To further demonstrate that variations in the investment

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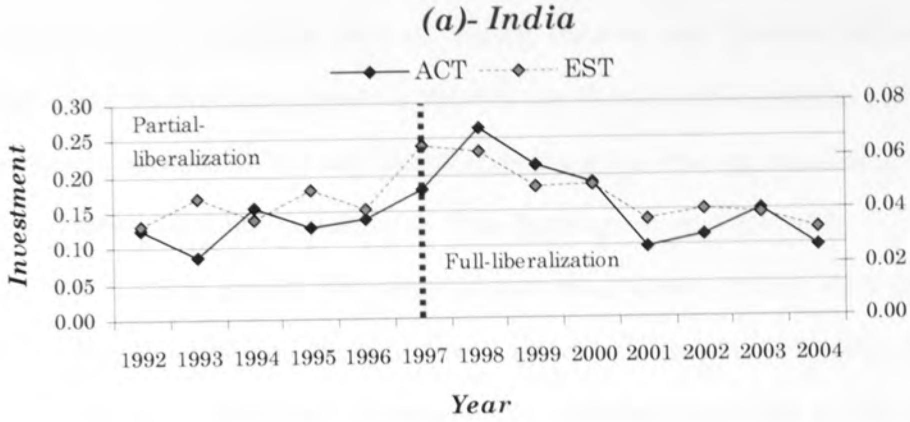
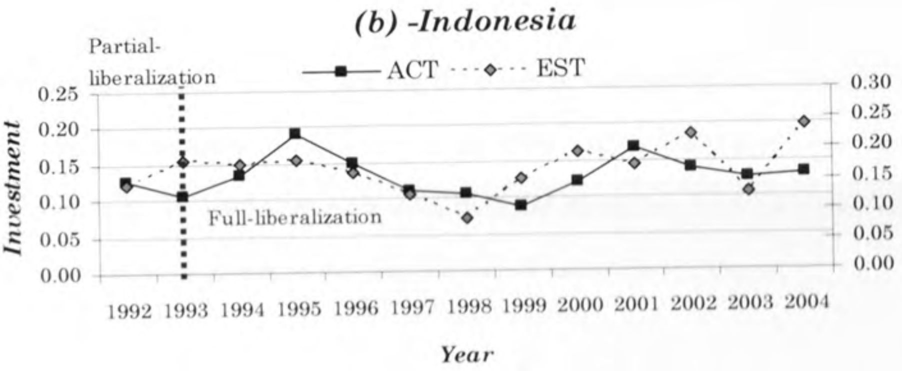
[4] Deryse and Jong (2006) used Q/K ratio to discriminate between the firms facing managerial discretion and information asymmetry problems, where Low Q/K-ratio firms face the managerial discretion problem and High Q/K-ratio firms face the asymmetry information problem.

dynamics captured by PSTR, the estimated investment transitions from the PSTR model are plotted in Fig 9.1 (a-f).





