Financial Market Efficiency in a Corporate Crisis

The Case of Bridgestone / Firestone

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Aston University

October 2001

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Abstract

The continued interest in the field of Efficient Market Hypothesis has broadened and deepened the understanding of the modern financial mechanism, which have an ever-increasing popularity due to the increased levels of personal investors as well as new forms of institutional investors. The questions still looms as to whether there is any benefit in technical information provided by the vast array of professional advisors. This research tackles the scenario where the compound assumptions of the market model are tested to the limit. This scenario is that of a crisis phenomenon in which the human elements of market formulation reveals its underlying weakness which affects the systems which depend upon it.

The research scenario is that of the manufacturing fault on the Ford Explorer tires manufactured by Bridgestone/Firestone. The fault occurred in overseas markets first before reaching critical levels in the American domestic market. The period of denial and withdrawal of information lead to a prolonged drama. The market responded in its own way based on snippets of information to quantify the magnitude of the financial consequences to the firm in the long term well in advance of formal root cause analysis and financial notices.

The methodology of the research is to use the Market Model for testing the degree of market efficiency via cumulative excess returns over specified event windows. The data obtained spans a period of two years and thus more than one event window is considered and interpretation of the effects of different release reports are examined.

The results of the research revealed that events occurring outside the primary geographical of concern of the investors are not viewed as relevant information and thus the market is unreactive to these occurrences. This means that market efficiency is confined to information sources within First World events primarily until such times that it is viewed that outside events have direct implications in US.

The results revealed that the market was at least semi-strong efficient to the events as they reached critical levels within the US and thereafter. The predictive ability of the investor to interpret the value of information was shown to be accurate in most cases. The relevancy of rational behavior between investors was shown to be crucial to market efficiency and that in crisis periods, this assumption experienced relapses.

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Chapter I:

Introduction

Chapter I

1. Introduction

The efficient market hypothesis is one of the cornerstones of financial theory. Essentially, this theory states that the market prices of assets incorporate all existing information about the company and also other public and private information. The financial literature generally supports the hypothesis that the financial markets are efficient in the semi-strong form (Copeland, & Weston, 1998). However, there is never a definitive conclusion as to how efficient the market is as there are a lot of unanswered questions about how effective the procedures are to testing efficiency.

This research will look at the history and the development of the Market Efficiency Hypothesis and examine the limitation of the models used to test the market as well as the scenarios to which the market is found to exhibit non-efficiency. Our research will directly contribute to this field of research by examining a specific scenario, which may exhibit non-efficiency more than any other case scenario.

The Bridgestone- Firestone Corp. has recently passed through a major corporate crisis resulting in an extensive recall of its sold tires. This has obviously been a public relations and financial catastrophe for the firm. The firm did not willingly or fully accept the responsibility for the defective tires. Instead, the drama was played out over several months in which bits and pieces of information were released to the market. It was generally observed that the market did not have to wait for the information to be released to make its own assessment and prediction of the likely outcome and to incorporate that in the stock price. The extent to which the investors, as well as the potential investors interpreted the snippets of information will be examined. It would interesting if there was an identifiable learning curve for the investors to make sense of the unfolding drama. Such an investigation is considered to be out of the realms of this thesis as the focus is not on investors' strategies but rather the investor-market interaction.

The drama surrounding Firestone has required intervention by the Congressional Committees due to large numbers of reported deaths from tire failure. The consequent examination lead to private information been made available, which had been suppressed and maintained within the knowledge sphere of Ford and Firestone senior management. By retrospective analysis, the effect of such private knowledge on the share price allows testing of the more stringent form of market efficiency, namely the strong form efficiency. A history of the chronological events will be detailed in this report and used to classify different event periods to facilitate the examination of this multi-facet crisis.

1.2 Purpose of the study

The purpose of this study is to see if the market was on the whole efficient in incorporating this information or did it exhibit certain inefficiencies. The research aims to look at the different level of efficiency by examining the influence on the stock prices of the availability of past information, public information and private information. Each stage can be examined by setting up different event windows for each case of information release. This research aims not to be conclusive as the topic under study does not look at the many different companies, which participate in the market. However, our study should primarily contribute to the analysis of the performance of markets in response to crisis situations. Although much has already been written in relation to Firestone crisis, this study explores more in depth the consequence for the Market Efficiency Hypothesis.

The methodology employed is that which is standard to this field of research. However, in the light of possible limitations of the methodological approach to making valid conclusions requires that a proper examination of the assumptions and limitation of the methods that we use. The fundamental problem that is expected to be encountered is the level of surrounding information noise to identifying the effect of specific variables. This problem will be examined in the analysis as measuring the level of significance to the results obtained.

The data sought in the investigations of Firestone are primarily values that reflect the value of the companies' marketability. This is generally the stock market prices of the security under study. In the investigations of Bridgestone/Firestone, the source was that of the American Depository Receipts (ADR) which is of equivalent nature to the stock prices and does not alter the analysis as the market to which they are traded upon are the same as the convention stock market. The data was derived from standard and recognized information providers which are credible like DataStream. The period chosen for the collection of the data is that which covers sufficiently the event window period under study. As the nature of the study was of multiple period analysis, a formulation of categorized event windows allowed the segregated analysis of different events and hence to be able to draw conclusions on the hypothesis of efficient markets to the different stages of the crisis affecting Bridgestone/Firestone.

Statistical analysis and reiteration programs were performed on the E-View to derive the coefficients of the market model line of the securities performance with time. The data is analysed and using the limits of regression analysis to determine the predictive probabilities of the data to infer reasonable conclusions to the expected return figures. This is fundamental to the methodological approach in order to make any conclusion on the market efficiency of the stock market in the scenario of a crisis.

A discussion of the limitation of the experimental results is to be investigated in the course of the thesis and to the methods employed to reduce the impact that they may have on reducing the effectiveness of the conclusion. Further discussion of the limitations of the experimental results will be discussed later in the conclusion of this thesis.

1.3 A summary of the content of the different chapters:

Chapter II:

A discussion of the historical event leading up to the crisis of Firestone and different viewpoints of the cause of the unfolding crisis to reflect the different perception that different investor may have held based on the information released to the public primarily through the media. The inter-relationship between Ford and Firestone is discussed as one of the conclusions of our research is to reveal how the market responded to leaked information, the identification of a cover-up and to uncertainty of Ford/Firestone unprofessional response to the crisis. This information should be specifically targeted to other joint venture operations where the ultimate responsibilities to manufacturing faults are not clearly defined.

Chapter III:

This explores the theoretical underpinning of our thesis and the area to which the thesis seeks to contribute to. The nature of different markets and why they are deemed potentially as being efficient and how the interaction of information and investor make the market efficient will be discussed. The different measures of efficiency are defined as from the traditional viewpoint and their relevance to our research is explored.

Chapter IV:

This entails an overview of the research that has been carried out in the domain of study that this thesis has affinity with. The review is divided between the different levels of efficiency while are being investigated. This review of the current literature is informative in that it indicates problematic areas that one has to be concerned with in the experimental stage. It also highlights other variables with can interfere with the conclusions and hence conscious effort must be made to identify these variables and control their impact on the empirical investigations.

Chapter V:

This will outline the methodological approaches that can be employed in the research of 'Efficient Market Hypothesis' which have been derived from the theoretical basis of Efficient Market models. The models include their own assumptions and limitations and these have to be explored before any method is endorsed to determine the most suitable. The actual mathematical formulations are described in detail as well as the meanings of the specific terms contained in them, so that one is familiarized with the concepts prior to the analytical and conclusion chapters.

Chapter VI:

This details the actual sources of data and the analysis that is inferred from the obtained empirical data. This chapter covers the specific details to which the theory only alludes to in the previous chapters.

Chapter VII:

This is a short chapter detailing the conclusion that the analysis leads to and how the results can advise other companies in the future on their PR (Public Relations) strategies that they should choose to adopt in event of major manufacturing or servicing disaster. It will also summarize the drawbacks in making firm conclusions on the results based on the limitation of theory and the accuracy of our empirical data.

Chapter II:

History Of the Bridgestone/Firestone Crisis

Chapter II

2. History Of the Bridgestone/Firestone Crisis.

2.1 Nature of industry pressures:

Designing a tire is a long and onerous task as many factors are considered in the design of today's tires such as rolling resistance, overall fuel economy, braking traction and harshness/smoothness of the ride. Most car tires requirements are fairly standard and only when considering sport utility vehicles (SUVs) are development of the tire very consuming for the tire manufacturer. This is counter-balanced by the higher margins that can be charged.

Tire manufacturer have favoured the sport-utility demand as competitiveness in the market is dependent on access to growth markets to maintain or increase market share. The first Ford Explorer, which was a 4×4 off road design vehicle, was launched in 1991. The tire used had an aggressive tread pattern to cope with off road duties. The modification was made to the light truck radial tire design and to the shouldering to avoid excessive noise levels created by the tires.

Again, due to change in market taste, the redesigned Explorer altered to fit a more carlike front suspension to allow a smoother ride. This was striking a balance between the off road status plus the smoothness of urban riding. To meet this challenge, Ford required a modified tires which further reduced the harshness on the road. Firestone, achieved this by softening the area around the tread bead, which is close to the rim and also by changing the compound in the sub-tread to alter the rolling resistance felt by the tire (www.witiger.com/univ~of~toronto/MGCT44.htm)

Speculation has spread concerning the interplay of industry's competitive stance into the safety of the Firestone tires, specifically those manufactured in the Decatur Plant, Detroit, US which is a very old, not well maintained plant that also included old equipment. Furthermore the Decatur plant had experienced serious labour problems and strikes during 1994-96 and replacements workers were hired. Consequently, blame was put on

the replacement workers for the high number of defects on their manufactured tires. In addition, some dispute about whether the cost reduction lead to the Decatur plant cutting corners in material and assembly operations to save costs but newly manufactured tires were not safe due to narrow tread thickness (www.witiger.com/univ~of~toronto/MGCT4 4.htm).

On the other hand, an internal Ford e-mail produced as evidence in lawsuits against Ford showed that Ford engineers were worried about passing rollover tests as far back in 1989. Stability tests done showed that the Explorer had a higher risk of rollover when making sudden turns if the tires were inflated to 30 psi or higher. According to trial attorney, Tab Turner, Ford's concern about rollover caused them to recommend a lower tire pressure which contributed to tire failure. Moreover, Ian Jones, a vehicle dynamics engineer interviewed by CBS news reported that the design of the Ford Explorer contributed to its tendency to flip which ultimately lead to catastrophic deaths (Akron Beacon Journal, Oct., 11, 2000)

2.2 Quality testing of tires

Most tire makers perform a testing on tire performance either internally or contracted-out. The tests are not performed on specific cars as access to new models are available but are tested for general performance measures. The nature of such tests focus on the stress tolerance levels of material and design employed in the tire technology.

Independent laboratories such as Smithers Scientific Services Inc. performed a number of tests of tire designs such as tread wear, durability, load capacity and air retention. Durability of tires is determined by simulated experiments on tires, which lasts for days. Further on-road test are performed to measure performance under various weather conditions. This cumulates into performance expectation report on tire quality.

After this stage, the essentially take over the testing as the s do provide their model cars over to tire manufacturers for the tire to be tested on their particular model. It is the duty of the car manufacturer to test how the tire performs in concert with the rest of the vehicle. The testing includes driving the car around the test tracks, attaching sensors in the car to test the noise the tire makes, making abrupt stops at high speeds to measure how the tire holds up, and seeing how the car grips the road while zig-zagging around cones. From the results of these tests, the carmakers will request the tire makers to tweak the design. Ultimately, the carmakers have the last word on how the tire is used. It is the s that decides what the tire pressure should be.

Tire manufacturers have complained that due to the increasing demands that customers put on the usage of the vehicles (weighing down the car with family and heavy gear) that they are being pushed to the limit by the car maker pricing demands and the customers' safety. Continuous changes to the manufacturing process of a largely capital intensive industry has caused compromises to be made in types of materials used and types of designs.

2.3 US Government's Automotive Regulatory laws

The safety laws that are legally enforceable are 30 years old and such regulation are redundant in today's car models. Existing rules about roof standard are virtually useless in protecting occupants in rollover cases due to different speeds that cars operate today (The New York Times, Sep. 4, 2000).

Also the penalties for regulatory breaches are not substantial enough to have any significant influence on large automotive manufacturers. Maximum penalties for refusal to make recall at the appropriate time is \$925,000 and for withholding information to regulators, only \$1,000. Despite recent proposals to the Congress to increase penalties, the amount is not alarming to large manufacturers like Ford or Firestone (The New York Times 4 Sep 2000)

It is when the regulations of the automobile safety are hampered or lax, that the public pays the ultimate price. There are different reasons for the incompetence of these regulatory bodies. First that the auto industry has resisted proposal by the Consumers and official organizations on certain safety measures as it considers the costs attached to such intervention. Secondly, in 1981, NHTSA (National Highway Traffic Safety Administration) budget was cut by 49 % and according to John Martin of ABC news, since then, Republican congresses have continued to sabotage the agency. It has only 42 employees, just 15 to 20 of whom are investigators (The Washington Monthly, Oct. 2000)

Whilst, the legal aspects are of not primary concern to us, it is the lack of subpoena powers to prevent Ford and Firestone from withholding information that has lead to the gradual leaking of information which allows the study of the efficient market hypothesis.

Tab	le 2.1 History of Ford and F	irestone	
	FORD	FIRESTONE	
Founded	1903, Detroit, Michigan	The Firestone tire & Rubber Company in August 1900	
Original Product	Automobiles	Carriage tires	
Current products	Automobiles (70types), Financing and Servicing of Automobiles	Industrial products, Building products, Fibres and Textiles, Polymers, as well as tires	
Number of employees	Not documented	45,000 throughout America	
Milestones and events	*Model T was introduced in 1908 *Henry Ford amazed the world with 5\$ a day salary in 1914 *Ford Motor Company became	 * Tires chosen by Henry Ford in 1906 * Shorijo Ishibashi founds Bridgestone Tire Co. in 1931 * In 1988, Bridgestone purchases Firestone 	

2.4 Nature of Ford Motors and Bridgestone/Firestone relationship

Source: www.businesshistory.net/bridgeFire.html

Table 2.1 shows some major milestones in the history of Ford and Firestone and the relationship between them since 1900. Ford Motor company, a major player in the automotive manufacturing industry and a stalwart pillar and Wall Street darling have had 100 years history with Firestone whose brand name has been so cherished for its quality and superior tire technology (<u>www.businesshistory.net/bridgeFire.html</u>). The joint venture that existed had Firestone as the predominant supplier of all Ford vehicles with Goodyear having only slice of the action (www.businesshistory.net/bridgeFire.html)

The nature of Ford- Firestone relationship was a factor in the failure of recognizing responsibility. Often hand in hand with the sharing of risk and benefits, it demands to share the blame. It was this paralysis in either company acknowledging the responsibility that created such delays compared to spectator's expectations. (www.businesshistory.net/bridgeFire.html)

The paralysis was partially resolved by the CEO of Ford, Jacques Nasser, when he announced that he would seize control of the morass of unanalysed Firestone safety data to diagnose the root of the problem. This lead to Ford action to recall all tires in US and in 15 foreign countries in the previous year. (www.businesshistory.net/bridgeFire.html)

2.4 Overseas market where the crisis all began

Gulf coast countries and Southeast Asia have remained an attractive market for U.S. automotive manufacturers. According to an internal Ford memo dated July 1999, several incidents of tire tread separation from the main carcass of the tire had been reported in the Gulf region. All such separations occurred on vehicles built during 1996-97, and tires manufactured during October 1995--February 1997 (Wall Street Journal, September 1, 2000).

2.4.1 Gulf Coast

The first complaint about tires on Explorers surfaced in Saudi Arabia in 1997. Upon inspection of the tires, Firestone's verdict was unanimous and they related the problem to high temperatures and desert driving practices.

As additional similar tragic accidents were happening elsewhere in other Gulf countries, Ford and Firestone met on March 1999 whereby they discussed a program to install higher grade tires on the new Explorers being shipped to Saudi Arabia and to offer recent buyers the option of upgrading their original tires. However, Firestone had legal reservations about any plans to notify customers and offer them this option. Even within Ford there was reluctance to send a letter to owners of Ford Explorers for fear of the cost of replacement (Wall Street Journal, September 1, 2000).

A lawsuit was filed in May 1999 by Mr. Amaan Sadat against Haji Husein Alireza, a Ford dealer in Saudi Arabia, and dealers in the Gulf countries voiced that the OEM tires on the vehicle were "totally unsuitable for off-road driving" (Wall Street Journal, September 1, 2000).

A survey team from Ford and Firestone visited Saudi Arabia, Qatar and Oman during June 1999; it concluded that the original equipment designed for North America did not address requirements of this region. Ford acted on August 1999 by replacing the original tires. Following the Gulf coast countries, Ford decided in February 2000 to recall tires in Southeast Asia *Thailand and Malaysia* (Wall Street Journal, September 1, 2000)

2.4.2 South America

The problems experienced in Saudi Arabia were repeated in the same year (1998) in Venezuela.But it was in July 1999 that Ford and Firestone decided to send a survey team to Venezuela. The team found that more than 18% of the tires had inflation below Ford specified recommendations. Consequently they instituted a program to educate both dealers and customers on the correct usage and maintenance of the tires (Wall Street Journal, September 15, 2000).

In January 1999, Ford asked Firestone to design tires with a nylon cap ply, a safety feature often used in Europe and Latin America to make tires more durable. As tire failures continued to escalate in Venezuela, Ford initiated its own investigation at the

beginning of 2000. Ford claimed that more than half of the tires involved lacked the nylon layer. Firestone denied the charges and refused to replace the tires without Ford also correcting the Explorer's suspension. The two sides continued their fierce battling to avoid legal liability. Eventually, Firestone officials admitted that the company had mislabelled the tires of nine models made in Valencia, Spain and Venezuela. Consumers were then lead to believe that tires included the cap ply when some them did not.

Hector Rodriguez, purchasing manager for Ford in Venezuela said a company investigation found that 14 % of Firestone's tires showed signs of treads separation: "this is a number 1,000 times higher than in the U.S." tires (Wall Street Journal, September 15, 2000). Ford recalled in May 2000 all Explores sold in Venezuela – which was a whole TWO YEARS after discovering the tire were faulty.

The Venezuelan consumer protection agency, INDECU, started their investigations in August 2000 and they allegedly discovered that both Ford and Firestone knew about the problem but kept it under absolute secrecy. As a result, INDECU asked for filing criminal charges against Ford and Firestone for misleading consumers about their products, which had fatal consequences. Both accused companies denied the charges. The situation was not just confined to Venezuela as Ford also led to a voluntary recall of Firestone tires on the 8,500 Explorers and F-150 Pick-up Trucks sold in Columbia in September 2000. Ford did not notify U.S. regulators, NHTSA, about their overseas recalls. It argued that the company was under no legal obligation. When the Congress Committee reviewed the case, the U.S. Secretary disagreed with the judgement made and sought specific legislative authority to compel in future such reporting by automotive manufacturers. Despite not having legislative enforcing powers, there was obvious neglect of the customers safety in making no such notification (Wall Street Journal, September 29, 2000).

2.5 Nature of disclosure of crises

Ford and Firestone disagreed as to how to break the news. Firestone wanted to read a joint briefing statement with no questions taken. Ford disagreed as considered that answering questions was important PR strategy.