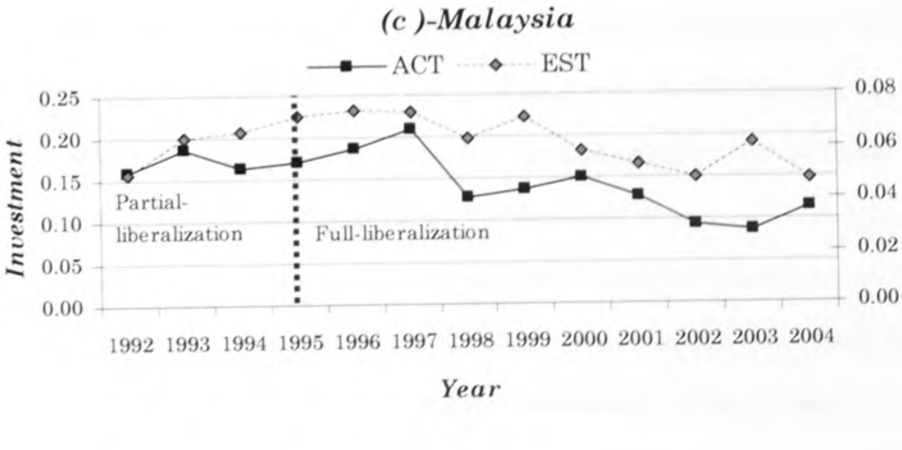


Fig 9.1 Estimated and Actual Firm-level Investment

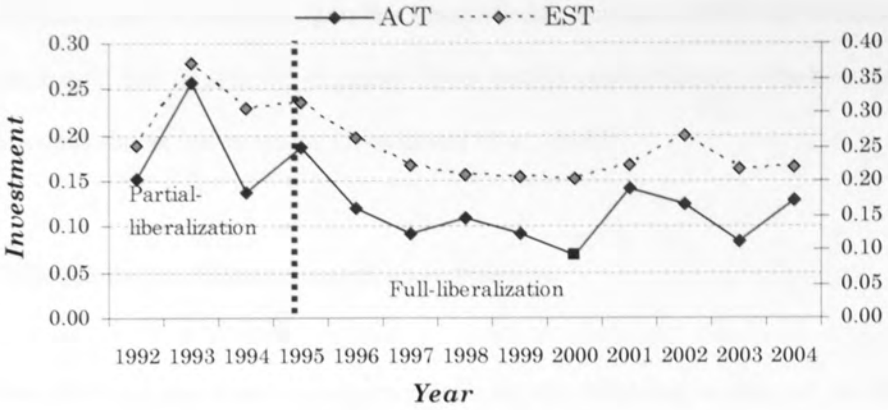
The primary y-axis (left-side) shows the actual investment ratio and the secondary y-axis shows the estimated investment ratio from the PSTR (right side)

The estimated and actual investments are plotted against time. To gain some indication as to whether a positive or negative transition in investment may have been triggered by liberalization, the time period has been divided into partial and complete liberalization episodes. It is important to note that the study's main focus is on the timing, duration and direction of transition and to find whether there has been an association between the duration of investment and liberalization in the countries in question. In the case of India (see Fig 9.1 a), the transition in investment rates was faster and higher after full liberalization of the banking sector during 1996-97, compared to in the partial liberalization period. The liberalization programme started with the removal of interest rate ceilings in 1993 and the reduction in the percentage of priority loans in 1994, there has been acceleration in firm-level investment. For Indonesia (see Fig 9.1 b), the estimated investment path shows a positive transition during the full liberalization that lasted for two years.

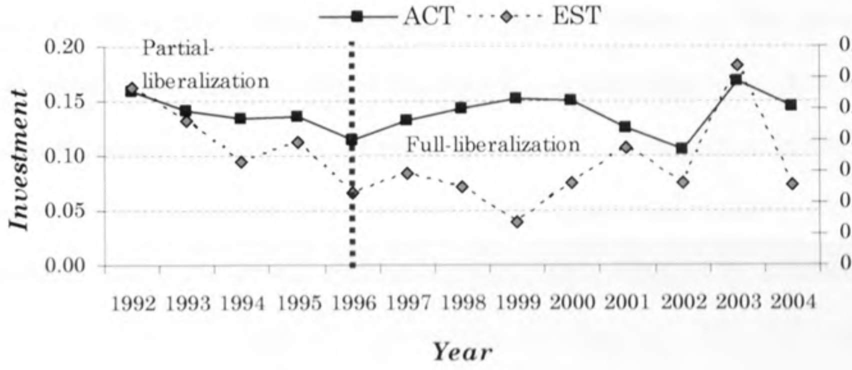
In the case of Malaysia and Thailand (see Fig 9.1 c and f), the transitions in firm-level investment started from the partial liberalization period in 1994. Since then there has been a gradual increase in investment. It is interesting to note that the duration of the transition has been much longer - four years for both countries compared to two 2 years for Indonesia.

In the case of Pakistan (see Fig 9.1 d), it seems that full liberalization after 1995 may have been associated with a decrease in the rate of firm-level investment. This result seems quite unexpected given the high investment rate during the partial liberalization period. Lastly, for South Korea, the investment transition appears very slow and gradual during the full liberalization period. The Asian financial crisis has negative impact on the firm-level investment. The direction of transition in investment has been mostly downward for all the countries (except India). On possible reason for the major push in investment level for India might be the very late interest rate liberalization in 1996 compared to other countries. In sum, these plots reveal that the investment transition has been mostly gradual which is also supported by the estimates of γ i.e., in most of the countries the transition did not occur in an instantaneous fashion.

(d) - Pakistan



(e)-South Korea



(f)-Thailand

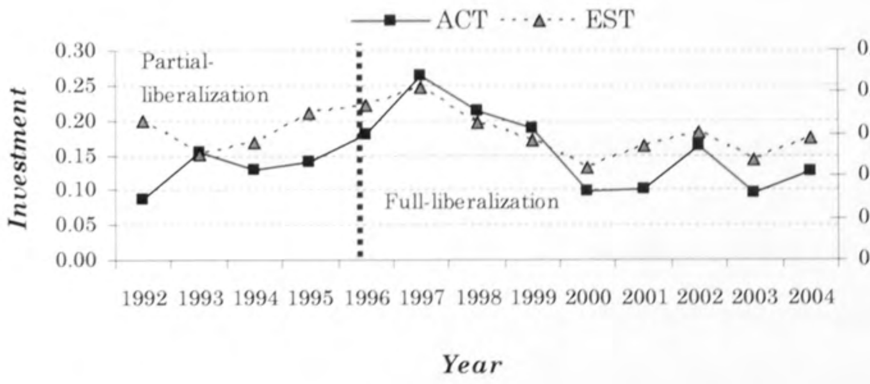


Fig 9.1 Estimated and Actual Firm-level Investment
The primary y-axis (left-side) shows the actual investment ratio and the secondary y-axis show the estimated investment ratio from PSTR (right side)

On the other hand, the difference in duration and direction of investment transitions shown by these estimates are expected because we should expect liberalization to affect different countries in quite different ways, depending upon the institutional context within which these reforms have been initiated and the degree of slippage from initial commitment, which occurs during the liberalization episode, as indicated by Greenaway et al. (1997).

9.6. Efficiency in Allocation of Investment

Prior to liberalization, government interventions in the banking sector led to the sub-optimal allocation of financial resources for investment. Consequently, firms with potentially higher returns face financial constraints and fail to invest in the positive NPV projects due to indivisibilities of investment. After liberalization, the reduction in the level of government interventions should allow efficient allocation of resources according to market- determined rates of interest, and therefore, increase the efficiency in allocation of resources. In the main theoretical literature pressures from external investors as well as insider ownership, encourage managers to pursue value-maximising investment policies (Jensen, 1986), despite this conjecture, there is little direct evidence on financial markets improve capital allocation (Wurgler, 2000).This section investigates the effect of financial liberalization on the efficiency of investment allocation, the aim being to investigate whether financial liberalization has increased the share of investment going to firms with a higher marginal rate of return on capital.

9.6.1 Measurement of Efficiency in the Allocation of Investment

The efficiency of investment has been measured by the incremental output capital ratio (IOCR) in previous studies. Gelb (1989) found an increase in the IOCR following the onset of financial reforms and King and Levine (1993) show that investment efficiency gains (measured using the IOCR) are associated with a high level of financial development. However, a major weakness of the IOCR is its sensitivity to business cycle fluctuations and the fact that it has no comparison with any benchmark. Other studies have observed the variance of expected marginal returns to capital across industries and compared this variance before and after a financial deregulation event, if the variance falls, they infer that liberalization encourage flows of capital to equate return across industries (Wurgler, 2000). In this study, the researcher develops an index of efficiency in the allocation of investment for each country as follows.

Firstly, it is assumed that the marginal return on investment is equal to the ratio of operating profits to capital (*CF/K*). Each firm's investment in a year was then multiplied by its marginal return on investment to obtain the total return on investment as indicated by the numerator term in (9.9) below. Then, the total return on investment was summed across all firms to obtain an estimate of the total return on investment for a country in a particular year. In the final step, this total return on investment for a country was divided by a benchmark, which is an estimate of total return if investment funds had been allocated to firms in proportion to their share of capital in the economy as indicated by the denominator term in Eq. (9.9). As a result of this procedure, an index was obtained for each country denoted by EI_t^j.

$$EI_t^j = \frac{\sum_i \frac{CF_{i,j,t+1}}{K_{i,t+1}} I_{i,j,t}}{\sum \frac{CF_{i,j,t+1}}{K_{i,j,t+1}} \times \frac{K_{i,j,t}}{K_t T} \times I_{t,j}{}^T} \tag{9.9}$$

where $I_{i,j,t}$, $CF_{i,j,t}$ and $K_{i,j,t}$ refers to investment, operating profit, and capital stock respectively. Note that each unit of investment in year *t* increases the capital stock, and generates a return, in year *t+1* i.e., it is assumed that investment becomes productive with one period delay.

Fig 9.2 shows that the index of efficiency in the allocation of investment has been greater than 1 for India, Indonesia, Malaysia, and South Korea in the early 1990s. The efficiency in the allocation of investment in the years identified earlier as transition periods of firm-level investment, shows that full liberalization of the banking sector has yielded greater economic benefit by increasing the efficiency in the allocation of investment in the case of India, and Thailand. The index has value of more than 1 for a longer period in the case of India, whereas, it lies between 1 and 1.50 for most of the time for Thailand.