Corporates seem to be slow to learn from the mistakes of the past especially when dealing with crises. Ford has had significantly improved its public relations execution since 1966 when there was an incidence in which 3 girls were killed by leaking gas in a Ford model. Criticism was aimed at Ford this time round, for admitting the problem at the end of August 2000 when prompt admission could have been made at beginning of the month when the recall was made.

The crisis highlighted a difference in how different cultures handle the same crisis. In Japan, crises are handled quietly and companies recede into a quiet period as a form of punishment. In America, investigators on behalf of the press trumpet every suspected cover up or corporate failings (Chicago Sun-Times, August 25, 2000).

Both Ford and Firestone were chastised by the Congressional committees that investigated the crisis for their lack of appropriate and timely disclosure. The problems of disclosure issues arise from the dilemma that corporate decision makers find themselves in. The two departments of advisors, which Firestone was influenced by, were the attorneys and the public relations staff. Attorneys suggest that as little as possible be said about a fault that might later be used as court evidence and for no responsibility to be publicly expressed. However the advise of public relations staff is to take responsibility as soon as possible for the fault even if it has not been 100% determined that you are the guilty party. This is because research shows that when recalls are performed effectively, the story quickly disappears from the public and media consciousness. Accusing others is a fine legal defense, but it does not typically play well in the court of public opinion.

2.6 History repeats itself

Anyone investigating an explanation for the dismal results of the Firestone handling of the recall of tires would notice a marked resemblance with the Firestone 1978 recall. It seems that mistakes made back then were not learnt and only repeating themselves. The basic axiom of recall policy is the necessity to react as quickly as possible in identifying the problem and implementing recall plans. The importance of telling the truth of the matter to the public has not been a policy of Firestone and has caused huge damage to their public image. Research has shown that in the 1978 recall, Firestone were angered by media reports that their Firestone 500 radial tires had an adjustment failure rate of 8% when they privately were aware that it was even greater at 17.5% (Cincinnati Nov, 2000).

Similar to the 2000 recall, in 1978, Firestone's first reaction was to blame the problem of the '500' tire on the consumer abuse of tires, through incorrect inflation of pressure. Union problems, management turnover, and the then recent tire industry conversion to radial tires were also blamed (Feinstein S.A, Nov. 6, 1978).

The importance of acting voluntarily was another lesson not learnt from 1978. Back in 1978, when the NHTSA requested a recall, Firestone refused and attempted to censor the NHTSA by suppressing certain data relevant to the investigation (Cincinnati Nov, 2000).

At the time federal regulators fined Firestone \$ 500,000 for concealing the safety problems. Firestone nearly went bankrupt after the recall and was subsequently bought by Bridgestone in1988. A generation later, again Firestone refused an initial recall request by the NHTSA and only later reluctantly issued a recall.

2.7 Criminal and Civil Action taken

As the number of deaths by accident in Explorer vehicles increased to as level above the normal accident death led in the US, the US Attorney General of the Justice Department, Janet Reno commenced investigations into criminal and civil action to be taken against the companies if failure to consider safety as a priority could be established. Lawmakers

have been advancing a bill that requires companies to provide more information to federal regulators about possible defects and toughen penalties for skirting recall laws. Thanks to the new law, The National Highway Traffic Safety Administration (NHTSA) now can mandate reporting on an international basis as well as a call to stricter tire and vehicle rollover standards (Chicago Tribune, Aug 10, 2000)

Investigations revolved around what precautions Ford and Firestone made, if any, about tires when a dangerous pattern of tread separation had been identified due to deaths reported overseas. Despite the official claim that Ford and Firestone had only begun investigating into a pattern of tread separation in July 2000, unofficial internal documents revealed that both companies had been aware and even monitoring the trend for a number of years (www.abcnews.go.com/sections/us/DailyNews/firestone001017.html).

As already seen, there had been clear evidence of such private information being held. One example is the case of the Ford dealer in Saudi Arabia which had languished since 1997. Evidence that Ford and Firestone had previously considered the consequences of reporting to US regulators was identified in an internal Ford memo from the Legal department advising in against such actions that would require disclosure to US safety officials as the same product was being sold in US as in the Saudi Arabia.

2.8 Consequences

One of the lasting consequences to Firestone of its ineffective approach to the recall of its tires has been its diminished corporate credibility. Any reduction in corporate credibility eventually translates in concrete terms that directors pay more attention to such factors as reduced sales, market share, profit and stock market capitalization.

Studies show a strong link between better shareholder returns and companies having superior stakeholder practices. The best practices include a focus on clear accountability and related rewards, a collegial and flexible workplace, and integrity of communications.

The cornerstone of an ethical corporate culture is an appropriate code of ethics or conduct. Intangible values like trust are critically important in today's global and technology-oriented environment. But the code has to be understood throughout the organization and not just be a slogan (www.kwtv.com/investigators/consumer/CW9 700V2.htm).

Surveys by CNW Marketing Research have shown that more buyers are shunning the Firestone tires for Goodyear and Michelin and other brands. As a result of the recall and the bad publicity of the company, only 4% of shoppers would consider a Firestone tire compared previous figures of 21%. The impact is that there has been a shift in Firestone future market share as greater demand has been experienced for tires made by main two rivals Michelin and Goodyear. The impact on the tire industry is that there is greater awareness amongst customer of the tire maintenance and safety.

The shift has now been to focus on tires, which are specifically designed for sport utility vehicles such as Michelin's Cross Terrain tire, rather than readjusting tires used for other make of vehicles (Montvale, Oct 2000)

With a loss of \$10 billion on the stock value, and loss of a reputable brand name, recovery of its market share is unlikely. Firestone had been in a fortunate position prior to the recall as it had caught up with Michelin as the No. 2 tire supplier and recently acquired rights to use tires in the Indy car racing. Now the consequences might entail the abandoning of the brand name completely. As one CNW market researcher has stated " Probably the best thing that Bridgestone can do with the Firestone name is to put it under a rock and forget about it" (The New York Times, Sep 17, 2000)

But the dust has not settled by any means. Ford and Firestone remain the targets of a cascading number of lawsuits that will take years and billions of dollars to settle (The New York Times, Sep 17, 2000).

The lesson that Firestone failed to learn in 1978 and accept from its PR advisor is that 'Perception is more powerful than reality' (Susan Bixler, President of Professional Image Consulting, Detroit, Dec 2000)

Five lessons to be learned from the Firestone/Ford Crisis:

- The CEO is both symbol and substance, the public's accountability falls at his feet
- Accept responsibility with contrition---The public is enormously forgiving
- Good business decisions mean seizing the knowledge base to diagnose the root of the problem.
- Speed of response is essential.
- Lead the critics, don't follow the critics

2.9 Timeline of key events in the history of Ford /Firestone:

2.9.1 1975 - JULY 2000:

1977: The NHTSA orders Firestone to recall 400,000 tires (US Today December 26, 2000).

1978: Congress blames Firestone for 34 deaths. Firestone argues the problem due to consumer ignorance and under-inflation (http://www.usatoday.com/money/consumer/ autos/mauto976.htm).

1988: Japanese tire maker Bridgestone buys Firestone (http://www.uswa.org/news/bridgestone.html).

1992: Firestone and Ford begin investigation for continuing tread separation complaints (St. Petersburg Times, May 20, 2001)

1997-98: Ford receives reports of tread separation on Explorers in Saudi Arabia (http://www.house.gov/commerce_democrats/tirerecall/summ.htm).

July 1998: Federal government was notified of 21 Firestone tread failures, 14 on Explorers (St. Petersburg Times, May 20, 2001).

12 March 1999: Internal Ford memo reveals that Firestone has strong reservations about recall of 16 in Wilderness tires in Saudi Arabia between it would require notification to the US NHTSA

August 1999: Ford unilaterally decides to replace Firestone tires on 6800 Explorers and Mercury Mountaineers SUVs in Saudi Arabia and in the Gulf cooperative states. In USA, warranty claims increasing on the Explorer's tires.(<u>http://www.fordexplorerrollovers</u>.com /time_line.htm)

Feb 2000: Houston television station KHOU announces problems with the Ford Explorer tires by reporting The Human Tragedy of the Jackson family's accident. Ford replaces Firestone tires in Malaysia and Thailand. Firestone is opposed (<u>http://www.columbia</u>. edu/cu/news/01/01/duPontForum01.html).

May 2000: NHTSA opens preliminary investigation into Firestone tread separations. The agency has 90 complaints and 4 deaths. It issued a letter to Firestone and Ford requesting information about the high incidence of tire failure on Ford Explorer vehicles and for more information about the overseas recalls of Firestone tires. Ford also replaces some Firestones tires in Venezuela. Firestone is opposed(<u>http://www.tire-defects.com</u>/tire_defe ct_news/Sept5.htm).

July 2000: Ford analysis of data on tire failure reveals that 15" ATX and ATX II models and Wilderness AT tires had high failure rates. It revealed that most deaths resulted from the toppling of the Ford Explorer when the tire had a blow out. (http://www.consumerreports.org/main/detail.jsp?CONTENT%3C%3Ecnt_id=18671&F OLDER%3C%3Efolder_id=18151).

2.9.2 AUGUST 2000:

"FIRESTONE CRISIS BLOW UP"

9 Aug 2000: 9 months after Ford started recalling tires overseas, it announced that Firestone will recall 6.5 million tires of P235/75R15 size ATX, ATX II and Wilderness AT tires, the majority produced at the Decatur, Illinois plant (Atlanta Business Chronicle Sept 8, 2000).

This was announced on the background of 88 identified traffic deaths resulting from the NHTSA investigations started 3 months ago.

The announced recall was staged in 3 phases, as limited supplies of replacement tires were available.

Released statistics that number of accidents per million for P235/75R15 was higher than other sizes in the same line. Majority of accident occurred in four states, which were in hot climates (Arizona, California, Florida and Texas).

21 Aug 2000: Ford suspends production at three plants.

Firestone increased production by 7,000 tires daily and airlifted thousands of tires to U.S. from its plants in Japan to help fill the replacement demand created by the recall.

Jacques Nasser begins prime-time TV ads to reassure customers (http://mirror.bridgestone-firestone.com)

28 Aug 2000: The first case to be filed against Firestone by a lawyer representing the relatives of Patricio and Nidia Leal who died in May 1999. The Texan judge ordered the appearance of the CEO of Bridgestone, Masatoshi Ono. Whilst this is the first lawsuit to arise after the tire recall, there have been more than 100 lawsuits filed against the tire manufacturers before the tire recall (www.newstimes.com/archive2000/aug23/nah.htm) 30 Aug 2000: Shares in Firestone plunged 4.5 % in Tokyo meanwhile Ford slipped 7/16 to trade at \$25-11/16 on the New York stock exchange (www.reporternews.com).

2.9.3 SEPTEMBER 2000

4 Sept 2000: Firestone recalls 62,000 AT tires in Venezuela (<u>http://www.sptimes.com/</u> News/webspecials/firestone/timeline.shtml)

6 Sept 2000: Congress opens hearings on the case Ford/Firestone .CEO Jacques Nasser insists his Ford company is not to be blamed and claimed;" *This is a tire issue, not a vehicle issue*". He took every opportunity to point fingers at Firestone and made it clear that Ford was reconsidering its 100-year old relationship with Firestone. (http://www.sptimes.com/News/webspecials/firestone/timeline.shtml)

7 Sept 2000: A Senate Bill is introduced allowing second –degree murder charges for executives withholding information about defective products that cause death. (http://www.sptimes.com/News/webspecials/firestone/timeline.shtml)

11 Sept 2000: Firestones first press conference since the 9th August announced recall of 6.5m tires (www.tiredefects.com/tire_defect_news/Aug30a.htm). President of Bridgestone Corp, Yoichiro Kaizaki made admissions that greater quality control should have been exercised in its US operations. Claims that Ford was forced to recall all Explorers due to Bridgestone inaction and failure to accept responsibility was denied.

14 Sept 2000 Tread separation occurred on a GMC Suburban, which utilized the Firestone tires. However the tires concerned is similar to the recalled tires but of a slightly different size and hence not recalled. The attorney for the claimant, Greg Barnhart of West Palm Beach said that this company was aware of similar complaints about the Suburban tires and so were negligent of failing to recall these particular tires (www.detroitnews.com/2000/autos/0009/11/autos-118157.htm).

18 Sept 2000 Firestone's PR company FleishmanHillard quit after the refusal of Firestone to extend the tire recall to a further 1.4 million tires. They have reported that they are tired of clashing with corporate lawyers and have decided that they are of no further service to Firestone.

The relevance being that the crucial decision to not consider the investors' perception of Firestone in the crisis ultimately lead to the damage created to the brand name. Had PR issues taken more seriously, history may have unfolded a different end.

To date, Firestone has spent \$350 million on cost to cover tire recall. It is expected there will be law suits cost of the order of billions of dollars (<u>http://www.usatoday.com</u>/money/ consumer/autos/mauto824.htm).

27 Sept 2000: Saudi Arabia has banned the import of vehicles equipped with Firestone tires because of fatal accidents linked to them in the U.S. and overseas (101 deaths in U.S. and 46 in Venezuela). The tire maker believes the action may violate international trade agreements (www.sptimes.com).

2.9.4 OCTOBER 2000

10 Oct 2000: Mr. Ono steps down as CEO of Firestone and the Executive Vice president John Lampe takes the job.

16 Oct 2000: US regulators report that death count has increased to 119 since investigation began at recall date. Experts estimate that final death count will be around 250.Ford official announce that the 15 inch ATX and ATX-II had defect rate of 241 tires per million compared to 2.3 tires per million in other makes. Firestone has agreed to replace, free of charge, an additional 1.4 million tires beyond the 6.5 million covered by the recall as part of multi-state agreement .

(www.abcnews.go.com/sections/business/DailyNews/Firestone000927.html).

17 Oct 2000: Firestone lays off 450 workers and announces Production Adjustment Plan In October 2000,sales of Explorer were down 16% compared to 1999.according to CNW the decline was based purely on the recall (Firestone Tire Recall, Legal Information Centre)

2.9.5 NOV-DEC 2000:

10 November 2000: Firestone reported a 40% decline in the U.S. replacement tire sales during September – October as compared to 1999.

6 Dec 2000: Further investigation in the extent of the tire failure as main cause of traffic accidents in Ford Explorer is 148 deaths and over 500 serious injuries. Firestone recalled 8,000 tires made in Mexico, Firestone says it will loose \$ 750-million by Dec.31 (www.abcnews.go.com/sections/business/DailyNews/Firestone000927.html).

2.9.6 2001 ONWARDS:

15 Jan 2001: Donna Bailey's case in Texas (accident with Explorer not equipped with Firestone tires) leads Ford to enter an intense public interrogation over the extent to which flaws in the Explorer's design contributed to deaths and injuries. At a time where

Ford had hoped their efficient, well- publicized recall efforts would enable them to put the tire crisis behind them, particularly as they prepare to introduce the new redesigned 2002 Explorer in February 2001 (Associated press, Nov 1, 2000).

Feb 2001: Firestone announces the completion of the independent expert's analysis. Dr Govindjee's findings independently confirm that there was no single casual factor. It is a combination of faulty design, manufacturing processes at Decatur plant and outside factors such as hot weather and over-weight vehicles (New York Times, Jan 15, 2001).

NHTSA reports of Firestone tire toll rises to 174 fatalities and more than 700 injuries but none of accidents occurred after August recall (Corporate News, Feb 2001).

21 May 2001: the new CEO of Firestone, John Lampe, declared formal divorce proceeding of the Ford- Firestone 100 year relationship on the basis of failure to maintain trust and mutual respect with business partners.

June 2001: Firestone has replaced about 6.3 million of the 6.5 million tires recalled last August and the company says it expects to conclude the recall project by Aug 29 (Akron Beacon Journal, Feb 7, 2001).

Firestone officials intend to close the Decatur III, plant by Dec 31. Workers at the plant reacted with bitter suspicion that they were being made scapegoats (Nashville Business Journal, June 25, 2001).

October 2001: At least 203 deaths and more than 700 injuries have been linked to Firestone tire failures in the U.S., many involved rollovers of the Ford Explorers (Associated Press, June 27, 2001).

Chapter III:

Theory of Efficient Markets

Chapter III

3. Theory of Efficient Markets

3.1 Introduction

The events surrounding the Firestone crisis provide an interesting example for the research of market efficiency of the American stock market to its ability to respond in corporate crisis situations. In order to make a detailed study of the market efficiency, the focus of our attention in this chapter is on the theoretical side of what market efficiency means.

It is our purpose to define what market efficiency is and the means for it to be tested. Also the type of market we are mainly concerned with is that of the common stock markets, this is because it is the stock market which has greater potential to be efficient due the nature of its setup. Other types of markets, which are not of concern, are bond markets and commodities markets.

An initial definition is that an efficient market is one in which its security prices accurately reflect information, and investors cannot use this information to obtain consistently higher returns than justified by investment's risk Fama (1970). This definition has been used as a hypothesis to test against actual market prices

3.2 Economics

The equilibrium price of any good or service in a perfectly competitive market where neither buyers nor customers have any advantageous power over the market mechanisms is set where the aggregate supply and aggregate demand equated to one another. This is a market determination of the consensus price as to the product's financial worth. It is thus a summation of the different perceptions of each contributor to the market whilst no individual contributor having an overriding influence. A new piece of information, which affects the contributors' perception of the value of the product, causing an adjustment in the aggregate demand and hence affects the equilibrium price. This rate of change in equilibrium price should be proportional to the rate of change in the perceptions of the buyers and sellers in the market. Several factors will affect the rate of change: the access to information and interpretation of the new information.

If we consider an idealized market where information is instantaneously available and interpretation of new information requires no period of interpretation before it is digested and acted upon by the market members, then it would said to reflect available information and no analysis would produce consistently yield above-normal returns. This is description attributed to the modern stock market and hence formulates a hypothesis known as *efficient market hypothesis* (EMH).

3.3 Historical framework of theories on market efficiency

It was initially believed that the stock prices were more affected by emotion rather than any tangible financial information or factor. Hence there was no drive to develop such understanding of stock prices in relation to economical factors. Prevailing theories of this time was Louis Bachelier who in 1900 developed what was known as the "Fair Game Model". The characteristic feature of this model was that the current security price was an unbiased estimate of its future price. A reinforcement of these ideas was the "Random Walk" which describes the return of each time period as independent of the return in the previous period.

The investigation carried by Osborne (1959), a physicist compared the lateral distribution displayed by dust particles in a beaker of water under observation by a microscope in the direction and length maintained in a particular direction to the direction changes in daily security prices and length of particular trends. This comparison of the random motion of molecules known as Brownian motion to stock price fluctuation revealed remarkable similarity. Analyst viewed this as indication of the irrationality of the market. Such

irrationality meant that the analysis of prices was fruitless. Fama (1970) took the view that the appearance of random walk fluctuation was a result of a fully efficient market in this the interaction of many investors acting in a rational manner to new pieces of information creates a random walk distribution.

This was the stage in which serious research began investigating on the central question of the efficiency of the market. In order to test the hypothesis (EMH), a discovery into new research methods was developed in order to perform experiments.

3.4 Nature of the markets

As stated in the introduction, the main arena to test market efficiency is the common stock market because of its particular characteristics, which make them more efficient than most other markets such as foreign bonds. Examples of common stock markets are London Stock Exchange, AIM, NASDAQ, New York Stock Exchange. Due to the organized and openness of these markets, they allow for rapid execution of sale and purchase orders and immediate response to new information.

Participators in the market are individuals, corporations and institutional investors such as Pensions Fund and Unit Trust managers. Each has its sole motive to increase wealth of their portfolios and is sensitive to fluctuation in prices and hence highly reactive to new information. This competitive force between different investors causes prices to adjust rapidly to reflect the financial significance of newly available information.