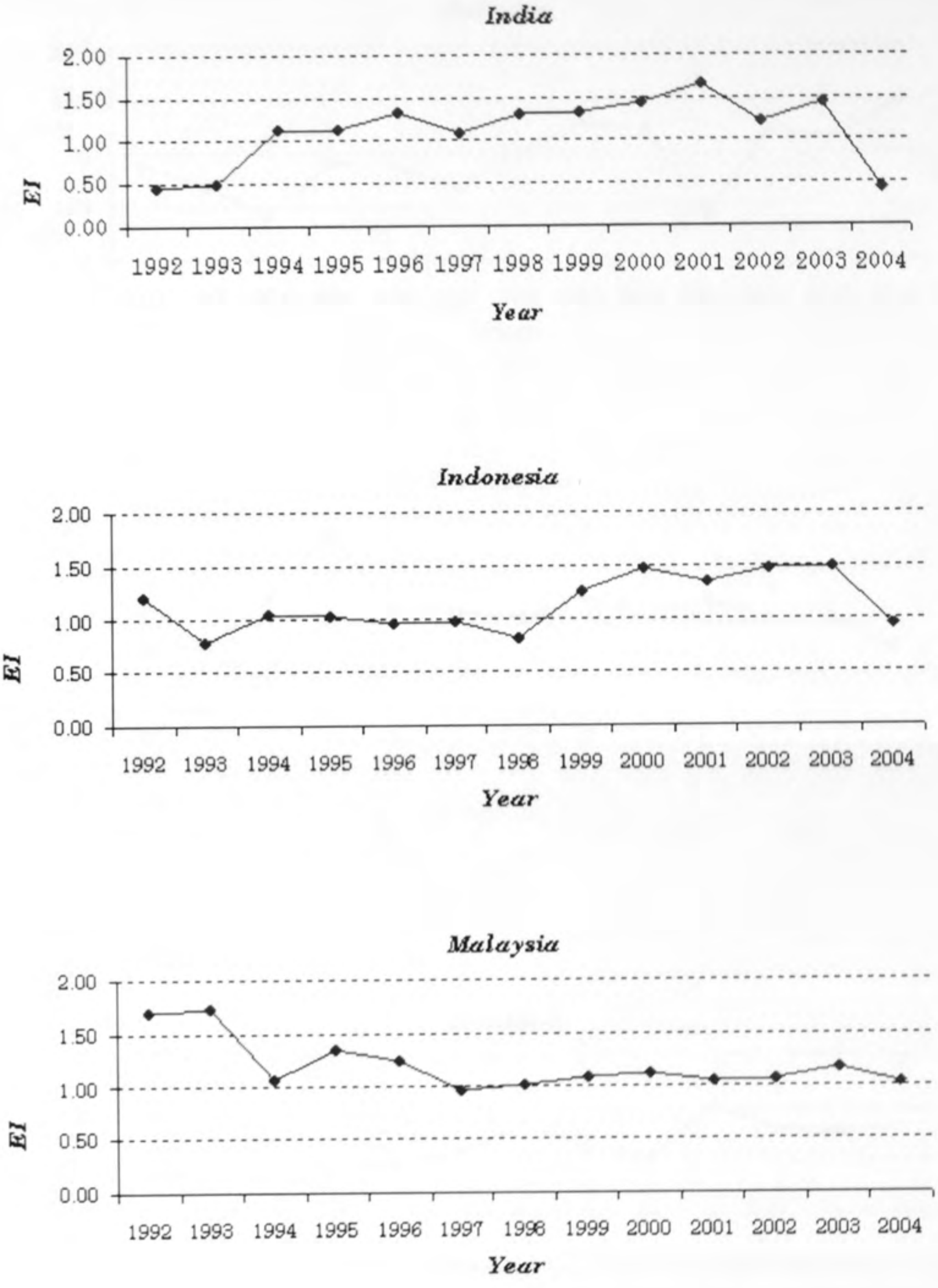


Fig 9.2 Index of Efficiency in Allocation of Firm-level Investment

This figure shows the index of efficiency in the allocation of firm-level investment for the Southeast Asian countries over the period 1992-2004.