The existence of several competing brokerages which creates efficient processing of orders and a rapid, independent reporting system of new information such financial press and satellite channels allows wide distribution system for release of new information. Such factors allow the interactions of information and participators affecting the market price to be efficient.

3.5 Sources of information

The most publicized information sources are the release of interim and annual accounting statements. The value of these reports is that investors use them as basis of estimating future stock prices and future dividends to be received by the investor.

Such reports require compulsory release as required by relevant Stock Exchange regulations and also are regulated by the statutory audit report, which makes independent critical investigation of the content's integrity. These reports have been heavily used as basis to test the market efficiency in relation to the price shift of the year-end results. These reports are useful in that they require compulsory disclosure of internal information, which would reasonably be expected to affect the view of investors' decisions.

There are other sources of information such as newspaper reports on new contracts and economic factors affecting particular or general industries have also acted as information to which research has been used to test market efficiency.

Markets have often had illogical responses to such information based on the fact that interpretation is a skill not always evenly distributable to all investors. Especially observable in the release of annual reports where cash flow statements and disclosure of contingent provisions and future commitments, where investors do not appreciate the significance on current and future trading of the companies. Despite the efforts of different Accounting Standards Boards to make the implications of companies actions more appreciated, the added complexity has confused investors' interpretations. This is a significant factor, which affects market efficiency, as the requirement for all participators is to have all knowledge is a fundamental aspect of perfect efficient market. Restricted access knowledge weakens the ultimate efficiency.

3.6 Limitations of market efficiency theory

Ball & Brown (1969) explored the anomalies that limit the research and the positive conclusion that can be made from research. He categorized the anomalies in 3 sections.

- Empirical anomalies: this can be the over or under reaction observed to a new piece of information due to abnormal reactions
- 2) Defects in Efficiency concept: the basic idea is that we assume that the information costs to be zero when in fact they are positive. Reasons for assuming it is zero is that it is a simplification of the fact we do not know what price to attach to the information Grossman and Stiglitz (1980). Also, if an analyst was to observe that an abnormal piece of information existed to him, he would be more likely to trade on this information to make an abnormal profit. If he is found to have published the information, it means that the benefit to him is not significant enough to justify the cost of trading. This entails that measurement of true efficiency requires analysis of the expected gain from producing and trading on private information.
- 3) Problems in testing efficiency as a model of stock market: the problem of drawing conclusion on the market efficiency when the model used is being simultaneously tested for its applicability.

3.7 Factors indicating non-efficiency

It would be presumed that the market is inefficient by noticing the size of accountancy firms whose works involves extensive review of past data to provide credible qualified opinion on the company's state of affairs. If efficiency did exist, then there is no benefit for such premiums to be paid to such firms if there is no additional financial value in the annual reports for the shareholders, to whom they report.

As already stated the annual reports, which include a vast amount of information, are often too sophisticated for the average individual investor. The consequence is that poor decisions are made in response to their ill-prepared perception of the annual reports, which create anomalies in the market price on the true reflection of the securities market valuation.
The occurrences of unusual events cause situations where investors are uncertain as to how to react. An example of such, is provided by the impact of the oil embargo on the economy and, indirectly, on companies' performance. The ability of the market to learn from past scenarios has been noted. An example of this learning subsequent embargos created faster reaction to events than observed in previous embargo scenarios.

The assumption that all investors have all knowledge is simply unrealistic as information sources such as financial press releases are not always read by all investors. Despite the public nature of the information, it is not instantaneously read and acted upon by individuals as investors have other matters to attend to. The consequential time delay for complete adjustment to reflect new information is a factor that leads to inefficiency.

Some information is not always public knowledge immediately and can be accessed by a minority of individuals for an upfront fee payment. Such privileges distort the period over which the shift is made. Observers of the changing price can speculate to the nature of new information, which has restricted access due to the partial change in security's price. Their reaction based possible inferences are not necessarily accurately founded and create artificial expectations of company's future value in use.

This was illustrated by the over confidence on new start-up e-commerce businesses which were making massive losses and poor cash inflows. Investors followed the rising market price, which was not substantiated, on actual tangible information.

The adverse factors mentioned above may not prove that the market is inefficient. Reasons being are that the above research assumed a scenario of no transaction costs whilst trading or whilst purchasing information for decision-making. Hence there may still be sufficient conditions for an efficient market to exist. For example, the case where the transaction costs for buying and selling shares is non-zero does not immediately imply that the market cannot be efficient. It merely suggests that the price changes will not occur unless the new price differs from the current one by an amount greater than the transaction costs.

3.8 Different levels of market efficiency

After having defined the meaning of market efficiency, it becomes essential to define the different levels of market efficiency. The reasons why different levels of market efficiency exist is a direct result of the fact that we have different types of information that can be used to test efficiency. The types of information fall into 3 categories:

- 1. Past information
- 2. All public available information, including projections of the company's prospects and general economic conditions.
- 3. Any information that is available whether it be public or private.

These different types of information create three levels of market efficiency, which are appropriate called: weak, semi-strong and strong. These three forms of efficiency are not independent of one another. As the market to be efficient in the semi-strong sense, it must also be efficient in the weak sense because if the price movements follow a predictable path past information is not incorporated in the current price, then the reaction by investors to published information must also be slow in order to allow profits to be exploited.

3.8.1 Weak efficiency

The market is considered to be weak efficient if the share price reflects all the information received in the past. This means that any financial value in past information has been fully recognized. Price movements are in effect totally independent of the previous movements implying that charting and technical strategies are of no use. These techniques attempt to search for patterns or irregularities in the past prices in order to forecast future prices. The rationale for such investment strategies is wholly unfounded. Numerous studies have revealed that a child selecting shares to buy by throwing darts at the Wall Street Journal are equally successful in increase their portfolio rather than specialist market predictors. This level of market efficiency that already found support

before it was defined in the research by Bachelier (1900) who realized that the prices of commodities were like a random walk.

3.8.2 Semi-strong efficiency

The definition of a semi-strong efficient market is that prices of securities reflect all publicly available information about the companies. The types of publicly available information concerned here are earning reports, annual reports, analyst's forecasts and any news announcement made by the firm via newspapers or other mediums.

The semi-strong market efficiency is of particular interest to the accountancy profession because accounting information is generally made publicly available via annual reports and is normally the primary data source for security analysis. The conclusion for analysts if the markets are semi-strong efficient is that no amount of analysis will be able to create abnormal profits as the share price already fully reflects the financial value of the reports.

The rational for the mechanism which could lead to the market fully reflecting the financial value of any report before it has had time to be analyzed is the competitive effect of many individuals working to make abnormal profit before the opportunity period ceases. This paradox on how the mechanism that create efficiency is based upon was summarized by Lorie and Hamilton (1973).

3.8.3 Strong form efficiency

The case for the market being efficient in the strong form is the most comprehensive of all the levels as it presumes that the market is efficient in the weak and semi-strong form as well as in the strong form. Under this category, the market is considered to impound into the security prices both public and private information. Examples of holders of private information are managers and their associates who could attain for themselves above normal profits. The strong form is more concerned about the disclosure efficiency of the information market rather than the pricing efficiency of the market. To most researchers, this form of market efficiency is hard to accept as it entails that securities prices reflect and incorporate information before it has been published.

There are possible mechanisms by which markets could be observed to exhibit this extreme form of efficiency. If there exist significant competition between a number of privately informed investors, there might be sufficient activity to reflect the hidden information in the share price. Non-informed investors may infer from rising prices that good news has been released to privately informed investors and hence trade on the rumor hence cause the security to fully reflect the private information. This is referred to as the *rational expectations theory* Suzuki (1991).

Examples of individuals possessing inside information are for example corporate insiders who have prior knowledge of earnings, new technological breakthroughs, management changes and any pending takeover bids. Most modern economies have facilities in place to require individuals who possess a material interest in the profitability of a quoted company to report their transactions to a governing body. In today's electronic age, hidden transactions are rare as all transactions are recorded as processed.

Chapter IV

Literature Review

Chapter IV

4. Literature Review

4.1 Introduction

Since the inception of the efficient stock market theory by Eugene Fama (1970), there has been much research in this field and it is ranked amongst one of the most interesting fields of research in economics. Fama set forward a hypothesis, which in the minds of famous economists, such as Friedman (1986), was dismissed as an idea more akin to religious faith rather than a scientific insight. Others, such as Ball and Brown (1968), considered it to be an initial building block and hence took the challenge to test the hypothesis despite the perception of most economists at the time that the idea of modelling the stock market in rational economic terms was academic heresy.

The first initial inspiration that such a search for an economic model to explain the phenomenon of stock market was a statistician, Roberts (1959). As science had developed a statistical model for the random motion of molecules, then there too might be economic laws underlying the apparent randomness of the stock prices. Roberts (1959) connected the idea that there must be a rational foundation to the random walk process in order for it to maintain its consistent randomness.

"If the stock market behaved like a mechanically perfect roulette wheel, people would notice the imperfections and, by acting on them, remove them. This rationale is appealing, if for no other reason than its value as counterweight to the popular view of the stock market 'irrationality', but it is obviously incomplete." Roberts (1995: P7)

4.2 Weak-form efficiency

Researchers into weak form efficiency have their origins in the random walk theory. The first group to test the theory was Kendall (1953) and Alexander (1961). They consistently demonstrated that the pattern of the share price movements follows that of a random walk and the movements were independent of prior movements. A second group of researchers

explored whether certain strategies could be used to obtain abnormal gains based on exploiting the systematic patterns that share movements exhibit. One such study by Alexander (1961) found that abnormal profits were earned by using filtering techniques however the profits were eliminated if the transaction costs were taken into account. Other more advanced strategies were tested by Latane and Young (1969) and Jensen and Bennington (1970), and revealed similar results that they were not able to outperform the market.

One of the most sophisticate studies carried out which observed weak form nonefficiency was that that Rosenburg and Rudd (1982). Their study was superior in that it broke the security's total return into the two components, that which is common to all securities and that which is specific to the security itself. The results revealed that there was positive correlation for the common element but negative correlation for the security specific component. This tends to indicate inefficiency in the weak form however; Rosenburg and Rudd (1982) did not eliminate the effect of transaction costs.

One area of research to test the value of technical analysis is the effect of consistent performance of the market has over different periods. If the market was weak efficient, the stock prices should not be predictable from the current information, hence return patterns to a particular day of the week or month of the year should not be apparent. The fact that analysts have been using this form of analysis to buy shares before the temporary rise in the share associated with a particular period and sell when the share reach their peak is indication that the market is not weak efficient.

The general consensus amongst most researchers is that the market is indeed efficient in the weak form. Despite the existence of trends in the historic movement of securities prices and the general belief of those that earn a living based on technical analysis of past data, which suggest that market can not be efficient, the evidence of numerous studies concludes the contrary.

4.3 Semi Strong Efficiency

There are two main elements of the semi-strong efficiency, which are examinable, the speed and the correctness of any price adjustment. Any research into this area has to take into the account the adjustment for risk in the formulation of the tests. This enables that the returns from securities of different level of risk are comparable.

The first test of market efficiency, which acts as basis of evidence for the semi-strong efficiency, is Ball and Brown's (1968) paper looking at earnings announcement. They examined 2,300 annual earning reports by around 300 New York Stock Exchange companies over the nine-year period 1956-1964. The reports were broken down into two main categories, which were used later to analyse 'good' and 'bad' reports. The stock returns of the individual companies in the two sectors were analysed over a period of one year before and six months after the news announcement. The conclusion, to many economists a surprise, was that the market had forecasted 80% of the news before the announcement and the 3 and 6 month return after the announcement was approximately zero. Other studies by other researchers have further reaffirmed the conclusion reached by Ball and Brown. The interpretation is that stock prices incorporate the new information in such a mysterious way that opportunities to gain abnormal profits are eliminated.

The study performed by Ball and Brown was only concerned with the direction of the price movements relative to the direction in the change in the earnings figure. A study by Beaver, Clarke and Wright (1979), examined the relation between the magnitude of the change in the share price to the magnitude of the change in the earnings figure as reported in the annual reports. The result of the study was that the market is efficient in its response and in the level of its response.

The next advancement was the Fama, Fisher, Jensen and Roll (FFJR) (1968) study of the stock market reaction to stock splits. With the introduction of the 'event time' methodology, FFJR study showed how the stock prices incorporated the good news

associated with stock splits was affected. The surprising conclusion from the data was how quickly the information was incorporated after the announcement as reflected in the near zero percentage deviation of the stock price changes to the market index. The apparent rational and orderly effect on stock price amongst the noisiest of background highlighted the rational trend underlying the market Chew and Stern (1998).

The market was no longer viewed as chaotic function but as revealing in the most unexpected ways. One such unusual revelation was a study to investigate the effect on share price as a result of the death of the companies' CEO. The conclusion discriminated between those CEO who had been the founders of the company and who were probable holding the company back from its full potential in the latter years and between CEO who were appointed as such due their good management skills. This revealed intelligence as to how the market reacts to events, which happen sometimes unconsciously, this reveal the real genius of the share price in interpreting events Johnson, Magee, Nagarajan, and Newman (1985).

The question raised by researchers is if the market is deemed to be efficient then is there any benefit for active management to spend their time analysing snippets of information if any value attached to the information is already incorporated in the share price. This was a topic of study performed by Fleming and Swedroe (1999). The question addressed was whether active management was able to consistently make money by exploiting market inefficiencies after factoring the cost of their efforts. The conclusion, which is quite alarming to analysts and for a majority of investors, is that active management has achieved inconsistent and below market results. It was concluded that active portfolio management was a loser's game where the odds of winning were so low it did not make sense to play. The report admitted that analysts could not accept such an argument because it would put them out of business. The study quoted a famous economist, Paul Samuelson, 'A respect for evidence compels me to the hypothesis that most portfolio managers should go out of business. Even if this advice is 'drop dead' is good advice, it obviously will not be eagerly followed.'

4.4 Strong Form Efficiency

The testing of strong form efficiency is difficult because it involves having access to the privately held information. The most common form of testing is the indirect method of examining the profitability of a strategy by an insider to make an abnormal profit. Details of insider's transaction are detailed in the US by the publication of the Official Summary of Insider Trading. Another indirect approach of testing for strong form market efficiency is to examine returns and trading volume prior to the public announcements. If this information when publicly released had not already been incorporated in the share price, there would be an adjustment to reflect the new information.

Private information can also be in the form of released information, which is costly to obtain, and so only a selected few obtain the information and are able to trade upon the information. Example of such incidence is with large institutional investors who trade large sums of money on behalf of their clients or customers. In the competition being the different institutional investors, specific preview to costly data is obtainable and this can lead to an competitive advantage over rivals. Researchers such as Kon and Jen (1979) showed that mutual funds do not achieve abnormally high returns on average. Worse still, research showed that individual investors were able to perform equally well as the mutual funds Schlarbaum, Lewellen, Lease (1978).

4.5 Efficiency of non-US and non-UK security markets

Initially when market efficiency was introduced as a hypothesis, the main concern was the efficiency of the main two stock exchanges, namely the New York and London Stock Exchange. The focus was on the securities market and the main centre of exchange as these had potential attributes of being efficient. The approach was that if these markets were not efficient, then other types of markets or other geographical securities markets will not be efficient.

Research revealed the expected conclusion, that depending on the stage of development of the particular geographical market, the efficiency was proportional. Investigations into the Japanese market Ang and Pohlman (1978) reveal that it was highly efficient whilst the individual European markets such as Greek, Belgian, Swiss, Dutch and German,. Solnik (1973), were not as efficient as the US securities market when tested for weak form efficiency. Chapter V

Methodological framework

Chapter V

5. Methodological framework

5.1 Introduction

In previous chapters, there have been explanations of what is meant by the market efficiency. Justifications have been put forth as to how efficiency could materialize as well why it might always hold true. Describing how price changes occur is a completely different challenge to actually deterministically measuring its occurrence. Tests to test market efficiency are split into the different levels of efficiency namely: weak, semi-strong and strong.

Analyses conducted to evaluate market efficiency are divided into two main categories: (i) statistical comparison of the actual returns that a security exhibits to that which the statistical prediction based on a model suggest that the return of the security should be, and (ii) comparison of specific trading strategies' returns over a period with a basic strategy.

In order to investigate the efficiency of the market, a theoretical model has to be developed to test and measure the daily stock prices. There is a choice of models, which can be used to govern the way the security prices fluctuate over a period of time. The two more common models that will be discussed are the Fair-Game Model and the Random Walk Model.

5.2 Fair-Game Model

If the market is considered to be fully efficient with respect to specific information set, then Fama's Fair Game Model states that the realized rate of return for a share is equivalent to the expected rate of return prior to that period. This model is valid for all levels of efficiency as the model is applicable to all information sets. If the information set being tested is past data of the securities stock prices, then the model is utilized to test weak form efficiency. If the information set is all public information, then the model is used to test semi-strong efficiency. Similarly, if all possible sources of information, private or public are part of the information set, the model is used to test strong form efficiency.

The Fair–Game model is not a model to determine the future price of an security for some time in the future. It is only a description that if the market is efficient, then no source of information can be used to create on average an actual return that is in excess of the exceptional value of the security prices when the sampling size is large.

5.3 Random Walk Model

The distinguishing factor in the Random Walk model is that instead of one of the variables being the expected value of the security's stock, it is based on the security's entire return distribution. The model assumes that the return distribution is constant with time, which means that the return in each period is independent of the return in the previous period. This is derived from the statistically nature of a pure random fluctuation of any variable, which requires that the individual events be identically distributed and independent.

Empirical studies of security return distributions have shown that the stock prices exhibit a slight positive correlation through time. This implies that the identical distribution and independence of different prices with different times is not generally supported.

It is for these reasons that despite the benefits that the Random Walk Model held in the early days of testing weak form efficiency that the Fair-Game Model has been preferred in recent research.

5.4 Calculation of the Realized Rate of Return

The method of determination is based on the holding period yield concept, which compares the actual prices for two periods of time and using a simple proportionality calculation to arrive at the realized return. The mathematical representation is shown below:

$$R_{i,t} = P_{i,t} + D_{i,t} - P_{i,t-1}$$

$$P_{i,t-1}$$

 $R_{i,t}$ = return yield of stock i , at time t. $P_{i,t}$ = price of stock i, at time t $D_{i,t}$ = dividend of the stock i, received in period t $P_{i,t-1}$ = price of stock i, at time (t-1)

5.5 Expected Deviation

In the Fair-Game Model, the expected rate of return is said to be equal to the actual rate of return. This equality is expected to hold true for an isolated time period but only true over a summated time period in which the random fluctuation cancel each other out. Another way in which the presumption can be expressed is that over a large sample of observed deviations, the expected return will equal to the realized and hence the average deviation is zero. This can be mathematically expressed as

 $AR_{i,t} = E_{i,t} - R_{i,t} = 0$

 $AR_{i,t} = expected deviation for stock i over period t to t + 1.$ $E_{i,t} = expected return for stock i over period t to t + 1$

5.6 Expected Rate of Return

Fama's Fair Game Model set the theoretical framework but left unsolved a means to determining the expectation variable of the future stock price. This variable is essential in

order to be able to calculate the expected deviation of the stock prices. There are three main models, which have been referred to by researchers, which were presented by Brown and Warner in (1980). They are the mean-adjusted returns, market-adjusted returns and the market model returns. The latter is the most sophisticated and incorporates the elements of the other models. The key feature of the Market Model, which was developed by Markowitz (1952) and Sharpe (1964) is that the relationship between the security and the market is to form a simple linear regression between a security's return and the market's return. This linear relationship is expressed mathematically as :

$$\mathbf{r}_{i,t} = \alpha_i + \beta_i \mathbf{r}_{m,t} + \varepsilon_{i,t}$$

where:

 α_{I} = regression coefficient representing the intercept term for security i. It is the security's return component that is independent of the market's return.

 β_{I} = coefficient representing the slope of the regression line. It measures the expected change in the security's return given a change in the market's return.

 $\varepsilon_{i,t}$ = error term of the regression. It measures the deviation of the observed return from the return predicted by the regression and has an expected value of zero.

 $\mathbf{r}_{m,t}$ = The return a selected market index.

The equation cannot be applied until the value of α and β have been determined. It thus essential that these values are enumerated by using least squares regression method using data of the stock prices of company being examined to the market index over a time period other than that of the event window. The values for α and β can be used in an

equation within the actual event window to calculate the expected return values as shown below

 $E_{i,t} = \alpha_i + \beta_i r_{m,t}$

From this equation, the abnormal returns can be determined by subtracting the realized return from the expected returns.

5.7 The Cumulative Abnormal Returns (CAR)

As described before, the values are expected to randomly fluctuate around zero and so the cumulative effect of all daily calculations within the event window needs to be determined. It is this summated variable that the Fair-Game Model states should average to zero if the market is deemed to be efficient. If this CAR is found to be positive or negative, this indicates a trend in the residuals, which implies market inefficiency.

 $CAR = \sum AR_{i,t}$

This equation will be used to draw conclusions on whether the market acted efficiently around the selected announcement dates of the specified information set of the Firestone Crisis.

5.8 Factors to consider in using the methodology

One of the concerns about using this methodology is the validity of the conclusions that can be drawn when there are many interfering factors. The reaction of stock prices to multiple facets of commercial business transaction would incline researcher to believe that the amount of interference variables are too numerous to be discounted in studying the impact of a single factor. There are a bewildering variety of events and circumstances affecting companies' value. There are announcements of earnings and dividend, new promotional campaigns, labor disputes, staff retrenchments, new debts and equity issues, management charges, proxy contests, asset write-offs, bond rating changes and changes to interest rate, money supply figures and GDP data.

It was with the creation by Fama, Fisher, Jensen and Roll (FFJR, 1969), the 'event time' methodology that an approach to isolate one variable was born. It was the single most instrumental development to govern future research. In attempting to isolate the market reaction to one factor, they looked at the same event occurring in many different companies at different times. The event time was the thread connecting them all.

The event time is the time at which the specified information has become available. The event window is the period subsequent to the event time in which the measurement of the CAR is performed. In the analysis of the data to be obtained for Firestone share prices, the event time will be selected on dates in which the tire recall occurs. By selecting this event, the reaction of the market investors can be measured by looking at the CAR subsequent to the tire recall.

5.9 Discussion of other models that could have been used

The other models that could have been employed to determine the expected returns is the Capital Asset Pricing Model (CAPM). This model was developed by Sharpe (1964), Lintner (1965), and Mossin (1966) to offer a simple formula that yields the expected returns for individual securities. The CAPM model is the most widely applied measure of risk in the investment community. It is popular because it captures the essential treatment of risk in capital markets, reflecting the crucial function of those markets in diversifying risk across the society. The key feature in the model is the Beta factor, which is a statistical measure of risk. A key interpretation of this factor is that the measure of an individual security's risk contribution is the contribution that the security gives the whole of the portfolio. Additional for all well diversified portfolios, the risk contribution to the portfolio is highly correlated to the risk contribution of the market as a whole and hence

the market index is referred to in the model. This risk contribution to the market is what is measured by beta.

The measurement of beta is determined by observing the relationship between company share prices and market prices Pettingill, Sundaram and Mathur (1995) . In cases of untraded assets such as projects, no estimate of beta can be performed and more complex econometric methods are required. The problem of beta estimation is fundamental drawback in the model. This model is widely used in assessing pension funds and unit trusts where they hold diversified portfolios. The simplicity of the formula is achieved by the stringency of the underlying assumptions of the CAPM model. The fundamental approach is to consider individual investors holding diversified portfolios to obtain the maximum return for a given level of risk. The crucial aspect is that the return is related to its risk and that this risk is measured by the security's systematic movements with the overall market. Furthermore, this systematic risk cannot be eliminated by merely increasing the number of securities in the investor's portfolio Campbell, Lo, and Mackkiinlay (1997).

The problem with the CAPM model is that the model creates problems in empirical tests due to the expectational nature of the model. In comparison, the chosen model for this research, the Market Model, states that the unexplained return variance from the linear function is measure of the unsystematic risk and that any unexplained return is the abnormal return. The choice between the CAPM model and the Market Model is decided upon by whether the stringent assumptions of the CAPM model are applicable to the case study. In most case, the Market Model has been more suitable and flexible as its only assumption is that investors are risk-averse, wealth maximizers who select their holdings of securities on the basis of the mean and variance of the distribution of returns. The restrain on the approach is a drawback of the different approaches to determine market efficiency. It is true to say that no test can ever prove that markets are efficient. However, each test can indicate some level of confidence whether or not the series of returns under study possesses properties consistent with those of an efficient market Gibbons and Ferson(1985).

Chapter VI

Empirical Estimation and Analysis

Chapter VI

6. Empirical Estimation and Analysis

6.1 Empirical Estimation

The stock market price data for Bridgestone-Firestone was obtained from DataStream. Bridgestone is not directly listed on any of the American stock markets. However, it is traded in the form of American Depository Receipts (ADRs). One ADR is the equivalent of ten shares. Daily ADR price and the value of S&P 500 was obtained for the period January 1, 1996 to December 29, 2000. The data was then divided into two sets. Set one started from January 1, 1996 and extended up to December 31, 1998. Set 2 started from July 1, 1999 and extended up to December 29, 2000, the last trading day of the year 2000. The intervening period between the two sets was not used in order to keep the estimates of the market model free from any abnormal market sentiments in the period immediately before the start of the crisis. The first data set was used to determine the market model line. The period required had to fulfil two criteria, i) that no abnormal events occur there in and ii) that the period is resent, so that the regression line derived will be relevant. There were two events which happened during the period of the first data set such as notification to Federal government of 21 tread failures on Firestone tires. However, these events had little or no impact on investors and this can be considered not to skew the market model line.

The price level data was first converted to return data by using the formula:

 $R_t = (P_t - P_{t+1})/P_t$

Data set 1 converted into returns was used to estimate the Market Model. The regression is estimated by using E-views which is given in Table 1 below:

TABLE 1 MARKET MODEL ESTIMATION OF BRIDGESTONE ALPHA AND BETA

Dependent Variable: Bridgestone daily security returns Method of Analysis: Least Squares Method Sampling period: Jan 1st 1996 - Dec 31st 1998 Included observations: 784 days were examined as data-points

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Market Return (B)	0.136094	0.074990	1.814831	0.0699
Intercept (α)	0.000575	0.000797	0.721340	0.4709

Additional statistics tests:

R-squared	0.004194	Mean dependent var.	0.000702
Adjusted R-squared	0.002921	S.D. dependent var.	0.022258
S.E. of regression	0.022226	Akaike info criterion	-4.772567
Sum squared residue	0.386301	Schwarz criterion	-4.760668
Log likelihood	1872.846	F-statistic	3.293611
Durbin-Watson stat	2.230358	Prob.(F-statistic)	0.069933

These results represent the equation of the market model line, which is required to extrapolate into the future periods in order to evaluate the expected returns for Bridgestone securities prices. The results provide the gradient and the intercept of this line as constants α and β .

The variable α represents the element of Bridgestone's security price, which is independent of the market return. The variable β , represents the element of Bridgestone's security price which varies directly proportional to the market trend.

The Market Model thus provides us with the following return formulation for Bridgestone:

 $E \otimes_{BRIDGESTONE} = 0.000575 + 0.136094 * E \otimes_{S \& P 500} (0.721340) \quad (1.814831)$

where E BRIDGESTONE is the security price of Bridgestone. E B S&P 500 is the market price (...) is the T-statistic coefficient relating to α and β

The beta estimate is significant at 10% level. The alpha estimate is not significant at any of the conventional significance levels. One rather surprising finding is the very low value of the Bridgestone beta, indicating the low level of volatility of the stock in the precrisis period. This may be due to the fact that the estimation period is confined to the era of the longest economic expansion in the United States history. This was a period in which the demand for Firestone tires was particularly strong as the automobile industry and especially Ford raked in high profits as compared to historic levels.

The alpha and beta estimates of the market model were then used to compute dailyexpected return, E(R), for Bridgestone ADRs starting from July1, 1999 to December 28, 2000. The daily actual return was subtracted from daily-expected return to provide daily excess return, ER. Dividing the excess return by the forecasted standard deviation then standardized the excess return, SER. The standard deviation for each day was forecasted using the formula:

$$\sigma_{jt} = \sigma_j \left[1 + 1/T + (R_{mt} - \overline{R}_m)^2 / \sum_{t=1}^T (R_{mt} - \overline{R}_m)^2 \right]^{1/2}$$

 σ_j = Standard deviation of the error terms in the estimation model for firm j, which is Bridgestone

T = Number of daily returns in the estimation model

 R_{mt} = Return on the market index for day t for which the standard deviation is to be forecasted

 R_m = Mean market return in the estimation period

The SER are distributed approximately unit normal and tests of significance are carried out at the 95% and 90% level.

The cumulative excess returns are then computed for each month during the crisis period. The cumulative excess return on a particular date is obtained by adding the excess return of that date with all the excess returns for the dates preceding that date up to the first day of that month. The cumulative excess returns were then tested for significance at the 95% and 90% level. The test statistic z for the cumulative excess returns over various intervals from t_1 to t_2 is:

$$z_{t1,t2} = \sum_{t=t_1}^{t_2} z_t / \sqrt{t_2 - t_1 + 1}$$

6.2 Analysis

For the purposes of this analysis, a defined event window has to be established in order to evaluate the CAR to the different major events as they occurred. In the Firestone crisis, there were 9 separate event windows that were identified from the historical profile in Chapter II and these are summarized below.

Table 2 Summary of the Different Event windows periods used in CAR analysis

Period	Dates	Event Name
1	Aug-Sep 99	Tire recall in the Middle East
2	Sep 99- Jan 2000	Period pre-first announcement of US domestic crisis
3	Feb-Mar '00	First broadcast of US domestic crisis by Texas TV station
4	Mar-Apr '00	Pre-further developments in South America
5	May-Jun '00	Tire replacement in South America and US's NHTSA

		commences investigation into events
5	August 2000	Bridgestone announces voluntary recall in US
7	Sept 2000	Extension of recall to other tires after NHTSA warnings
3	Oct 2000	Corporate changes and root cause analysis released
9	Nov-Dec '00	Post crisis period

A graph of the Bridgestone security prices against the market index from the period January 1998 – May 2001 illustrates the disparity between Bridgestone's fluctuation and the markets (Appendix 3).

Table A (Appendix 1) shows the final results of the empirical analysis on the Firestone crisis period. A 'single black star' under the Plus column denotes a significantly positive return at the 95% level and a 'double black star' marks a significantly positive return at the 90% level. The 'single red star' and 'double red star' under the Minus column denotes a significantly negative return at the 95% and 90% level respectively.

This analysis is somewhat handicapped by the inability to precisely determine the dates of some events associated with the crisis. A review of news and information pertaining to the Firestone crisis period shows that often, the articles just mention the month in which an event occurred without mentioning the precise date of the event. Knowledge of the precise date is quite important for gauging the response of the market to the information. In the absence of specific dates, the market response will be gauged by the number and signs of significant SERs and CSERs in the month.

6.2.1 Period 1: August 1999 Tire Recall in Middle East

The Firestone crisis began publicly in August 1999 when Ford agreed to replace Firestone tires on 6800 Explorers and Mercury Mountaineers sport-utility vehicles in Saudi Arabia and the Gulf Cooperative states including Kuwait. If the market is efficient in the semi-strong form, this publicly available information should have been evaluated for its impact on the shares of the company in USA and should have been immediately reflected in the share prices. Thus, an efficient market should have been able to see this information as a possible harbinger of the looming crisis in United States and appropriately discounted the share prices. One of the theories we test here is that financial analysts in the United States perhaps have a hard focus on the happenings in the domestic market and possibly the markets of the major developed countries. This would imply that the markets are not efficient with respect to publicly available information in the developing countries. The empirical work of this study lends credibility to this theory. In the month of August 1999, there were 5 significant positive daily excess returns and only one significant negative daily excess return. In the early part of August, specifically on August 5 and 6, the cumulative excess return became significantly positive but the rest of the month did not indicate any abnormal market activity as measured by cumulative excess returns. This is a strong indication of the validity of the above hypothesis.

6.2.2 Period 2: September 1999 – January 2000

The replacement of Firestone tires in the Middle East in August of 1999 was immediately followed by an escalation of warranty claims on Firestone tires in the United States. It can perhaps be argued that such information is not public knowledge. However, financial analysts of large brokerage houses and institutional investors that were tracking Ford and Firestone have the ability to ask for and get pertinent information from the companies directly. A savvy analyst following the happenings in the Middle East should have been able to ferret this information. If an analyst had done so, the American market would have reacted faster to growing signs of crisis. However, for the next five months, the stock returns show no abnormal activity. There are almost an equal number of positive and negative significant daily excess returns in the period September 1999 to January 2000. Specifically, there were 14 significant positive daily returns and ten significant negative daily returns. The story on monthly cumulative excess returns is similar. None of the months during this period had a significant cumulative return for the month as a whole but within the month, the cumulative returns turned significantly negative three times and significantly positive only once. However, the significant negative cumulative returns were mostly in the earlier part of the month when the influence of a single daily negative return is proportionately large. The picture, therefore, is of a market that was not savvy to the forthcoming crisis.

6.2.3 Period 3 : February 2000 Domestic broadcast of looming crisis

During the month of February 2000, a couple of events finally appear to alert the market. In the month of February, Ford replaced the tires on vehicles in Thailand and Malaysia and the Houston based television station KHOU showed a major investigative report implicating the Firestone tires in several crashes caused by tread separation. The month of February therefore starts with negative excess returns almost from the start of the month. Specifically, significant negative excess daily returns were experienced on February 2, 3, 9 and 17. On two days in the month i.e. on February 4 and 14, there were significant positive daily returns as well but the cumulative excess return remained negative throughout the month except for the first day of the month. These negative cumulative returns turned significant on February 2,3, and 9 to 11. Although the precise dates of these events are indeterminate in this research, the large negative returns early in the month may indicate a predictive ability of the market if, in fact, some or all of the events of February followed the flurry of negative returns in the early part of the month. An alternative view is that the market finally reached an accumulative knowledge, which was sufficient for the investors to react to. The latter explanation would have revealed some signs of negative fluctuation prior to Feb 2000 and this was not observed. So the predictive element of the market is the preferred explanation.

6.2.4 Period 4: March - April 2000

The following two months, March and April 2000 were bereft of any more bad news for Firestone. The market seems to have adopted a wait and see attitude. Some significant positive daily returns, six days in all, are interspersed with some significant negative returns, a total of four. In the month of March especially, after the bad news of the previous month, the market appears to be cautiously optimistic as the cumulative excess returns stay positive throughout the month except on one day and actually are significant on five of the twenty three trading days of the month.

6.2.5 Period 5: May- July 2000 NHTSA investigations commence

The month of May 2000 brought more bad news for Bridgestone. On May 2, the National Highway Transportation Safety Authority (NHTSA) opened investigation into charges that defective design or manufacturing was responsible for tread separation in Firestone tires. A day before the announcement of this inquiry, the market produced significant negative return on Bridgestone ADR's. This indicates that the market foresaw the announcement of this bad news. On the day of the actual announcement and the following two days, there were no significant returns. It would appear from this that the market had fully and completely impounded the impact of the NHTSA announcement, consistent with semi-strong efficiency. However, inexplicably, the market produced a significant positive excess return on May 8, which gave back to the investors what they had lost on May 1. Another piece of bad news for Firestone in this month was the Ford decision to replace Firestone tires in their South American markets of Columbia, Ecuador and Venezuela. The combined effect of these developments was that cumulative returns for most of May, save for three days, remained negative.

In June there was some volatility, a couple of significant positive daily excess returns being off set by a couple of alternating significant negative daily excess returns. The month of July was one of anxious expectation as the market waited to see what Bridgestone would do. Other than a significantly negative excess daily return on one day that was followed a few days later by a significantly positive excess daily return there was no other significant activity in the market. The cumulative returns were not significant during any period of this month. However, the underlying foreboding of the market was perhaps expressed by mostly negative cumulative returns during the period. This is an indication of the fact that although individual daily excess return were not significant, the cumulative effect of the negative returns was greater than that of the positive returns.

6.2.6 Period 6: August 2000 Bridgestone announce recall publicly

As this crisis was unfolding, Bridgestone had continued to deny that their product was defective. Finally, on August 9, 2000, Bridgestone announced voluntary recall of 6.5 million Firestone ATX and Wilderness AT tires. Surprisingly, the market reaction to the recall was very positive. Two days before the recall, the market registered a significant positive daily return. On the day of the announcement and the day following there were again significant positive daily excess returns. In the remainder of the month, there were five more significant positive daily excess returns that were offset by just two significant negative daily excess returns.

At least one of the significant negative daily excess return on August 28 seems to be the consequence of the August 25 announcement by the Venezuela consumer protection agency recommending that Bridgestone and Ford face criminal prosecution over tires linked to 46 deaths in Venezuela. Since the markets were closed for the weekend on August 26 and 27, the impact of the announcement was incorporated in the stock trading on August 28. The real sentiment of the market to the voluntary recall can best be gauged by looking at the cumulative returns in this period.

Two days before Bridgestone announced the voluntary recall, the cumulative excess return turned significantly positive and then remained so well into the month of September. This constitutes the longest continuous string of significant positive cumulative excess return for any part of the period in this study and this occurred despite the bad news coming out of Venezuela.

This apparent paradox of market enthusiasm in the face of bad news is perhaps not totally inexplicable. As long as, Bridgestone was in a denial phase and refused to accept responsibility for its defective product, it was continuing to build provisions for legal liability for damages resulting from fatalities and injuries resulting on the road from its tires. When it agreed to replace the tires, it capped its provision for future liability at the accidents that had already occurred. Once the defective tires were off the road, future accidents as a result of its defective product would cease happening. The market was

visualizing an unlimited liability as long as Bridgestone was not accepting responsibility. When it did, the liability became limited. The market abhors uncertainty and when that uncertainty was resolved, it reacted enthusiastically.

6.2.7 Period 7: September 2000 Extension of Recall to other tires

However, this enthusiasm was short-lived. On September 1, NHTSA issued warning on 1.4 million additional suspect tires. Bridgestone's initial reaction was to refuse the recall of the 1.4 million tires in question. On this day, the market return was significantly positive. It may be that the warning was given after the markets had closed. Confirmation of the fact is difficult to confirm, as precise timing of the information being made public on the Friday afternoon is not known. The following day, the market did not move significantly but the day after that the market did register a significant negative daily excess return.

This delay in adjustment is somewhat surprising but may have been occasioned by the simultaneous arrival of contradictory signals - the NHTSA warning and the Bridgestone denial. However, Bridgestone partly relented on its initial refusal and on September 12, 2000 Bridgestone ordered inspection and replacement of tires identified in NHTSA's September 1 advisory.