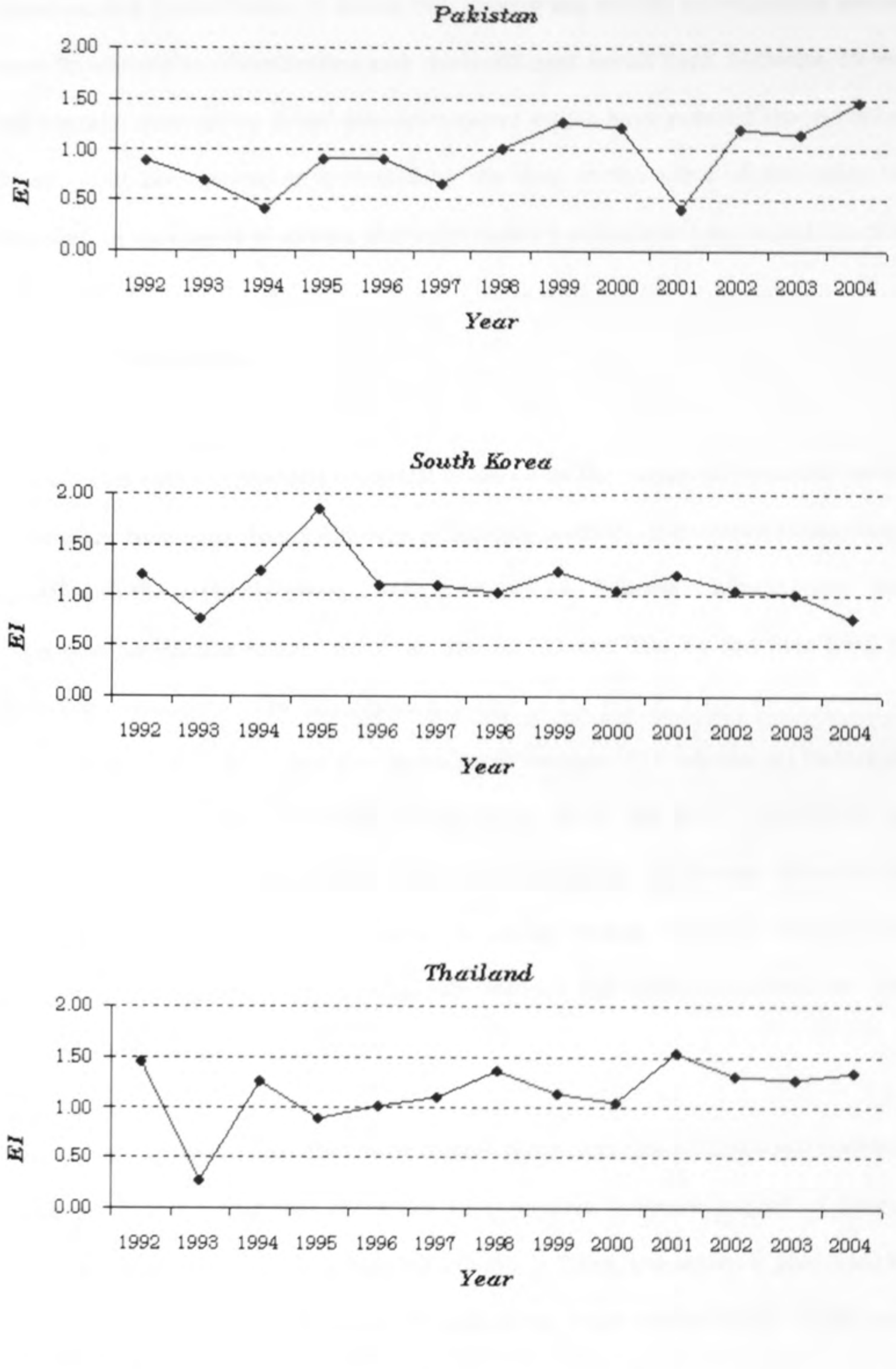


Fig 9.3 Index of Efficiency in Allocation of Firm-level Investment
This figure shows the index of efficiency in the allocation of firm-level investment for the Southeast Asian countries over the period 1992-2004.

The investment allocation efficiency in the case of Pakistan appears more persistent despite the decrease in the overall level of firm-level investment. On the contrary, in the case of Indonesia, Malaysia and South Korea, it seems that during the partial liberalization period, firms reacted more favourably to liberalization and made efficient investment decisions. However, during the full liberalization period firms' over-investment might have reduced the overall efficiency in the allocation of investment, as indicated by the drop in the value of the index for South Korea. However, in the case of Malaysia, the index shows a stable trend in the full liberalization period.

9.7. Conclusion

This chapter extends previous empirical evidence on the impact of financial liberalization on firm investment behaviour. Using different estimation methods, it has been found that investment was sensitive to the available internal cash flows prior to financial liberalization. During this period, there was significant impact from the decline in cash flow on the firm level investment. The financing constraints were manifested not only in the higher response of investment to financial factors such as cash flows, but also in the lower response to fundamental factors such as increases in sales. However, after financial liberalization, there has been a significant reduction in the financial constraints of the firms. The implementation of discrete financial reforms such as interest rate liberalization, reduction in policy credits, reduced reserve requirements and prudential regulations, have significantly reduced the financial constraints and improved the efficiency of investment allocation.

Despite the differences in the institutional characteristics of financial systems in the sample countries, it was found that there has been positive economic impact of liberalization on firm investment and efficiency of investment allocation. Thus, the evidence presented hitherto suggests that instead of criticizing financial liberalization, some credit is due to financial liberalization reforms.

It is suggested that future research should take into account the impact of foreign direct investment to provide a more comprehensive analysis of the investment behaviour of firms in these countries as indicated in Kugler (2005). An empirical question to address in future research should be: does foreign direct investment in these countries generate positive externalities on local producers? The econometric evidence on these positive externalities is rather scarce. The foreign direct investment increases the domestic technology opportunities. The entry of multinational subsidiaries can cause productivity gains for host country producers through increased competition. The setting up of the multinational subsidiaries raises managerial incentives in the host country enterprises to make efficiency, enhancing investment because of the increased risk of a loss of market share.

The empirical evidence presented in this chapter casts considerable doubt on the rationale of using financial repression to increase the capital stock of a country by repressing interest rates and priority credits. Although the financial systems in these countries are characterized by government controls to address the social and political problems for which no 'first best' optimum solution exists, the second best optimum solution of a repressed financial system to allocate resources for regional developments might have also created substantial deadweight costs in the way of achieving economic growth.

Appendix-9

9-A Linearity Test

The first step in specifying the Panel Smooth Transition Regression Model (PSTR) involves testing for linearity against the PSTR non-linearity defined in Equation (9.2). In order to derive a linearity test, which means testing γ=0 in the $F_L(s_{i,j,t};\gamma,c)=1/(1+\exp\{-\gamma(s_{i,j,t}-c)\}$ in Eq. (9.2), the researcher used first order Taylor approximation around γ_1 =0 in place of $F_L(s_{i,t};\gamma,c)$ and this parameterization leads to the auxiliary regression (9-A).

$$y_{i,j,t}=\mu_i+\beta_0'^{*}x_{i,j,t}+\beta_1'^{*}x_{i,j,t}s_{i,j,t}+\beta_2'^{*}s^2{}_{i,j,t}+\beta_3'^{*}s^3{}_{i,j,t}+u^{*}{}_{i,j,t} \qquad \text{(9-A)}$$

where $s_{i,t}$ is a transition variable, the parameters $\beta_1'^{*}, \beta_{2,}'^{\ *}, \beta_3'^{*}$ are multiples of γ. The null hypothesis $H_0:\gamma=0$ in the logistic function corresponds to testing $H_0:\beta_1=0$ and $\beta_1'^{*}$ =0; $\beta_{2,}'^{\ *}$ =0; $\beta_3'^{*}$ =0. The study used $({}^{D}\!/\!_{K})$, $({}^{S}\!/\!_{K})$, $({}^{CF}\!/\!_{K})$, *and* $({}^{Q}\!/\!_{K})$ one by one as transition variables $s_{i,t}$ in (9-A) for the linearity test. The test was carried out as follows:

(i) Regress variable $({}^{I}\!/\!_{K})$ on $({}^{D}\!/\!_{K})$, $({}^{S}\!/\!_{K})$, $({}^{CF}\!/\!_{K})$, *and* $({}^{Q}\!/\!_{K})$ (with and without year dummies) and get the residuals and the residuals sum of squares RSS_0

(ii) Get the residuals from auxiliary regression in Eq (9-A) and obtain the residual sum of squares RSS_1.

(iii) Compute $LM1_\chi=\dfrac{(T)(RSS_0-RSS_1)}{(RSS_1)}$. Under the null hypothesis the $LM1_\chi$ is asymptotically χ^2 distributed with *mk* degree of freedom. Here *m* is the number of regimes in the transition model, here *m=2*; *k* is the number of parameters in the auxiliary regression above. *T* is the number of observations

The *F*-version of the above test denoted by $LM2_F$ can be derived as under:

$$LM2_F=\frac{LM_\chi}{mk}$$

The $LM2_F$ has an approximate F distribution with degree of freedom $(mk, TN - N - M(k+1)$ .The F-version of the linearity test is the most suitable of the LM test statistic because these have better size properties than the χ^2 variant defined as $LM1_\chi$, which may be heavily oversized. The results using $(D/_K)$, $(S/_K)$, $(CF/_K)$, *and* $(Q/_K)$ are reported in Table 9.4.

9-B *Parameter Constancy Test*

This test has been used to test for parameter constancy in the PSTR with the two regimes against the alternative of smoothly changing parameters. The test is constructed by adding the Time Varying Transition Panel Smooth Transition Function defined as, $G(t;\gamma_2,c_2) = 1/(1+\exp\{-\lambda_2 \prod_{j=1}^{h}(t-c_{2j})\}$ in Eq. (9.2) as under.

$$y_{i,j,t} = \mu_i + (\beta'_{10}x_{i,j,t} + \beta'_{11}x_{i,j,t}F(s_{i,j,t};\gamma_1,c_1)) + G(t;\gamma_2,c_2)(\beta_{10}x_{i,j,t} + \beta_{11}x_{i,j,t}F(s_{i,j,t};\gamma_1,c_1)) \qquad \text{(9-B)}$$

The main hypothesis to test is $\gamma_2 = 0$ in (9-B). Again using the Taylor expansion around γ_2 =0, and rearranging terms, this yields the following auxiliary regression:

$$\begin{aligned} y_{i,j,t} = {} & \mu_i + \beta'^{*}_{10}x_{i,j,t} + \beta'^{*}_{1}x_{i,j,t}t + \beta'^{*}_{2}x_{i,j,t}t^2 + \\ & (\beta'^{*}_{20} + \beta'^{*}_{21}x_{i,j,t}t + \beta''^{*}_{22}x_{i,j,t}t^2)G(t;\gamma_2,c_2) + \eta^{*}{}_{i,t} \end{aligned} \qquad \text{(9-C)}$$

The parameter vectors ${\beta'}^{*}{}_{j}$ for j=1,2, ...,h,h+1,...2h are multiples of γ_2 such that the null hypothesis γ_2=0 can be reformulated as ${\beta'_{20}}^{*}$=0; ${\beta'_{21}}^{*}$=0; ${\beta'_{22}}^{*}$=0 in the auxiliary regression (9-C). The parameter constancy tests $LM3_\chi$ and $LM4_F$ are then computed as follows:

(i) Regress dependent variable $(I/_K)$ on $(D/_K)$, $(S/_K)$, $(CF/_K)$, *and* $(Q/_K)$ F (with and without year dummies) and get the residuals and the residuals sum of squares RSS_3.