The market had apparently accepted the Bridgestone refusal to recall the additional tires. The concession announced on September 12 sent the market reeling and it appears that it took the market several days to digest and fully incorporate this information. In the next seven days of trading, investors had negative excess returns on six days, four of which were significant. This delay can not be explained by assuming that the information was gathered over a seven day period as no new information was published post the first announcement. So the only reasonable explanation is that investors were unable to decide on how to react initially. The markets therefore did not quite behave with the semi-strong efficiency expected from it.

6.2.8 Period 8: October 2000 Corporate changes and root cause analysis release

There were two important developments in the Bridgestone crisis during October 2000. On October 10, John Lampe was named as the CEO of Bridgestone in USA. The market did not consider there was any price sensitive information in this news. For four trading days before the announcement and for two days after there were no significant excess returns. Either the market had anticipated the change a week earlier on October 3, when there was a significant positive excess return, or the market did not think that the new CEO would be able to change the course of the Bridgestone crisis. Be that as it may, the announcement of John Lampe as the CEO was a non-event.

The second important event of October 16 was the release of the first status report of root cause analysis by the independent experts. The release of this report caused more of a stir than the appointment of the new CEO. The release of the report was preceded a day earlier by significant positive daily excess return. Simultaneously, the cumulative returns turned significantly positive and remained so for nine continuous trading days. This is another instance of where the capping of uncertainty is viewed as a positive development by the market even when the news itself is not good.

6.2.9 Period 9: Post crisis period

November brought some more bad news for the investors. On November 1, Bridgestone announced that it would significantly broaden the availability of its warranty and money back programs. It might first be thought that the further capping of the uncertainty by the above announcement would create positive returns. However this announcement was immediately followed the next day by significant negative daily excess return. This possibly reflects that the warranty programs were not viewed as effective enough to secure the buyer's perception of the company. The immediate response does illustrate again that the market does react to the news in a fashion consistent with semi-strong efficiency. The negative impact of the announcement pervaded the market sentiment throughout the month. There were no significant positive excess returns during the month either on a daily basis or on a cumulative basis. On the contrary, the cumulative excess returns turned negative around the middle of the month and continued so almost without a break to the end of the month.

December 2000 is the last month of this study. The major event of this month was the announcement on December 19 of the root cause analysis carried out by Bridgestone's own team of experts. The impact of this announcement on the market was not significant. Neither in the days immediately proceeding nor in the couple of days after the announcement did the investors receive any significant excess returns - positive or negative. It would appear, therefore, that the report did not add any information to what was already available to the market participants. However, the month of December is significant in providing the longest string of significant positive cumulative excess returns. The cumulative excess returns for the month turned positive on December 5, and remained so till the end of the month. This is remarkable in that there was no Bridgestone specific good news that arrived in the market. The only piece of company specific news reaching the market was the Company's own finding of root cause analysis and that, we have seen, had already been discounted before its release. The only plausible explanation for this rather strange behavior is that the market had already been bombarded with bad news about Bridgestone on a regular basis over the previous several months that a month like December which brought no news, good or bad, was greeted enthusiastically by the market. In other words, it was a case of "No news is good news."

Chapter VII

Conclusion

Chapter VII

7. Overview of research

The objective of this research was to determine the degree of efficiency for Bridgestone/Firestone in the event of a major corporate crisis. The examination of Bridgestone allowed the research to develop in that there were many stages of development of the crisis as it was played out over period of 2 years. The crux of the research was to identify any temporary hiccups in the relatively stable American markets in a particular testing scenario such as a crisis.

The nature of the Bridgestone crisis was initially a manufacturing fault, which developed into a financial and public relations disaster due to the company's mismanagement. The use of this research would be to advise firms in the future on how to handle the scenario. This research aimed to explore whether the management reactions to hide information and to deny the circumstances had any effect in light of investors' predictive powers.

The body of knowledge that this research will contribute to is the study of efficient market hypothesis. The specific contribution will be to the limitations that exist to prevent absolute efficiency and identification of how and when they become important variables.

7.1 Conclusion

The empirical analysis provides us with support for the following conclusions:

7.1.1 Market response to Middle East recall

The conclusions that can be drawn from the inactivity of Bridgestone security prices to the unfolding events in Saudi Arabia and Kuwait is that there is clear suggestions of the myopic behavior of the Western markets to Middle East affairs, however this thesis alone, is not conclusive on this commentary. The financial analysts in the American markets have a hard focus on tracking company specific developments in their own markets and those of other industrialized countries but do not catch signals emanating from the markets of some developing countries.

In particular, this study found that the analysts in America did not catch the early warning signs of the looming crisis from the Middle East. In this sense, the market did not behave efficiently in a semi-strong fashion. This hypothesis would have us believe that all public information is quickly and without bias incorporated into the stock prices. In this particular incident, the news from the Middle Eastern market was not incorporated in the ADR price of Bridgestone.

This conclusion is consistent as well as supplementary to the research carried out by Solnik (1973) on the European markets and the conclusion drawn on the market efficiency of the developing countries. A further observation was that the sphere of public information is confined to that in the major stock trading countries. This is a further elucidation of the fact that information being available and accessible and of relevant use to the perception of investors is crucial to the efficiency of the market. Thus the market is limited to its absolute efficiency by the discriminatory perception held by the investors of the market. This conclusion is not optimistic to the market ever achieving absolute efficiency due to foundations of the efficiency is based on human social and psychological attitudes.

7.1.2 Market reaction to growing internal crisis

Once the crisis appeared on the radar screens of the financial analysts in USA in the month of February 2000, the market behaved in a manner generally consistent with the dictates of semi-strong efficiency. The conclusions reflect that within the American market, the market is reactive in a manner consistent to other research studies that have been performed on this market. Hence, this research only reinforces the semi-strong efficiency of the American market.

In many instances of domestic breaking news, the market showed predictive ability. The market reaction in the form of abnormal returns was completed a day or two before the actual release of the information. This is consistent with many other studies of market efficiency found in the literature, for example Fama, Fisher, Jenson and Roll (1969).

Once the crisis had commenced, the market reacted to international firm specific events in a manner consistent with semi-strong form efficiency. However, it did not exhibit the same predictive ability that it did in the case of domestic information. In other words, the market was reactive rather than proactive in such cases. This confirms the concentration of investors' knowledge is limited to their perceived sphere of concern. This questions whether infinite access to all knowledge is achievable even by large groups of individuals as the investors seek to follow the investigative patterns of fellow investors rather than searching in unchartered territories. Thus the conclusion of semi-strong efficiency in the American market is generally supported however there are serious flaws in the market system at critical times.

One of the characteristic features of efficiency is that there are no significant biases after a particular announcement. No significant biases were noticed in the incorporation of information. A significant negative return could be followed a positive return or a negative return with equal likelihood. Though no statistical tests were performed to formally test for this, the general survey of the results obtained seems to support the conclusion that there were no significant biases.

7.1.3 Predictive ability of the market

The market was revealed to be predictive to the effects of the damage caused to the firm. This was indicated by the stock market fluctuating prior to the event of the announcement of the NHTSA investigation, and there afterwards remaining steady which indicates that the actual announcement contains no additional news. A further example of this predictive nature was the Bridgestone announcement of the voluntary recall on August 8th in which the post cumulative excess returns were not significant. The days prior to the
August 8th announcement had been predicted and predicted accurately by the investors. This is clear bill of good health for the stock market in the event of crisis, it might indicate that as long as events follow a reasonable course of action then investor maintain their rationality.

7.1.4 Irrationality of investors crucial to efficiency

Despite the above stated conclusions about the semi strong efficiency of the market. There are illustrative periods where the crisis reached new depths to which the investors lost faith in active participation in the course of events. The example being September 12, 2000 when Bridgestone partly agreed to the advice of the NHTSA after a period of denial. The faith in the Bridgestone's repentance of August 9th to make appropriate corrective measures by the majority on financial investors crumbled under the weight of further acknowledgements of new problems. The response was that of irrational behaviour, which meant that, the announcement of September 12th was not digested properly until a week later. This is inefficiency caused by the failing assumption that all investors act rationally, at all times. However, the inefficiency is only temporary and the market is able to bounce back to normal operations after a minor relapse.

7.1.5 Technical information affecting efficiency

The effect of technical information on the efficiency has always been argued to be of little importance by advocates of the semi strong hypothesis. However, in the first status report to be released of the root cause analysis by the in-house experts, the bulk of the information seems to have predicted by the investor on the day prior to its release. The information in the report might have been technical so as not to be easily digestible by majority of investors. Hence, a later response was required by the market four days later to compensate for the error in the magnitude of pre-announcement response. This is indicative of importance of usable information for the market to be efficient. This does not negate that in some cases the investor can infer accurately the value of technical

information where past experiences allows their predictive ability to improve, however it is vulnerable to be inefficient when faced with new scenarios.

7.2 Limitation of the Study

There are two important limitations of the study, one empirical and the other theoretical.

- For several events it was not possible to pin point the exact date when the information became available to the market. This hinders the ability to interpret the market reaction with precision. This study adopted the second best approach in such cases to look at the monthly reaction of excess return rather than the return on and around the event date.
- 2. The theoretical limitation of this study is the one that it shares with all other studies of market efficiency based upon the event study methodology. These studies are based on a joint test of the hypothesis of asset return and market efficiency. In this study, the predicted returns are determined using the market model. This study therefore assumes that the market model provides an accurate representation of the return generating process. If this assumption is not valid, then the conclusions of this study are thrown into doubt.
- One case study can not be used to make generalizations and thus observed patterns and explanatory theory can not be extrapolated to other cases as no distinction between general principles of market mechanism and specific mechanisms can be made.

7.3 Final summary

As this case shows, the market is sensitive to information in the Western world and only sensitive to Middle East and South America in the situation where the sphere of investor's concern has been prompted to be broadened based on domestic concerns.

The market is limited by the rationality of the investors, which can be weakened by a prolonged crisis in which it becomes dysfunctional in its reaction to new information and

its core principles of market operation are shaken. The market reveals non-efficiency in such events however they are temporary and do not have any long-term consequences to the securities' market capitalization or to the confidence in the markets.

The restriction of information as practiced by Bridgestone to prevent major disaster was in retrospect, fully unsuccessful. The restriction of information created uncertainty amongst the investors and also added to the deteriorating public relation's image, all of which was reflected in the share price. Critics have also observed that the mismanagement of the crisis was amplified by the joint venture relationship that existed between Firestone and Ford. This added factor created a lack of primary leadership in the handling of the events leading to indecisive action. As there appeared to be no clear chain on matters affecting both companies, the reaction of both companies was slow, which was viewed as complacency to the seriousness of events by investors. This was a woeful lesson to be learnt and one that should be learnt by all corporate joint ventures.

Another contribution of this research is that time is an important factor as investors have limited patience toward companies. Any excess delay erodes investor's confidence and is reflected by falling share prices, which do not recover quickly. In the case of Bridgestone, share prices have not restored to normal after 18 months, which is indicative of serious erosion of investor's confidence.

Another mishandling of the crisis is the choice of advisors that Bridgestone chose to listen to. Experience of previous corporate crisis illustrates that public perception of the investors and customers is more fundamental to the going concern status of the company than the legal incrimination by the courts. Bridgestone ignored this advice and maintained a position of denying responsibility as advised by the lawyers as opposed to PR damage minimization strategy as advised by PR representatives. This choice of favoring the lawyer's advice is evidenced by the quitting of Bridgestone's PR consultants, FleishmanHillard. The PR consultant would have other reasons as to why to quit such as to avoid open ended liability, but from the sequence of events, the reasons are clear that it is due to way they had be treated. However, the research does indicate that financial confidence and trust is the bedrock of modern public firms and any invasion of the open channels of communication are only paid for in full by those to whom the market is trusted to.

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Appendix 1:

Bridgestone-Firestone Excess Return Analysis

 Table A: Bridgestone-Firestone Excess Return Analysis

 The dates follow the US convention of publishing the month before the date

Drugestone-Firestone Excess Return Analysi	Brido	estone-F	irestone	Excess	Return	Analy	vsis
--	-------	----------	----------	--------	--------	-------	------

Date	ER	SER +	- CS	ER +		Major Events
8/2/99	0.007659	0.344288	0.3	44288		August: Ford replaces Firestone tires in Saudi
						& Kuwait
8/3/99	0.041003	1.841998 *	2.1	86287		
8/4/99	0.012704	0.568472	2.7	54758		
8/5/99	0.049717	2.233424 *	4.9	88183 *		
8/6/99	-0.014386	-0.644748	4.3	43434 **	*	
8/9/99	-0.013541	-0.608631	3.7	34804		
8/10/99	-0.036157	-1.618201	2.1	16603		
8/11/99	0.029570	1.322122	3.4	38725		
8/12/99	0.009671	0.434625	3.8	73350		
8/13/99	-0.015954	-0.709304	3.1	64046		
8/16/99	-0.021347	-0.959653	2.2	04393		
8/17/99	-0.005137	-0.230497	1.9	73896		
8/18/99	-0.022681	-1.017542	0.9	56354		
8/19/99	0.035286	1.584005	2.5	40360		
8/20/99	0.041082	1.843498 *	4.3	83857		
8/23/99	-0.003553	-0.158732	4.2	25126		
8/24/99	-0.003530	-0.158683	4.0	66443		
8/25/99	-0.019279	-0.863628	3.2	02814		
8/26/99	0.039130	1.749954 *	4.9	52768		
8/27/99	-0.000402	-0.018011	4.9	34758		
8/30/99	-0.062191	-2.773958	2.1	60800		
8/31/99	0.039386	1.770093 *	3.9	30893		
9/1/99	-0.046039	-2.067396 *	-2.0	67396	*	
9/2/99	0.015253	0.684222	-1.3	83174		
9/3/99	0.026977	1.193148	-0.1	90026		
9/6/99	0.000575	0.025849	-0.1	64177		
9/7/99	-0.029091	-1.306852	-1.4	71029		
9/8/99	0.000281	0.012630	-1.4	58398		
9/9/99	-0.052357	-2.353617 *	-3.8	12016		
9/10/99	0.055781	2.507449 *	-1.3	04567		
9/13/99	-0.000320	-0.014388	-1.3	18955		
9/14/99	0.004818	0.216397	-1.1	02558		
9/15/99	-0.011380	-0.509336	-1.6	11893		
9/16/99	0.037481	1.684972 *	0.0	73079		
9/17/99	0.002182	0.097786	0.1	70865		
9/20/99	-0.013181	-0.592541	-0.4	21675		
9/21/99	-0.065112	-2.899068 *	-3.3	20743		
9/22/99	0.055077	2.475946 *	-0.8	44797		
9/23/99	-0.000781	-0.034705	-0.8	79502		
9/24/99	0.020360	0.915088	0.0	35586		
9/27/99	-0 004720	-0 212124	-0.1	76537		

9/28/99 -0.002896	-0.130170	-0.306708
9/29/99 0.042128	1.888792 *	1.582085
9/30/99 -0.026743	-1.199709	0.382376
10/1/99 -0.007488	-0.336609	-0.336609
10/4/99 -0.003210	-0.143594	-0.480203
10/5/99 0.006365	0.286093	-0.194110
10/6/99 -0.002332	-0.104225	-0.298335
10/7/99 -0.019011	-0.853907	-1.152242
10/8/99 0.003615	0.162001	-0.990242
10/11/99 -0.005744	-0.258202	-1.248444
10/12/99 0.020004	0.894126	-0.354318
10/13/99 0.031368	1.397854	1.043536
10/14/99 0.001151	0.051746	1.095282
10/15/99 -0.031671	-1.402762	-0.307480
10/18/99 -0.002058	-0.092483	-0.399963
10/19/99 -0.004932	-0.221639	-0.621602
10/20/99 -0.023733	-1.058467	-1 680069
10/21/99 0.007580	0.340584	-1 339485
10/22/99 -0.005911	-0 264958	-1 604442
10/25/99 0.034626	1 555269	-0.049174
10/26/99 0.026897	1 207092	1 157918
10/27/99 0.038521	1 728398 *	2 886316
10/28/99 0.007564	0.333576	3 219892
10/20/00 -0.037752	-1 691460 *	1 528/32
10/20/00 -0.00//02	-1.031400	1.020402
11/1/99 -0.027539	-1,236915	-1 236915
11/2/99 -0.011500	-0.516736	-1 753651
11/3/99 0.009980	0.448507	-1.305145
11/4/99 -0.003345	-0 150334	-1 455478
11/5/99 0.046241	2.078088 *	0.622610
11/8/99 -0.038229	-1.718172 *	-1 095563
11/9/99 0.032580	1 462537	0.366974
11/10/99 0.015082	0.677737	1 044712
11/11/99 0.017698	0 795337	1 840049
11/12/99 0.045596	2 046690 *	3 886739
11/15/99 0.023058	1.036511	4 923251
11/16/99 0.001103	0.049332	4 972583
11/17/99 -0.069253	-3 110478 *	1 862104
11/18/99 -0.021117	-0.948071	0.914033
11/19/99 0.045864	2 061582 *	2 975615
11/22/99 -0.012495	-0.561717	2 413898
11/23/99 -0.007159	-0.321045	2 092853
11/24/99 0.005794	0.260234	2 353087
11/25/99 0.000575	0.025849	2 378936
11/26/00 0.030265	1 360542	3 730/78
11/20/00 0.010246	0.864526	4 604004
11/30/99 0.013094	0.586739	5 1907/3
1.1.0000 0.010004	0.000700	0.100740
12/1/99 0.045354	2.037990 *	2.037990
12/2/99 -0.018936	-0.850597	1,187393
12/3/99 0.004872	0.218116	1,405508

12/6/99 0.009038	0.405935		1.811444	
12/7/99 -0.046804	-2.100257	*	-0.288813	
12/8/99 0.006533	0.293593		0.004780	
12/9/99 0.027477	1.235165		1.239944	
12/10/99 0.010536	0.473431		1.713375	
12/13/99 -0.015615	-0.701939		1 011436	
12/14/99 -0.002399	-0.107709		0.903727	
12/15/99 0.052019	2.337107 *		3 240834	
12/16/99 -0.048092	-2 161746	*	1 079088	
12/17/99 0.044411	1 996530 *		3 075618	
12/20/99 0.007557	0.339671		3 415289	
12/21/99 0.012281	0.551258		3 966547	
12/22/99 -0.080039	-3 598158	*	0.368388	
12/23/99 0.005204	0 233213		0.601602	
12/24/99 0.000575	0.025833		0.627434	
12/27/99 0.014905	0.670051		1 207485	
12/28/00 0.0/6052	2 070208 *		3 367783	
12/20/00 -0.006605	0.206806		3.070996	
12/20/00 0.05/201	2 445197 *		5.516072	
12/30/99 0.034391	2.445107		5.510073	
12/31/99 0.001019	0.045620		5.501095	
1/3/00 -0 000732	-0.436756		-0 436756	
1/4/00 0.023534	1 03/036		0.508180	
1/5/00 0.023334	0.419250		1 017/20	
1/6/00 0.009320	0.419250		1 120596	
1/7/00 0.002/17	6.050062	*	5 911276	
1/10/00 0.001200	0.054251		-5.011370	
1/11/00 0.001209	0.034231		-3.757125	
1/12/00 0.001951	0.493070		-2.900003	
1/12/00 0.010/50	1 524705		-2.497595	
1/13/00 0.034200	1.004/00		-0.902000	
1/14/00 0.025921	1.103/31		0.200923	
1/17/00 0.000575	0.025849		0.226772	
1/18/00 0.003378	0.151754		0.378526	
1/19/00 -0.005/85	-0.260059		0.118467	
1/20/00 -0.016160	-0.725852		-0.607384	
1/21/00 -0.033358	-1.499319		-2.106704	
1/24/00 -0.012820	-0.569969		-2.6/66/3	
1/25/00 0.021916	0.984888		-1.691/85	
1/26/00 0.009212	0.414003		-1.2///81	
1/27/00 0.021000	0.943758		-0.334023	
1/28/00 0.024866	1.106012		0.771988	
1/31/00 0.010206	0.455304		1.227292	
2/1/00 0 020660	1 333137		1 222127	
2/1/00 0.029009	1.002107		1.002107	
2/2/00 -0.088821	-3.992967	*	-2.660830	
2/3/00 -0.049425	-2.218838	*	-4.879668	
2/4/00 0.037897	1.703672 *		-3.175996	
2/7/00 0.000292	0.013144		-3.162851	
2/8/00 -0.010260	-0.460482		-3.623333	
2/9/00 -0.076506	-3.418549	*	-7.041882	