(ii) Get the residuals from auxiliary regression in (9-C) and obtain the residual sum of squares RSS_4.

(iii) Compute $LM3_\chi = \dfrac{(T)(RSS_3 - RSS_4)}{(RSS_4)}$. Under the null hypothesis the $LM3_\chi$ is asymptotically χ^2 distributed with *2hk* degree of freedom. Here *h=2*; *k* is the number of parameters in the auxiliary regression above. T is the number of observations

The F-version of the above test denoted by LM_{4F} is derived as under:

$$LM4_F = \frac{LM_\chi}{2hk}$$

$LM4_F$ has approximate F distribution with degree of freedom $(2hk, TN - N - 2k(h+1) - (m+1)$. We report F-version of the linearity in the specification tests.

9-C *No Remaining Heterogeneity Test*

This test has been used to test whether a two-regime PSTR model captures the heterogeneity in annual panel dataset or not. In the PSTR framework, it can be tested by using additive PSTR model with *m=2* regimes as an alternative. Thus,

$$y_{i,j,t} = \mu_i + \beta_0' \, x_{i,j,t} + \beta_1' x_{i,j,t} F_1(s_{i,j,t}^{(1)}; \gamma_1, c_1) + \beta_2' \, x_{i,j,t} F_2(s_{i,j,t}^{(2)} \; ; \gamma_3, c_3) + \varpi^*{}_{i,t} \qquad \text{(9-D)}$$

where the transition variables can, but need not, be the same. For $s^{(1)}$ we have used that variable which has the highest $LM2_F$ and lowest p-value and for $s^{(2)}$ the next highest $LM2_F$ and lowest p-value. Again the null hypothesis of no remaining heterogeneity can be formulated using the first order-Taylor approximation around leads to the auxiliary regression (9-E)

$$y_{i,j,t} = \mu_i + \beta_0'^* x_{i,,jt} + \beta_1' x_{i,j,t} F_1(s_{i,j,t}^{(1)}; \bar{\gamma}_1, \bar{c}_1) + \beta_{21}'^* x_{i,j,t} s_{i,j,t}^{(2)} + \varphi^*{}_{i,t} \qquad \text{(9-E)}$$

The LM tests $LM5_\chi$ and $LM6_F$ are computed as follows:

(iv) Regress dependent variable $(I/_K)$ on $(D/_K)$, $(S/_K)$, $(CF/_K)$, *and* $(Q/_K)$ (with and without year dummies) and get the residuals and the residuals sum of squares RSS_3 .

(v) Get the residuals from auxiliary regression in (9-E) and obtain the residual sum of squares RSS_4.

(vi) Compute $LM5_{\chi} = \frac{(T)(RSS_5 - RSS_6)}{(RSS_6)}$. Under the null hypothesis the $LM_{5\chi}$ is asymptotically χ^2 distributed with *mk* degree of freedom. Here *m=2*; *k* is the number of parameters in the auxiliary regression above. *T* is the number of observations.

The *F*-version of the above test denoted by $LM6_F$ is derived as under:

$$LM6_F = \frac{LM_{\chi}}{mk}$$

$LM6_F$ has an approximate *F* distribution with degree of freedom $(2hk, TN - N - 2k(m+2)$.

Chapter 10

CONCLUSION

This research examined the impacts of financial liberalization for six Southeast Asian countries. A systematic analysis was conducted to expose the similarities and differences in the firm-level capital structure and investment dynamics occasioned by the changes in the cost of equity capital under this economic environment. In this analysis the firm-level and the country-level influences on the changes in the capital structure, the cost of equity capital, and investment of the firms, have been separately identified.

Previous studies have examined the influence of the financial market developments on firm-level financing, and these empirical analyses document that financial reforms have changed the long-term and short-term financing behaviour of Southeast Asian firms (e.g., Schmukler and Vesperoni, 2001). However, the findings from this research show that the results of these previous studies are weak because their methodology ignored the adjustment process of capital structure and changes in investment strategies at firm-level for the sample countries. By taking into account these adjustment processes, it is found that the speeds of adjustment of debt and equity ratios to optimal levels have been time-varying. The researcher finds that the speed of adjustment of debt ratio has been positively affected by the domestic banking sector liberalization, and similarly, the increase in the speed of adjustment of equity ratio has been associated with stock market liberalization.

The economic impact of less spacing (shorter lags) in the implementation of domestic banking sector reforms in the case of South Korea has benefited the firms with a higher speed of adjustment to optimal debt ratio compared to other countries where there has been more spacing (longer lags), such as Malaysia, and Indonesia. Further analysis revealed that the larger firms, and those firms associated with business groups, have a higher speed of adjustment of debt ratio than smaller and independent firms in these countries. The adjustment processes of foreign firms have been slower than domestic firms. These findings suggest that banking sector reform has been beneficial for the domestic firms in these countries.

The results from this study show that stock market liberalization has different economic impacts on the speed of adjustment of equity ratio for some countries which, as empirically demonstrated, has been due to time-varying stock market integration. The results obtained from using a combination of methodologies, show that integration of stock markets has been time-varying. For countries, such as Malaysia and South Korea, regional and world factors seem to explain variations in stock market returns co-movement. The findings might imply that a high level of global integration seems to have influenced the speed of adjustment of equity ratio for South Korea and the low cost of equity capital for Malaysia.

The study investigated the impact of stock market liberalization and institutional reforms on the cost of equity capital for these countries, in order to draw stronger evidence that gradual integration of stock markets reduces the cost of equity capital for these countries. The results seem to indicate that stock market liberalization has been associated with a lower cost of equity capital. The findings also show that the securities market infrastructure developments such as the electronic trading system, and changes in firm-level disclosure requirements, have been associated with a decrease in the firm-level cost of equity capital. The findings of a decrease in the cost of equity capital at firm-level are new for the Southeast Asian countries compared to earlier findings for these countries at country-level.

The study's findings also demonstrate that financial liberalization has significantly reduced the financial constraints. After financial liberalization, there has been a significant reduction in the financial constraints of the firms in some of the countries. Most importantly, economic impact of reduction in the financing constraints has been observed in the improved efficiency in the allocation of investment. The research findings also show evidence of over-investment in some countries, as firms' investment exceeded the optimum level in the case of Indonesia and South Korea, and suggest weaknesses of the internal corporate governance mechanism in the countries in questions.

The implications of this research for policy-makers are as follows. Firstly, the timing of the reform measures is crucial in order to reap the full benefits of financial liberalization in the short-run, as it was found that in the short period after opening up of stock markets, the cost of equity capital decreased for most of the countries. Further analysis reveals that the coherence of the reform measures is essential to sustain the nexus of relationship between real sector growth and financial sector development in the long term. One obvious advantage of policy coherence is that it can result in more consistent signals to both the real sector and the regulators about what is forthcoming, and thus allow for the formation of expectations or the decision to remain with the status quo. To illustrate, prudential regulations were implemented before the interest rate liberalization in Malaysia and South Korea which seem to have an impact on the speed of adjustment of debt ratio. This policy coherence might have alerted the banking sector to avoid risky portfolio. Similarly, it was found that a decrease in the cost of equity capital was associated with an increase in the firm-level investment in Malaysia. This finding seems to suggest that the advantage of policy coherence resulted in a more efficient allocation of resources.

Overall, research findings seem to suggest that the economic benefits of financial liberalization will be unevenly distributed across countries. Thus, to predict winners and losers from the liberalization and economic integration, given that support for liberalization policies developed along the lines of political or economic interests, it can be argued that, those countries that internalize the pre-requisites for liberalization strategy or adapt to its imposing demands, can be crowned as winners, even though the sceptics of liberalization seem to have counted some of the East Asian countries on the 'losers' side.

The research findings have implications for future research and some extensions of the current work are indicated as follows. For example, what is the optimal combination of financial reforms that can lead to economic growth and financial development? In other words, as Bekaert and Harvey (2002, p. 441) suggest "we need a better understanding on the relation between the different reforms". What is the optimal level of securities market regulations that should be implemented in emerging markets? These are important policy issues with respect to legal and institutional environment in the emerging markets that needs further research. It will be worth examining that, what are the economic benefits of implementing global standards of regulations in these emerging markets? At present, local institutions are not considered stronger and competitive than their counterparts in the developed countries (Chang, 2005). The local institutions in the emerging markets are under pressure explicitly or implicitly to adopt global standards but it is not clear whether these global standards will be useful. For example, Bank of International Settlement style financial regulations emphasize the safety of corporate investment, borrowing and growth, and thus can be harmful for some developing countries which need more external finance for development and growth. The real impact of adoption of global standards can only be ascertained when it can be empirically shown that such institutions have led to superior economic performance in these emerging markets.

The normative issue of social welfare also needs more attention in the changing financial and institutional environment of the emerging markets. There are major implications of the deregulations in real and financial sector on the welfare that should not be sidelined by the policy makers (Bekaert and Harvey, 2002). For instance, Das and Mohapatra (2003) find that income inequality has increased after stock market liberalization in the emerging markets. In some Southeast Asian countries, the government control over financial markets produced negative externalities in the form of bankrupt state owned sector and highly exposed banks due to banking and currency crisis seen in recent times. As a result, governments have bailed out banks from national money, thus, reducing social welfare, in general. As the institutions in these emerging markets catch up with developed countries, it would be useful to examine the impact of institutional developments on the social welfare because when government interventions are lowered and financial markets start to devote more resources to ensure transparency and fairness, which reduce information and economic risk, then, social welfare should increase in these countries.

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