February: Ford replaces tires in Thailand and Malaysia and KHOU TV airs program

2/10/00 2/11/00 2/14/00 2/15/00 2/17/00 2/17/00 2/21/00 2/22/00 2/23/00 2/24/00 2/25/00 2/28/00 2/29/00	0.032264 0.001360 0.064476 0.008215 -0.005963 -0.040523 0.015968 0.000575 0.005762 -0.016279 0.016860 0.009683 0.022969 -0.016631	1.450307 0.060765 2.898557 * 0.369014 -0.267662 -1.821729 * 0.709294 0.025849 0.259001 -0.731564 0.757610 0.434004 1.031320 -0.746192	-5.591575 -5.530810 -2.632254 -2.263240 -2.530902 -4.352631 -3.643337 -3.617488 -3.358486 -4.090051 -3.332441 -2.898437 -1.867118 -2.613310
3/1/00 3/2/00 3/3/00 3/6/00 3/7/00 3/8/00 3/10/00 3/13/00 3/13/00 3/14/00 3/15/00 3/15/00 3/15/00 3/16/00 3/17/00 3/22/00 3/22/00 3/22/00 3/22/00 3/24/00 3/22/00 3/24/00 3/29/00 3/29/00 3/30/00 3/31/00	0.013436 0.052891 0.024383 0.001238 -0.019687 0.003130 0.010995 0.003182 0.011088 0.046024 0.008223 -0.052407 -0.042983 0.004306 -0.006225 -0.002776 0.014341 -0.000309 -0.033716 -0.064439 0.038378 -0.014041	0.603512 2.377753 * 1.091476 0.055519 -0.877761 0.140615 0.490835 0.143005 0.497996 2.060837 * 0.367399 -2.302236 * -1.932124 * 0.193504 -0.278067 -0.124794 0.642792 -0.013883 -1.515560 -2.892842 * 1.494578 1.721458 *	0.603512 2.981265 * 4.072741 * 4.128260 * 3.250500 3.391115 3.881950 4.024955 4.522951 6.583788 * 6.951188 * 4.648952 2.716828 2.910332 2.632264 2.507470 3.150263 3.136380 1.620820 -1.272023 0.222555 1.944013 1.313051
4/3/00 4/4/00 4/5/00 4/6/00 4/10/00 4/10/00 4/11/00 4/12/00 4/13/00 4/14/00 4/17/00 4/18/00	-0.001516 -0.045283 -0.036228 0.050992 0.048436 -0.013099 0.001907 -0.033951 -0.026871 0.021787 0.037490 0.020927	-0.068146 -2.034240 * -1.628060 2.290668 * 2.175627 * -0.588388 0.085722 -1.517868 -1.203522 0.948171 1.669285 * 0.934193	-0.068146 -2.102386 -3.730446 -1.439778 0.735849 0.147462 0.233184 -1.284684 -2.488206 -1.540034 0.129251 1.063443

4/19/00	0.014569	0.654259		1 717702
4/20/00	-0.004619	-0 207622		1 510080
1/21/00	0.000575	0.025840		1.525020
4/21/00	-0.032707	1 474191		0.061749
4/24/00	-0.032797	1 117700		1.170456
4/25/00	0.025096	1.11//08		1.179456
4/26/00	-0.019575	-0.878873		0.300583
4/27/00	0.044601	2.005006 *		2.305588
4/28/00	-0.035648	-1.601299		0.704289
5/1/00	-0.052187	-2.344005	*	-2.344005
5/2/00	0.014845	0.665852		-1.678153
5/3/00	-0.000671	-0.030028		-1.708182
5/4/00	-0.009350	-0.420239		-2.128420
5/5/00	0.007917	0.355190		-1.773230
5/8/00	0.052877	2.376164 *		0.602933
5/9/00	0.009210	0.413701		1.016634
5/10/00	0.010772	0.482325		1.498959
5/11/00	-0.035835	-1.606961		-0.108002
5/12/00	-0.034534	-1.551574		-1.659575
5/15/00	-0.050917	-2.280252	*	-3.939827
5/16/00	-0.035820	-1.609328		-5.549155
5/17/00	0.014617	0.656125		-4.893030
5/18/00	0.024323	1.092827		-3.800203
5/19/00	0.007283	0.326084		-3.474119
5/22/00	-0.003834	-0.172328		-3.646446
5/23/00	-0.034499	-1.545668		-5.192115
5/24/00	0.010910	0.489244		-4.702870
5/25/00	-0.032905	-1.477055		-6.179926
5/26/00	0.059767	2.686631 *		-3.493294
5/29/00	0.000575	0.025849		-3 467445
5/30/00	-0.023925	-1.067000		-4 534445
5/31/00	0.048637	2 186435 *		-2 348009
0,01,00	0.010001	2.100100		2.010000
6/1/00	-0.021801	-0.977248		-0.977248
6/2/00	0.043726	1.960175 *		0.982928
6/5/00	-0.032709	-1.469781		-0.486853
6/6/00	-0.007014	-0.315167		-0.802020
6/7/00	0.011814	0.530792		-0.271228
6/8/00	-0.018745	-0.842326		-1.113554
6/9/00	-0.013029	-0.585652		-1.699206
6/12/00	0.031533	1.416779		-0.282427
6/13/00	-0.007091	-0.318192		-0.600619
6/14/00	0.059203	2.661516 *		2.060897
6/15/00	0.034624	1.556276		3.617173
6/16/00	0.003549	0.159390		3.776563
6/19/00	-0.065743	-2.951044	*	0.825519
6/20/00	-0.003578	-0.160793		0.664727
6/21/00	-0.003502	-0.157437		0.507290
6/22/00	-0.001114	-0.049914		0.457377
6/23/00	0.033662	1.512483		1.969860

 May: Ford replaces tires in Ecuador, Columbia and Venezuela NHTSA opens investigation

6/26/00 0.052748	2.369937 *	4.339797
6/27/00 -0.057062	-2.564930 *	1,774867
6/28/00 0.035286	1.586275	3.361142
6/29/00 -0.005945	-0.267092	3 094050
6/30/00 0.009814	0.441008	3 535058
0.00.00 0.0000011	0.111000	0.000000
7/3/00 0.000606	0.027229	0.027229
7/4/00 0.000575	0.025849	0.053079
7/5/00 -0.031375	-1.407358	-1.354279
7/6/00 -0.036512	-1.640927	-2.995207
7/7/00 0.035187	1.579321	-1.415886
7/10/00 0.016337	0.734382	-0.681504
7/11/00 0.001846	0.083000	-0.598504
7/12/00 0.015521	0.697473	0.098969
7/13/00 0.020695	0.930344	1.029313
7/14/00 -0.031563	-1.418132	-0.388819
7/17/00 -0.024957	-1.121966	-1.510785
7/18/00 0.000783	0.035149	-1.475636
7/19/00 0.036478	1.638926	0.163290
7/20/00 0.002389	0.107335	0.270625
7/21/00 -0.003317	-0.148964	0.121661
7/24/00 -0.060599	-2.721401 *	-2.599740
7/25/00 -0.025524	-1.147126	-3.746865
7/26/00 -0.003227	-0.144801	-3.891666
7/27/00 0.052498	2.359954 *	-1.531713
7/28/00 -0.033218	-1.488101	-3.019814
7/31/00 -0.008855	-0.397924	-3.417738
8/1/00 0.029674	1.333829	1.333829
8/2/00 0.014085	0.633189	1.967018
8/3/00 -0.005705	-0.256317	1.710701
8/4/00 -0.015731	-0.707009	1.003692
8/7/00 0.095004	4.267578 *	5.271270 *
8/8/00 -0.015531	-0.698207	4.573063 **
8/9/00 0.076187	3.423540 *	7.996604 *
8/10/00 0.112013	5.032189 *	13.028793 *
8/11/00 -0.027221	-1.223310	11.805483 *
8/14/00 0.024589	1.104118	12.909601 *
8/15/00 0.048638	2.186026 *	15.095627 *
8/16/00 0.096316	4.329445 *	19.425072 *
8/17/00 -0.029417	-1.321444	18.103628 *
8/18/00 -0.000215	-0.009682	18.093946 *
8/21/00 0.066709	2.998555 *	21.092501 *
8/22/00 -0.038244	-1.719273 *	19.373228 *
8/23/00 0.019508	0.876897	20.250126 *
8/24/00 0.023968	1.077522	21.327648 *
8/25/00 -0.002206	-0.099178	21.228470 *
8/28/00 -0.055445	-2.492255 *	18.736215 *
8/29/00 0.041660	1.872650 *	20.608865 *
8/30/00 0.034906	1.568819	22.177683 *

Bridgestone announces voluntary recall

Venezuela consumer protection agency recommends criminal prosecution

8/31/00	0.069257	3.111568 *	25.289251 *	
9/1/00	0.059657	2.681931 *	2.681931 *	NHTSA issues warning on additional tires. Firestone rejects more recalls.
9/4/00	0.000575	0.025849	2.707781 **	September: Saudi bans Firestone and Bridgestone recalls tires in Venezuela
9/5/00	-0.038581	-1.733161 *	0.974620	Diagestorie recails tires in venezuela.
9/6/00	0.015689	0.704693	1.679313	
9/7/00	0.033118	1.488438	3.167751	
9/8/00	0.131068	5.890535 *	9.058286 *	
9/11/00	0.001436	0.064553	9.122839 *	
9/12/00	-0.036846	-1.656039 *	7.466800 *	Bridgestone reinstates inspection and replacement program for NHTSA's Sept 1 advisory.
9/13/00	-0.045321	-2.037415 *	5.429384 **	autiony.
9/14/00	-0.008621	-0.387509	5.041875	
9/15/00	-0.001509	-0.067771	4.974105	
9/18/00	-0.048697	-2.185313 *	2.788792	
9/19/00	0.003778	0.169719	2.958510	
9/20/00	-0.079661	-3.580003 *	-0.621492	
9/21/00	0.063185	2.840391 *	2.218899	
9/22/00	0.001949	0.087627	2.306526	
9/25/00	-0.027237	-1.223936	1.082590	
9/26/00	0.018238	0.819413	1.902003	
9/27/00	0.036167	1.625882	3.527885	
9/28/00	-0.001851	-0.082929	3.444956	
9/29/00	-0.020690	-0.928418	2.516538	
10/2/00	0.022244	1.000001	1.000001	
10/3/00	0.038735	1.740599 *	2.740600 **	
10/4/00	-0.012912	-0.580362	2.160238	
10/5/00	0.021336	0.959196	3.119434	
10/6/00	0.014190	0.636077	3.755511 **	
10/9/00	0.001169	0.052562	3.808073	
10/10/00	-0.005049	-0.226778	3.581295	John Lampe named CEO of Bridgestone
10/11/00	0.016689	0.748674	4.329969	
10/12/00	0.023024	-1.029878	5.300090	
10/16/00	0.051154	0.567034	5.502010	Independent Expert releases first status
10/10/00	0.012015	0.507054	0.149032	report of root cause analysis
10/17/00	0.018112	0.812188	6.962041 *	report of root outdoe analysis
10/18/00	0.001150	0.051687	7.013727 **	
10/19/00	0.043100	1.922438 *	8.936165 *	
10/20/00	0.100036	4.496442 *	13.432607 *	
10/23/00	-0.007082	-0.318375	13.114232 *	
10/24/00	-0.026915	-1.209969	11.904263 *	
10/25/00	-0.082051	-3.673294 *	8.230969 **	
10/26/00	-0.058715	-2.639567 *	5.591402	
10/27/00	0.029004	1.302988	6.894390	
10/20/00	0.05/266	2 136702 *	0 221192 *	

10/31/00	-0.017980	-0.805898		8.525284 **
11/1/00	0.019173	0.861658		0.861658
11/2/00	-0.041351	-1.858758	*	-0.997101
11/3/00	-0.008859	-0.398242		-1.395343
11/6/00	-0.030685	-1.3/9402		-2.774744
11///00	-0.002583	-0.116137		-2.890881
11/8/00	0.031405	1.409193		-1.481688
11/10/00	-0.015649	-0.703238		-2.184920
11/13/00	-0.020226	-0.008428		-2.570057
11/14/00	-0.025163	-1 127446		-3 697503
11/15/00	-0.023103	-1 688953	*	-5 386456
11/16/00	-0.004633	-0.208025		-5 594481
11/17/00	-0.030961	-1.391708		-6.986189
11/20/00	-0.020459	-0.917492		-7.903681
11/21/00	0.011089	0.498509		-7.405172
11/22/00	0.011538	0.517396		-6.887776
11/23/00	0.000575	0.025850		-6.861926
11/24/00	0.015025	0.674618		-6.187309
11/27/00	-0.045604	-2.049914	*	-8.237223
11/28/00	0.000455	0.020428		-8.216796
11/29/00	-0.017552	-0.789012		-9.005808
11/30/00	-0.031958	-1.432596		-
				10.438404
12/1/00	-0.037014	-1.663974	*	-1.663974
12/4/00	-0.010812	-0.485914		-2.149888
12/5/00	0.140542	6.260881 *		4.110993 *
12/6/00	0.121979	5.470960 *		9.581953 *
12/7/00	0.003917	0.176019		9.757972 *
12/8/00	0.003243	0.145477		9.903449 *
12/11/00	0.001599	0.071877		9.975326 *
12/12/00	-0.000314	-0.014130		9.961196
12/13/00	0.016389	0.736420		10.69/616
12/14/00	-0.001332	-0.059812		10.037803
12/18/00	0.001673	0.075204		10.607872 *
12/19/00	-0.001188	-0.053366		10.554506 *
12 10/00	0.001100	0.000000		10.004000
12/20/00	-0.013993	-0.625113		9.929393 *
12/21/00	0.001664	0.074783		10.004176 *
12/22/00	0.090631	4.060781 *		14.064957 *
12/25/00	0.000575	0.025850		14.090807*
12/20/00	0.023882	0.246400		15.104207 *
12/28/00	0.001110	0.0500422		15.510029
12/20/00	-0.000947	-0.038044		15.5008/7
12/23/00	-0.000847	-0.030044		10.022000

Bridgestone significantly broadens the availability of its tire warranty and money back programs.

Bridgestone announces findings of root cause analysis

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Appendix 2:

Bridgestone-Firestone Data

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Bridgestone-Firestone Data

		0				US	
	BRIDGESTONE	BRIDGESTONE	BRIDGESTONE	PRIDCESTONE	S&P 500	BILL 3	
	ADR. 1 ADR = 10	SHARES -	SHARES -	ADR. 1 ADR = 10	- PRICE	MIDDLE	
Date	SHARES - Price	MARKET VALUE	DIVIDEND YIELD	SHARES - PE	INDEX	RATE	B-return
02/08/99	305.39	23577.07	0.31	7.5	1328.05	4.79	-0.00715
03/08/99	292.86	22609.62	0.32	7.2	1322.18	4.84	-0.04103
04/08/99	288.8	22295.98	0.33	7.1	1305.33	4.78	-0.01386
05/08/99	274.86	21219.96	0.34	6.7	1313.71	4.73	-0.04827
06/08/99	278.59	21508.27	0.34	6.8	1300.29	4.8	0.013571
09/08/99	282.45	21806.23	0.33	6.9	1297.8	4.88	0.013855
10/08/99	292.34	22569.81	0.32	7.2	1281.43	4.8	0.035015
11/08/99	284.5	21964.25	0.33	7	1301.93	4.88	-0.02682
12/08/99	281.8	21755.79	0.34	6.9	1298.16	4.87	-0.00949
13/08/99	287.33	22182.59	0.33	7	1327.68	4.72	0.019624
16/08/99	293.72	22675.96	0.32	7.2	1330.77	4.76	0.022239
17/08/99	295.8	22836.4	0.32	7.2	1344.16	4.81	0.007082
18/08/99	302.34	23341.84	0.31	7.4	1332.84	4.76	0.02211
19/08/99	291.56	22509.5	0.32	7.1	1323.59	4.74	-0.03566
20/08/99	280.14	21627.7	0.34	6.9	1336.61	4.8	-0.03917
23/08/99	281.97	21768.83	0.34	6.9	1360.22	4.91	0.006532
24/08/99	283.22	21865.34	0.33	6.9	1363.5	4.98	0.004433
25/08/99	289.36	22339.41	0.33	7.1	1381.79	4.93	0.021679
26/08/99	277.64	21434.69	0.34	6.8	1362.01	4.92	-0.0405
27/08/99	277.53	21426.24	0.34	6.8	1348.27	4.96	-0.0004
30/08/99	294.27	22718.19	0.32	7.2	1324.02	4.96	0.060318
31/08/99	282.74	21828.38	0.33	6.9	1320.41	4.98	-0.03918
01/09/99	296.23	22870.18	0.32	7.2	1331.063	4.93	0.047712
02/09/99	291.52	22505.88	0.32	7.1	1319.11	4.91	-0.0159
03/09/99	284.97	22000.44	0.33	7	1357.24	4.91	-0.02247
06/09/99	284.97	22000.44	0.33	7	1357.24	4.91	0
07/09/99	293.23	22638.57	0.34	7.2	1350.45	4.91	0.028986
08/09/99	293.13	22630.13	0.34	7.2	1344.15	4.81	-0.00034
09/09/99	308.75	23836.43	0.32	7.6	1347.656	4.81	0.053287
10/09/99	291.83	22530.14	0.34	7.1	1351.656	4.75	-0.0548
13/09/99	291.87	22533.23	0.34	7.1	1344.125	4.76	0.000137
14/09/99	290.4	22419.74	0.34	7.1	1336.29	4.82	-0.00504
15/09/99	293.33	22645.81	0.34	7.2	1317.97	4.76	0.01009
16/09/99	282.52	21811.05	0.35	6.9	1318.484	4.69	-0.03685
17/09/99	282.56	21814.67	0.35	6.9	1335.42	4.69	0.000142
20/09/99	286.45	22114.79	0.35	7	1335.531	4.67	0.013767
21/09/99	304.45	23504.69	0.33	7.4	1307.578	4.78	0.062838

22/09/99	287.95	22230.84	0.34	7	1310.516	4.82	-0.0542
23/09/99	287.44	22191.03	0.34	7	1280.406	4.81	-0.00177
24/09/99	281.66	21744.7	0.35	6.9	1277.359	4.77	-0.02011
27/09/99	283.33	21873.78	0.35	6.9	1283.313	4.81	0.005929
28/09/99	284.28	21947.36	0.35	7	1282.203	4.86	0.003353
29/09/99	272.05	21002.83	0.36	6.7	1268.375	4.83	-0.04302
30/09/99	279.9	21609.11	0.35	6.8	1282.703	4.82	0.028855
01/10/99	282.16	21783.31	0.35	6.9	1282.813	4.86	0.008074
04/10/99	283.88	21916	0.35	6.9	1304,594	4.81	0.006096
05/10/99	282.14	21782 1	0.35	6.9	1301 344	4 85	-0.00613
06/10/99	283.67	21900.32	0.35	6.9	1325.4	4.81	0.005423
07/10/99	289	22311.66	0.34	7.1	1317 641	4.82	0.018780
08/10/99	288 67	22286 33	0.34	7.1	1336.02	4.02	-0.00114
11/10/00	200.07	22200.00	0.34	7.1	1005.02	4.75	0.000114
12/10/00	290.47	22425.05	0.34	7.1	1010.001	4.79	0.000235
12/10/99	204.17	21930.92	0.35	7	1005 547	4.00	-0.02109
13/10/99	274.01	21200.00	0.36	6.7	1285.547	4.97	-0.03364
14/10/99	274.39	21183.77	0.36	6.7	1283.422	5	-0.0008
15/10/99	282.19	21/85./2	0.35	6.9	1247.406	5	0.028427
18/10/99	283.14	21859.3	0.35	6.9	1254.13	5.08	0.003367
19/10/99	284.92	21996.82	0.35	7	1261.313	5.13	0.006287
20/10/99	292.71	22598.08	0.34	7.2	1289.422	5.12	0.027341
21/10/99	290.48	22426.26	0.34	7.1	1283.609	5.11	-0.00762
22/10/99	292.92	22614.45	0.34	7.2	1301.656	5.07	0.0084
25/10/99	282.7	21825.53	0.35	6.9	1293.63	5.02	-0.03489
26/10/99	274.91	21223.58	0.36	6.7	1281.906	5.13	-0.02756
27/10/99	264.91	20451.55	0.37	6.5	1296.703	5.13	-0.03638
28/10/99	264.33	20406.92	0.37	6.5	1342.438	5.1	-0.00219
29/10/99	275.01	21231.57	0.36	6.7	1362.922	5.1	0.040404
01/11/99	282.5	21809.84	0.35	6.9	1354.125	5.13	0.027235
02/11/99	285.73	22059.55	0.35	7	1347.74	5.14	0.011434
03/11/99	283.25	21867.75	0.35	6.9	1354,922	5.12	-0.00868
04/11/99	284.58	21970.41	0.35	7	1362.64	5.08	0.004695
05/11/99	271.8	20983.53	0.36	6.7	1370.23	5.13	-0.04491
08/11/99	282 53	21812.26	0.35	6.9	1377.01	5 18	0.039478
09/11/99	273.16	21088 48	0.36	6.7	1365 281	5.18	-0.03316
10/11/99	269.42	20800 18	0.37	6.6	1373 46	5 10	-0.01360
11/11/99	265.02	20460	0.37	6.5	1381 /53	5 10	-0.01633
12/11/00	253.47	10568 55	0.30	6.2	1306.06	5.02	-0.01000
15/11/00	233.47	10125.84	0.55	6.1	1204 20	5.25	-0.04336
16/11/00	247.73	10162.02	0.4	0.1	1394.39	5.20	-0.02205
17/11/99	240.22	19103.23	0.4	0.1	1420.003	5.29	0.001978
17/11/99	265.33	20484.13	0.37	6.5	1410.703	5.24	0.068931
18/11/99	271.45	20956.99	0.36	6.6	1424.938	5.24	0.023066
19/11/99	259.08	20001.61	0.38	6.3	1422	5.25	-0.04557
22/11/99	262.44	20260.96	0.38	6.4	1420.94	5.22	0.012969
23/11/99	264.06	20386.41	0.37	6.5	1404.641	5.27	0.006173
24/11/99	263	20304.38	0.38	6.4	1417.08	5.29	-0.00401
25/11/99	263	20304.38	0.38	6.4	1417.08	5.29	0
26/11/99	255.18	19700.66	0.39	6.2	1416.62	5.3	-0.02973

29/11/99	250.2	19316.43	0.4	6.1	1407.83	5.32	-0.01952
30/11/99	246.61	19038.98	0.4	6	1388.906	5.32	-0.01435
01/12/99	235.78	18203.02	0.42	5.8	1397.719	5.26	-0.04392
02/12/99	240.64	18578.18	0.41	5.9	1409.031	5.24	0.020612
03/12/99	240.17	18541.98	0.41	5.9	1433.297	5.22	-0.00195
06/12/99	237.91	18367.07	0.42	5.8	1423.328	5.25	-0.00941
07/12/99	248.86	19212.69	0.4	6.1	1409.172	5.22	0.046026
08/12/99	247.25	19088.44	0.4	6	1403.875	5.21	-0.00647
09/12/99	240.7	18583	0.45	5.9	1408 109	5.25	-0.02649
10/12/99	238.51	18413 68	0.45	5.8	1417 031	5 27	-0.0091
13/12/99	242.33	18708 45	0.44	5.9	1415 219	5.36	0.016016
14/12/99	242 77	18742 23	0.44	5.9	1403 172	5 30	0.001816
15/12/99	230 52	17796.49	0.47	5.6	1413 32	5.34	-0.05046
16/12/99	241.86	18672.27	0.45	5.0	1410.02	5.34	0.040102
17/12/00	221 21	17959.00	0.45	5.5	1410.701	5.50	0.049193
17/12/99	201.01	17030.02	0.47	5.7	1421.031	5.45	-0.04362
20/12/99	229.03	17727.73	0.47	5.0	1418.094	5.54	-0.00726
21/12/99	227.28	1/546./9	0.47	5.6	1433.43	5.56	-0.01023
22/12/99	245.66	18965.4	0.44	6	1436.125	5.55	0.080869
23/12/99	245.04	18917.82	0.44	6	1458.344	5.46	-0.00252
24/12/99	245.04	18917.82	0.44	6	1458.34	5.55	0
27/12/99	241.5	18644.52	0.45	5.9	1457.094	5.44	-0.01445
28/12/99	230.53	17797.7	0.47	5.6	1457.656	5.41	-0.04542
29/12/99	232.31	19965.67	0.46	5.7	1463.453	5.22	0.007721
30/12/99	219.83	18892.72	0.49	5.4	1464.469	5.22	-0.05372
31/12/99	219.83	18892.72	0.49	5.4	1469.25	5.22	0
03/01/00	221.81	19063.27	0.49	5.4	1455.22	5.22	0.009007
04/01/00	215.56	18526.13	0.5	5.3	1399.422	5.43	-0.02818
05/01/00	213.73	18369.01	0.5	5.2	1402.11	5.44	-0.00849
06/01/00	213.3	18331.41	0.51	5.2	1403.453	5.42	-0.00201
07/01/00	247.51	21271.79	0.44	6.1	1441.469	5.39	0.160384
10/01/00	247.73	21291.08	0.44	6.1	1457.594	5.4	0.000889
11/01/00	232.09	19946.87	0.46	5.7	1438.56	5.43	-0.06313
12/01/00	229.59	19732.02	0.47	5.6	1432.25	5.43	-0.01077
13/01/00	222.25	19100.87	0.49	5.4	1449.672	5.39	-0.03197
14/01/00	216.94	18644.51	0.5	5.3	1465,156	5.42	-0.02389
17/01/00	216.94	18644.51	0.5	5.3	1465 156	5.42	0.02000
18/01/00	216.13	18574 47	0.5	5.3	1455 141	5.37	-0.00373
19/01/00	217 52	18693.98	0.5	53	1455 906	5.52	0.006431
20/01/00	220.05	18080 /1	0.49	5.0	1445 562	5.02	0.015760
21/01/00	220.35	10625.02	0.43	5.4	1443.303	5.47	0.013703
21/01/00	220.50	10015 07	0.47	5.0	1441.339	5.44	0.000604
24/01/00	230.50	19015.27	0.47	5.0	1401.55	5.5	0.009034
25/01/00	225.83	19408.38	0.48	5.5	1410.031	5.54	-0.02052
26/01/00	223.75	19229.79	0.48	5.5	1404.094	5.56	-0.00921
2//01/00	219.06	18826.93	0.49	5.4	1398.563	5.57	-0.02096
28/01/00	212.92	18299.18	0.51	5.2	1360.156	5.65	-0.02803
31/01/00	211.6	18185.57	0.51	5.2	1394.453	5.68	-0.0062
01/02/00	205.75	17682.8	0.52	5	1409.281	5.72	-0.02765
02/02/00	224.14	19263.36	0.48	5.5	1409.12	5.69	0.08938

03/02/00	235.69	20255.73	0.46	5.8	1424.969	5.62	0.05153
04/02/00	226.88	19498.36	0.48	5.6	1424.37	5.64	-0.03738
07/02/00	226.94	19503.73	0.48	5.6	1424.18	5.63	0.000264
08/02/00	229.78	19748.13	0.47	5.6	1441.75	5.69	0.012514
09/02/00	246.84	21214.54	0.44	6	1411.7	5.63	0.074245
10/02/00	239.14	20552.5	0.45	5.9	1416.828	5.65	-0.03119
11/02/00	238.27	20477.3	0.45	5.8	1387.125	5.67	-0.00364
14/02/00	223.11	19174.73	0.48	5.5	1389.94	5.62	-0.06363
15/02/00	221.67	19051.02	0.49	5.4	1402.047	5.76	-0.00645
16/02/00	222.81	19149.21	0.48	5.5	1387.67	5.74	0.005143
17/02/00	231.98	19937.47	0.46	5.7	1388.266	5.74	0.041156
18/02/00	227.45	19548.04	0.47	5.6	1346.09	5.78	-0.01953
21/02/00	227.45	19548.04	0.47	5.6	1346.09	5.78	0.01000
22/02/00	226.41	19458.07	0.48	5.5	1352 17	5.76	-0.00457
23/02/00	230.42	19803.02	0.47	5.6	1360.60	5.70	0.017711
23/02/00	200.42	10466 12	0.47	5.0	1252 422	5.79	0.01701
24/02/00	220.5	10240.02	0.48	5.5	1000.050	5.0	-0.01701
25/02/00	223.90	19249.93	0.40	5.5	1333.359	5.79	-0.01113
28/02/00	219.3	10047.07	0.49	5.4	1348.05	5.82	-0.02089
29/02/00	223.48	19206.95	0.48	5.5	1366.422	5.8	0.019061
01/03/00	220.89	18984.04	0.49	5.4	13/9.19	5.75	-0.01159
02/03/00	209.39	17995.69	0.51	5.1	1381.766	5.74	-0.05206
03/03/00	204.97	17615.66	0.53	5	1409.172	5.78	-0.02111
06/03/00	204.48	17574.04	0.53	5	1391.281	5.82	-0.00239
07/03/00	207.91	17868.12	0.52	5.1	1355.625	5.82	0.016774
08/03/00	207.61	17842.61	0.52	5.1	1366.7	5.83	-0.00144
09/03/00	206.17	17719.06	0.52	5	1401.688	5.81	-0.00694
10/03/00	205.5	17661.32	0.52	5	1395.07	5.85	-0.00325
13/03/00	203.11	17455.86	0.53	5	1383.62	5.87	-0.01163
14/03/00	193.39	16620.6	0.56	4.7	1359.15	5.88	-0.04786
15/03/00	192.55	16548.09	0.56	4.7	1392.15	5.84	-0.00434
16/03/00	204	17532.41	0.53	5	1458.47	5.85	0.059465
17/03/00	213	18305.89	0.51	5.2	1464.469	5.87	0.044118
20/03/00	212.05	18223.98	0.51	5.2	1456.625	5.89	-0.00446
21/03/00	214.23	18411.98	0.5	5.2	1493.875	5.89	0.010281
22/03/00	215.08	18484.5	0.5	5.3	1500.641	5.91	0.003968
23/03/00	212.64	18275.01	0.51	5.2	1527.344	5.88	-0.01134
24/03/00	212.83	18291.13	0.51	5.2	1527.453	5.88	0.000894
27/03/00	220.06	18912.87	0.49	5.4	1523.859	5.85	0.033971
28/03/00	234.05	20114.73	0.46	5.7	1507,734	5.88	0.063574
29/03/00	226.42	19459.41	0.48	5.5	1508,516	5.87	-0.0326
30/03/00	217.44	18687.27	0.5	5.3	1487.922	5.86	-0.03966
31/03/00	220.83	18978 67	0.49	5.4	1498 578	5.88	0.015591
03/04/00	221 44	19031.04	0.49	54	1505 969	5.86	0.002762
04/04/00	231 37	19884 67	0.47	5.7	1494 734	5.83	0.044843
05/04/00	230 72	20603 53	0.45	5.0	1487 275	5.83	0.036133
06/04/00	203.15	10501.01	0.43	5.9	1501 244	5.03	-0.04014
07/04/00	217.35	18670 75	0.47	5.0	1516 244	5.9	-0.04914
10/04/00	217.00	19015 55	0.0	5.5	1504 452	5.67	0.010600
10/04/00	220.09	10910.00	0.49	0.4	1004.400	0.04	0.012000

11/04/00	219.72	18883.32	0.48	5.4	1500.594	5.82	-0.00168
12/04/00	226.64	19478.21	0.47	5.5	1467.172	5.83	0.031495
13/04/00	232.3	19964.33	0.46	5.7	1440.516	5.8	0.024974
14/04/00	225.53	19382.87	0.47	5.5	1356.563	5.8	-0.02914
17/04/00	218.22	18754.41	0.49	5.3	1401.438	5.8	-0.03241
18/04/00	214.63	18445.55	0.5	5.3	1441.609	5.81	-0.01645
19/04/00	211.34	18163.55	0.5	5.2	1427.469	5.81	-0.01533
20/04/00	212.58	18269.64	0.5	5.2	1434.531	5.78	0.005867
21/04/00	212.58	18269.64	0.5	5.2	1434.531	5.78	0
24/04/00	219.58	18871.24	0.48	5.4	1429.859	5.76	0.032929
25/04/00	215.19	18493.89	0.49	5.3	1477.438	5.79	-0.01999
26/04/00	219.2	18878.4	0.48	5.4	1460.984	5.74	0.018635
27/04/00	209.63	18053.5	0.51	5.1	1464.922	5.74	-0.04366
28/04/00	216.98	18687.32	0.49	5.3	1452,422	5.81	0.035062
01/05/00	228.75	19700.6	0.46	5.6	1468.25	5.79	0.054245
02/05/00	225.02	19378.99	0.47	5.5	1446.281	5.91	-0.01631
03/05/00	224.64	19346.69	0.47	5.5	1415.094	5.9	-0.00169
04/05/00	226.75	19528.36	0.47	5.5	1409.563	5.88	0.009393
05/05/00	225.59	19428.78	0.47	5.5	1432.625	5.95	-0.00512
08/05/00	213.61	18396.65	0.5	5.2	1424.172	6.05	-0.05311
09/05/00	211.52	18216.33	0.5	52	1412 141	6.14	-0.00978
10/05/00	208.77	17979.49	0.51	5.1	1383.047	6.11	-0.013
11/05/00	216.88	18677.89	0.49	5.3	1407 813	6.12	0.038847
12/05/00	224.77	19357.46	0.47	5.5	1420 953	6 14	0.03638
15/05/00	237.02	20412 46	0.45	5.8	1452 359	6 14	0.0545
16/05/00	245.95	21182 19	0.43	6	1466 031	6 14	0.037676
17/05/00	242.08	20848 46	0.44	59	1447 797	6.04	-0.01573
18/05/00	236.09	20333.07	0.45	5.8	1437 203	5.88	-0.02474
19/05/00	233.83	20137 95	0.45	5.7	1406 953	5.00	-0.00957
22/05/00	234 72	20214 65	0.45	57	1400.333	5.86	0.003806
23/05/00	242 34	20871 34	0.44	5.9	1373 850	5.00	0.0000000
24/05/00	240.44	20707 16	0.44	5.9	1399 047	5.01	-0.00784
25/05/00	248.08	21365.2	0.43	6.1	1381 516	5.85	0.031775
26/05/00	233 31	20093 54	0.46	5.7	1378 016	5.00	0.05054
29/05/00	233.31	20093.54	0.46	5.7	1378.016	5.00	-0.05954
30/05/00	240.05	20033.54	0.40	5.7	1400 450	5.00	0 000000
31/05/00	228.47	19676 38	0.47	5.9	1422.455	5.75	0.020009
01/06/00	234.2	20170.27	0.47	5.0	1420.594	5.04	-0.04624
02/06/00	204.2	10353 45	0.43	5.7	1440.013	5.00	0.02500
05/06/00	224.72	19980 52	0.46	5.5	14/7.200	5.05	-0.04040
05/06/00	202	19900.00	0.46	5.7	1407.03	5.00	0.032396
07/06/00	200.00	10012.05	0.46	5.7	1457.84	5.00	0.000081
07/06/00	231.22	19913.25	0.46	5.7	14/1.36	5.92	-0.00998
08/06/00	235.46	20280.62	0.45	5.8	1461.67	5.9	0.018424
12/06/00	238.58	20547.06	0.45	5.8	1456.95	5.91	0.013165
12/06/00	230.95	19890.38	0.46	5.7	1446	5.85	-0.03198
13/06/00	233.23	20086.84	0.46	5.7	1469.44	5.89	0.009872
14/06/00	219.58	18910.72	0.48	5.4	1470.54	5.81	-0.05853
15/06/00	212.27	18280.95	0.51	5.2	1478.73	5.82	-0.03329

16/06/00	211.36	18202.9	0.51	5.2	1464.46	5.81	-0.00429
19/06/00	225.8	19446.3	0.48	5.5	1486	5.8	0.068319
20/06/00	226.53	19509.55	0.48	5.5	1475.95	5.79	0.003233
21/06/00	227.52	19594.32	0.47	5.6	1479.13	5.8	0.00437
22/06/00	227.34	19579.52	0.47	5.6	1452.18	5.83	-0.00079
23/06/00	219.59	18911.75	0.49	5.4	1441.48	5.83	-0.03409
26/06/00	208.42	17949.91	0.52	5.1	1455.31	5.82	-0.05087
27/06/00	220.34	18976.66	0.49	5.4	1450.55	5.83	0.057192
28/06/00	212.78	18325.36	0.51	5.2	1454.82	5.81	-0.03431
29/06/00	213.92	18423.59	0.5	5.2	1442 39	5.84	0.005358
30/06/00	212.19	18274 43	0.51	5.2	1454.6	5.87	-0.00809
03/07/00	212.48	18299 79	0.51	5.2	1469 54	5.53	0.001367
04/07/00	212.40	18299 79	0.51	5.2	1469 54	5.53	0.001007
05/07/00	218.81	18844 70	0.49	5.2	1446.02	5.07	0.020701
06/07/00	207 14	10562.02	0.49	5.4	1456.67	6.01	0.029791
00/07/00	227.14	19005 50	0.40	5.0	1430.07	0.01	0.03607
10/07/00	219.75	10925.52	0.49	5.4	1478.9	0	-0.03254
10/07/00	210.22	18021.41	0.5	5.3	1475.62	6.06	-0.01606
11/07/00	216.05	18606.6	0.5	5.3	1480.88	6.09	-0.00079
12/07/00	213.06	18349.58	0.51	5.2	1492.92	6.16	-0.01384
13/07/00	208.83	17984.9	0.52	5.1	1495.84	6.18	-0.01985
14/07/00	215.81	18586.42	0.5	5.3	1509.98	6.14	0.033424
17/07/00	221.33	19061.44	0.49	5.4	1510.49	6.15	0.025578
18/07/00	220.95	19029.14	0.49	5.4	1493.74	6.15	-0.00172
19/07/00	212.78	18325.36	0.51	5.2	1481.96	6.16	-0.03698
20/07/00	212.66	18314.59	0.51	5.2	1495.57	6.18	-0.00056
21/07/00	213.19	18360.34	0.51	5.2	1480.19	6.12	0.002492
24/07/00	225.92	19457.07	0.48	5.5	1464.29	6.15	0.059712
25/07/00	232.03	19983.28	0.47	5.7	1474.47	6.18	0.027045
26/07/00	232.44	20018.27	0.46	5.7	1452.42	6.17	0.001767
27/07/00	220.31	18974.02	0.49	5.4	1449.62	6.22	-0.05219
28/07/00	227.14	19562.09	0.48	5.6	1419.89	6.19	0.031002
31/07/00	229.52	19767	0.47	5.6	1430.83	6.2	0.010478
01/08/00	223	19205.48	0.48	5.5	1438.1	6.25	-0.02841
02/08/00	220	18947.11	0.49	5.4	1438.7	6.25	-0.01345
03/08/00	221.67	19091.1	0.49	5.4	1452.56	6.23	0.007591
04/08/00	225.5	19420.79	0.48	5.5	1462.93	6.23	0.017278
07/08/00	204 55	17616 51	0.53	5	1479 32	6.23	-0.0929
08/08/00	207.91	17905 56	0.52	51	1482.8	6.25	0.016426
09/08/00	192	16535.66	0.56	4.7	1472 87	6.23	-0.07652
10/08/00	170 38	14673.25	0.63	4.7	1460.25	6.24	-0.1126
11/08/00	175.2	15007.12	0.63	4.2	1400.25	6.29	-0.1120
14/08/00	175.5	14760.06	0.62	4.3	1471.04	0.20	0.020077
15/08/00	171.41	14702.00	0.63	4.2	1491.50	0.27	-0.02219
16/08/00	147.00	10600.44	0.00	4	1404.43	0.20	-0.048/1
17/08/00	147.38	12092.41	0.73	3.6	14/9.85	6.27	-0.09616
19/08/00	152.02	13092.07	0.71	3.7	1496.07	6.26	0.031483
18/08/00	152.08	13097.46	0.71	3.7	1491.72	6.26	0.000395
21/08/00	142.13	12240.27	0.76	3.5	1499.48	6.27	-0.06543
22/08/00	147.63	12713.94	0.73	3.6	1498.13	6.28	0.038697

23/08/00	144.94	12482.66	0.74	3.5	1505.97	6.29	-0.01822
24/08/00	141.58	12193.34	0.76	3.5	1508.31	6.29	-0.02318
25/08/00	141.95	12225.64	0.76	3.5	1506.45	6.29	0.002613
28/08/00	150	12918.67	0.72	3.7	1514.09	6.32	0.05671
29/08/00	143.78	12383.09	0.75	3.5	1509.84	6.31	-0.04147
30/08/00	138.75	11949.77	0.78	3.4	1502.59	6.31	-0.03498
31/08/00	129.41	11145.05	0.83	3.2	1517.68	6.3	-0.06732
01/09/00	121.8	10489.69	0.89	3	1520.77	6.26	-0.05881
04/09/00	121.8	10489.69	0.89	3	1520.77	6.26	0
05/09/00	126.42	10888.02	0.85	3.1	1507.08	6.25	0.037931
06/09/00	124.34	10709.04	0.87	3	1492 25	6.2	-0.01645
07/09/00	120.41	10369 93	0.9	29	1502.51	6 19	-0.03161
08/09/00	104 61	9009 43	1 11	2.6	1494 5	6.10	-0.13122
11/09/00	104.01	8007.32	1.11	2.0	1494.5	6.11	0.00124
12/00/00	109.91	0220.26	1.11	2.0	1409.20	0.11	-0.00134
12/09/00	112.31	9320.30	1.07	2.7	1481.99	6.09	0.036757
13/09/00	113.31	9758.77	1.02	2.8	1484.91	6.09	0.046164
14/09/00	114.31	9845.1	1.01	2.8	1480.87	6.14	0.008825
15/09/00	114.39	9851.83	1.01	2.8	1465.81	6.14	0.0007
18/09/00	119.8	10317.71	0.97	2.9	1444.51	6.14	0.047294
19/09/00	119.59	10299.95	0.97	2.9	1459.9	6.15	-0.00175
20/09/00	129.09	11118.13	0.9	3.2	1451.34	6.16	0.079438
21/09/00	120.98	10419.71	0.96	3	1449.05	6.15	-0.06282
22/09/00	120.81	10404.91	0.96	3	1448.72	6.16	-0.00141
25/09/00	124.06	10684.82	0.94	3	1439.03	6.15	0.026902
26/09/00	121.73	10484.31	0.95	3	1427.21	6.17	-0.01878
27/09/00	117.39	10110.21	0.99	2.9	1426.57	6.19	-0.03565
28/09/00	118.03	10165.38	0.98	2.9	1458.29	6.23	0.005452
29/09/00	120.3	10360.5	0.96	2.9	1436.51	6.21	0.019232
02/10/00	117.69	10135.77	0.99	2.9	1436.23	6.19	-0.0217
03/10/00	113.09	9740.14	1.03	2.8	1426.46	6.25	-0.03909
04/10/00	114.7	9878.75	1.01	2.8	1434.32	6.25	0.014236
05/10/00	112.34	9675.55	1.03	2.7	1436.28	6.24	-0.02058
06/10/00	110.52	9518.1	1.05	2.7	1408.99	6.24	-0.0162
09/10/00	110.38	9505.99	1.05	2.7	1402.03	6.24	-0.00127
10/10/00	110.84	9546.36	1.05	2.7	1387.02	6.22	0.004167
11/10/00	108.81	9371.42	1.07	27	1364 59	6.22	-0.01831
12/10/00	111	9559 82	1.05	27	1329 78	6.17	0.020127
13/10/00	105.89	9119 77	11	26	1374 17	6.17	-0.04604
16/10/00	104.62	9010 34	1 11	2.0	1374.62	6.22	-0.01100
17/10/00	102.53	8830.45	1.11	2.0	1240.07	6.20	-0.011009
18/10/00	102.00	8818 34	1.10	2.5	1049.97	6.29	-0.01990
19/10/00	00 50	9494.09	1.10	2.5	1342.13	0.0	-0.00137
20/10/00	90.52	7647 59	1.10	2.4	1388.76	0.32	-0.0378
20/10/00	00.0	7705 45	1.31	2.2	1396.93	0.31	-0.09866
23/10/00	89.47	7705.45	1.3	2.2	1395.78	6.35	0.007545
24/10/00	91.95	/919.41	1.26	2.2	1398.13	6.35	0.027719
25/10/00	99.25	8547.85	1.17	2.4	1364.9	6.34	0.079391
26/10/00	105.13	9053.84	1.1	2.6	1364.44	6.36	0.059244
27/10/00	102.3	8810.26	1.13	2.5	1379.58	6.34	-0.02692

30/10/00	97	8354.07	1.2	2.4	1398.66	6.35	-0.05181
31/10/00	99.09	8534.39	1.17	2.4	1429.4	6.37	0.021546
01/11/00	97.17	8368.88	1.19	2.4	1421.22	6.37	-0.01938
02/11/00	101.31	8725.48	1.14	2.5	1428.32	6.37	0.042606
03/11/00	102.25	8806.23	1.13	2.5	1426.69	6.37	0.009278
06/11/00	105.5	9086.13	1.1	2.6	1432.19	6.41	0.031785
07/11/00	105.83	9114.39	1.1	2.6	1431.87	6.41	0.003128
08/11/00	102.34	8814.3	1.13	2.5	1409.28	6.4	-0.03298
09/11/00	103.91	8948.87	1.12	2.5	1400 14	6.38	0.015341
10/11/00	102 41	8819 68	1 13	25	1365.98	6.37	-0.01444
13/11/00	104.39	8990 59	1.11	2.6	1351 26	6.38	0.019334
14/11/00	107.41	9250 31	1.08	2.6	1382.95	6.37	0.010004
15/11/00	111 58	9609.77	1.00	2.0	1280.81	6.37	0.02030
16/11/00	111.07	0642.25	1.04	2.7	1070.00	0.37	0.000020
17/11/00	115.97	9043.25	1.04	2.7	1372.32	0.35	0.003495
17/11/00	115.45	9943.34	1	2.8	1367.72	6.35	0.03108
20/11/00	117.59	10127.7	0.99	2.9	1342.62	6.34	0.018536
21/11/00	116.41	10025.43	1	2.8	1347.35	6.35	-0.01003
22/11/00	114.84	9890.86	1.01	2.8	1322.36	6.35	-0.01349
23/11/00	114.84	9890.86	1.01	2.8	1322.36	6.35	0
24/11/00	113.41	9767.05	1.02	2.8	1341.77	6.37	-0.01245
27/11/00	118.73	10225.94	0.98	2.9	1348.97	6.33	0.046909
28/11/00	118.59	10213.82	0.98	2.9	1336.09	6.28	-0.00118
29/11/00	120.81	10404.91	0.96	3	1341.91	6.23	0.01872
30/11/00	124.41	10714.42	0.93	3	1314.95	6.21	0.029799
01/12/00	129.09	11118.13	0.9	3.2	1315.23	6.21	0.037618
04/12/00	130.69	11255.39	0.89	3.2	1324.97	6.16	0.012394
05/12/00	113.09	9740.14	1.03	2.8	1376.54	6.08	-0.13467
06/12/00	99.08	8533.05	1.17	2.4	1351.46	6.09	-0.12388
07/12/00	98.67	8498.06	1.18	2.4	1343.55	6.11	-0.00414
08/12/00	98.67	8498.06	1.18	2.4	1369.89	6.07	0
11/12/00	98.67	8498.06	1.18	24	1380.2	6.06	0
12/12/00	98.67	8498.06	1.18	24	1371 18	6.06	0
13/12/00	97	8354.07	12	2.4	1350.00	6.05	-0.01602
14/12/00	97	8354.07	1.2	2.4	1240.02	6.05	-0.01093
15/12/00	97	9254.07	1.2	2.4	1010.15	6.01	0
18/12/00	97	0354.07	1.2	2.4	1312.15	5.01	0
10/12/00	97	0354.07	1.2	2.4	1322.74	5.95	0
19/12/00	97	0354.07	1.2	2.4	1305.6	5.92	0
20/12/00	98	8440.2	1.18	2.4	1264.74	5.81	0.010309
21/12/00	98	8440.2	1.18	2.4	1274.86	5.46	0
22/12/00	89.5	7708.14	1.34	2.2	1305.97	5.46	-0.08673
25/12/00	89.5	7708.14	1.34	2.2	1305.97	5.46	0
26/12/00	87.5	7535.89	1.37	2.1	1315.19	5.77	-0.02235
27/12/00	87	7492.83	1.38	2.1	1328.92	5.76	-0.00571
28/12/00	87	7492.83	1.38	2.1	1334.22	5.89	0
29/12/00	87	7492.83	1.38	2.1	1320.28	5.89	0
01/01/01	87	7492.83	1.38	2.1	1320.28	5.89	0
02/01/01	92	7923.45	1.31	2.3	1283.27	5.83	0.057471
03/01/01	88	7578.95	1.36	2.2	1347.56	5.73	-0.04348

04/01/01	88	7578.95	1.36	2.2	1333.34	5.38	0
05/01/01	92	7923.45	1.31	2.3	1298.35	5.12	0.045455
08/01/01	92.5	7966.51	1.3	2.3	1295.86	5.18	0.005435
09/01/01	88.5	7622.02	1.36	2.2	1300.8	5.23	-0.04324
10/01/01	83	7148.33	1.45	2	1313.27	5.3	-0.06215
11/01/01	83	7148.33	1.45	2	1326.82	5.29	0
12/01/01	85	7320.58	1.41	2.1	1318.32	5.29	0.024096
15/01/01	85	7320.58	1.41	2.1	1318.32	5.34	0
16/01/01	83	7148.33	1.45	2	1326.65	5.36	-0.02353
17/01/01	88	7578.95	1.36	22	1329 47	5 36	0.060241
18/01/01	84.72	7296.3	1.42	21	1347 97	5.28	-0.03727
19/01/01	86	7406 7	14	21	1342 54	5.22	0.015109
22/01/01	90	7751.2	1 33	22	13/2 0	5.22	0.010103
23/01/01	03	8009 57	1 20	2.2	1360 /	5.20	0.040312
24/01/01	05	0101 00	1.25	2.0	1264 21	5.22	0.0000000
24/01/01	95	0101.02	1.20	2.3	1004.01	5.27	0.021505
25/01/01	95	0101.02	1.20	2.3	1357.51	5.20	0
26/01/01	95	8181.82	1.26	2.3	1354.95	5.16	0
29/01/01	96.5	8311.01	1.24	2.4	1364.17	5.13	0.015789
30/01/01	93.5	8052.64	1.28	2.3	1373.73	5.01	-0.03109
31/01/01	95.5	8224.89	1.26	2.3	1366.01	4.99	0.02139
01/02/01	94.5	8138.76	1.27	2.3	1373.47	4.99	-0.01047
02/02/01	93.88	8084.93	1.28	2.3	1349.47	5.05	-0.00656
05/02/01	91.5	7880.39	1.31	2.2	1354.31	5.09	-0.02535
06/02/01	91	7837.32	1.32	2.2	1352.26	5.08	-0.00546
07/02/01	90.5	7794.26	1.33	2.2	1340.89	5.07	-0.00549
08/02/01	89.5	7708.14	1.34	2.2	1332.53	5.07	-0.01105
09/02/01	91	7837.32	1.32	2.2	1314.76	5.06	0.01676
12/02/01	90.5	7794.26	1.33	2.2	1330.31	5.06	-0.00549
13/02/01	87.5	7535.89	1.37	2.1	1318.8	5.03	-0.03315
14/02/01	90.5	7794.26	1.33	2.2	1315.922	5.03	0.034286
15/02/01	86.5	7449.77	1.39	2.1	1326.616	5.08	-0.0442
16/02/01	86.5	7449.77	1.39	2.1	1301.53	4.95	0
19/02/01	86.5	7449.77	1.39	2.1	1301.53	4.95	0
20/02/01	87	7492.83	1.38	2.1	1278,946	5.03	0.00578
21/02/01	87	7492.83	1.38	2.1	1255.27	5.02	0
22/02/01	87	7492 83	1.38	21	1252 82	4 99	0
23/02/01	86.63	7460.53	1 39	21	1245.86	4.00	-0.00425
26/02/01	03.5	8052.64	1.00	2.1	1243.00	4.55	0.070202
27/02/01	97.5	8207 14	1.20	2.5	1257.05	4.02	0.079303
28/02/01	97.5	0097.14	1.20	2.4	1207.94	4.75	0.042701
20/02/01	97.5	0397.14	1.23	2.4	1239.94	4.04	0
01/03/01	97	8354.07	1.24	2.4	1241.23	4.83	-0.00513
02/03/01	94	8095.7	1.28	2.3	1234.18	4.83	-0.03093
05/03/01	94	8095.7	1.28	2.3	1241.41	4.87	0
06/03/01	95	8181.82	1.26	2.3	1253.805	4.77	0.010638
07/03/01	101.5	8/41.63	1.18	2.5	1261.899	4.69	0.068421
08/03/01	97.5	8397.14	1.23	2.4	1264.74	4.68	-0.03941
09/03/01	99.5	8569.39	1.21	2.4	1233.42	4.74	0.020513
12/03/01	99.5	8569.39	1.21	2.4	1180.16	4.66	0

13/03/01	96	8267.95	1.25	2.3	1197.66	4.66	-0.03518
14/03/01	94	8095.7	1.28	2.3	1166.71	4.54	-0.02083
15/03/01	94	8095.7	1.28	2.3	1173.569	4.51	0
16/03/01	95	8181.82	1.26	2.3	1150.538	4.53	0.010638
19/03/01	95	8181.82	1.26	2.3	1170.81	4.52	0
20/03/01	95	8181.82	1.26	2.3	1142.62	4.49	0
21/03/01	95	8181.82	1.26	2.3	1122.141	4.3	0
22/03/01	95	8181.82	1.26	2.3	1117.58	4.26	0
23/03/01	95	8181.82	1.26	2.3	1139.83	4.28	0
26/03/01	95	8181.82	1.26	2.3	1152.69	4.26	0
27/03/01	95	8181.82	1.26	2.3	1182.17	4.33	0
28/03/01	95	8181.82	1.26	2.3	1153.29	4.34	0
29/03/01	95	8181.82	1.26	2.3	1147.95	4.33	0
30/03/01	95	8181.82	1.26	2.3	1160.333	4.29	0
02/04/01	95	8181.82	1.26	2.3	1145.87	4.26	0
03/04/01	95	8181.82	1.26	2.3	1106.467	4.17	0
04/04/01	95	8181.82	1.19	2.3	1103.25	4.08	0
05/04/01	95	8181.82	1.19	2.3	1151.44	4.09	0
06/04/01	95	8181.82	1.19	2.3	1128.43	3.97	0
09/04/01	95	8181.82	1.19	2.3	1137.59	3.93	0
10/04/01	95	8181.82	1.19	2.3	1168.384	3.93	0
11/04/01	95	8181.82	1.19	2.3	1165.89	4.07	0
12/04/01	95	8181.82	1.19	2.3	1183.5	4.02	0
13/04/01	95	8181.82	1.19	2.3	1183.5	4.02	0
16/04/01	95	8181.82	1.19	2.3	1179.68	4.02	0
17/04/01	95	8181.82	1.19	2.3	1191.81	4.11	0
18/04/01	95	8181.82	1.19	2.3	1238.16	4.11	0
19/04/01	95	8181.82	1.19	2.3	1253.7	3.84	0
20/04/01	95	8181.82	1.19	2.3	1242.98	3.82	0
23/04/01	95	8181.82	1.19	2.3	1224.36	3.71	0
24/04/01	95	8181.82	1.19	2.3	1209.47	3.79	0
25/04/01	95	8181.82	1.19	2.3	1228.75	3.81	0
26/04/01	95	8181.82	1.19	2.3	1234.52	3.82	0
27/04/01	95	8181.82	1.19	2.3	1253.05	3.82	0
30/04/01	95	8181.82	1.19	2.3	1249.46	3.89	0
01/05/01	95	8181.82	1.19	2.3	1266.44	3.92	0
02/05/01	95	8181.82	1.19	2.3	1267.43	3.88	0
03/05/01	95	8181.82	1.19	2.3	1248.58	3.85	0
04/05/01	95	8181.82	1.19	2.3	1266.61	3.76	0
07/05/01	95	8181.82	1.19	2.3	1263.51	3.71	0
08/05/01	95	8181.82	1.19	2.3	1261.2	3.68	0
09/05/01	129.5	11153.12	0.87	3.2	1255.54	3.73	0.363158
10/05/01	129.5	11153.12	0.87	3.2	1255.18	3.72	0
11/05/01	129.5	11153.12	0.87	3.2	1245.67	3.75	0
14/05/01	129.5	11153.12	0.87	3.2	1248.92	3.7	0

Appendix 3:

Bridgestone Corporation (BRDCY US) Share Price VS Dow Jones Industrial Average Bridgestone Corporation (BRDCY US) Share Price vs. Dow Jones Industrial Average



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