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Financial estimates against investors' preferences: anchoring, denial and spillover effects

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This experimental study investigates how the characteristics of an estimate in a sensitivity disclosure and the level of threat it presents to investors' preferences interact to influence investors' risk judgments. Firstly, I predict and find that variation in an estimate affects not only investors' judgment on a related issue but also their future judgments on an unrelated issue. Secondly, I predict and find that investors are more sensitive to variations in an estimate when information contained in the estimate presents less threat to their preferred conclusions than when it presents greater threat. Finally, I predict and find that investors perceive more uncertainty regarding the association between the disclosed risk factor and the estimated financial reporting item in the estimate when the information presents greater threat.

Keywords: experiment; sensitivity disclosure; investor judgment; motivated reasoning

1. Introduction

Much previous financial accounting research has focused on the decision usefulness of the accounting information provided (see, for example, Koonce et al. 2005, Elliott et al. 2011, Nelson and Rupar 2015), with implications for policy, the quality of financial information and the need for investor education programmes. In a similar vein, this study examines how investors use one of the most prominently disclosed sources of accounting information, namely sensitivity disclosures. Specifically, it examines how the format of sensitivity disclosures impacts on investors' judgments of the disclosures themselves and of unrelated items.

In a financial disclosure setting, a sensitivity disclosure describes the relationship between a financial reporting item and its underlying inputs, typically by indicating how the value of the item would change in response to a hypothetical percentage change in the underlying input. Sensitivity disclosures are becoming more prevalent with increasing use of fair value financial

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reporting, and managers frequently have discretion to choose the hypothetical changes used in such disclosures. Accounting standards often allow managers flexibility in the format of their disclosures, including sensitivity disclosures, leading to variation in their placement, transparency and labelling (Koonce and Mercer 2005). Companies typically have flexibility in their choice of disclosure parameters for the same sensitivity,[1] and there is considerable variation across companies' choice of parameters (Nelson and Rupar 2015).

Psychology theories suggest that format effects may arise even when the format of a disclosure does not convey relevant information, and that certain formats may lead to systematic biases in investors' cognitive processing of the information disclosed (Koonce and Mercer 2005). Examination of hand-picked data from Fortune 100 companies' sensitivity disclosures reveals that managers do not necessarily convey relevant information in the magnitude of the hypothetical changes they choose to use in disclosures (see Appendix 1).

I conduct an experiment to examine how, when the actual sensitivity is kept constant (i.e. each 1% change in the input impacts on the financial reporting item by the same amount), different hypothetical changes in a sensitivity disclosure impact on investors' beliefs, both about the financial reporting item depicted and about a totally unrelated item, in two settings in which the information provided poses a low versus high threat to investors' preferences. The participants, who are graduate accounting students, play the role of investors. After viewing some background information about a company, they provide a judgment about its riskiness. The participants then read a sensitivity disclosure about the relationship between natural gas prices and the company's earnings. After reading some information about the expected company and market returns, the participants make an investment decision on their given portfolio. Afterwards, they make some judgments relating to the information given in the sensitivity disclosure, and then answer some demographic questions. At the end of the experiment, they make a judgment about a matter unrelated to the sensitivity disclosure they have previously read.

With random assignment, half the participants receive a sensitivity disclosure using a lower hypothetical percentage, and the other half receive a sensitivity disclosure using a higher hypothetical percentage, where the actual sensitivity is held constant across conditions. Again with random assignment, while keeping the risk depicted in the sensitivity disclosure constant, half the participants read that the company shares are expected to beat the market, and the other half read that the return on the company shares is expected to be equivalent to the market return.

Since sensitivity disclosures typically inform investors about the risk of change to a financial reporting item, the information depicted in the disclosure often goes against the preferences of investors who have already invested in the company. Although the previous literature suggests that individuals anchor on the parameters presented to them (see Tversky and Kahneman 1974, Kennedy et al. 1998), some studies suggest that individuals ignore information that is not aligned with their preferences (Festinger 1962, Kunda 1999) as long as they are able to justify themselves (Akerlof and Dickens 1982, Dunning et al. 1995, Kunda 1999), for instance, by claiming high uncertainty in the input–output relationship in the sensitivity disclosure.

In the experiment, participants are paid according to whether or not the value of their portfolio beats the market portfolio. Therefore, if, *ceteris paribus*, the company shares are expected to beat the market, participants will have a stronger preference for keeping the company shares. Since sensitivity disclosures typically inform investors about a risk, the information depicted in such disclosures goes against the preferences of investors who prefer to keep the shares. The higher the preference, the higher the threat to the preference posed by sensitivity disclosures. Therefore, in my setting, I operationalize the strength of the extent to which the sensitivity disclosure poses a threat to investors' preferences by manipulating the stock's future expected returns, *ceteris paribus*. In the low-threat condition, this return is equal to the market index fund that participants

can choose as an alternative investment, while in the high-threat condition, it is substantially higher than the alternative option.

Based on the motivated reasoning and cognitive dissonance literature (Festinger 1962, Kunda 1999, Hales 2007), I predict that, when a sensitivity disclosure presents a high threat to investors' preferences, the magnitude of the hypothetical change has less effect on their risk judgments and they perceive greater uncertainty regarding the relationship between the input and the output relationship depicted in the sensitivity disclosure. Drawing on the anchoring literature (Tversky and Kahneman 1974, Kennedy et al. 1998), I also predict that the magnitude of hypothetical changes in sensitivity disclosures impacts not only on investors' judgments of the disclosed risk, but also on those relating to an unrelated matter, such as the likelihood of a change in an asset that is neither the subject of, nor correlated with, items depicted in the sensitivity disclosure.

The results confirm my predictions. I find that a higher hypothetical change in a sensitivity disclosure increases investors' risk perceptions, but this effect is only significant when the information provided poses a low level of threat to investors' preferences. When the information poses a high level of threat, participants perceive more uncertainty in the input–output relationship depicted in the disclosure. Importantly, the magnitude of the hypothetical change in the sensitivity disclosure also impacts on participants' judgments of an unrelated issue.

This paper makes several contributions to the literature. Extant financial disclosure research (Nelson and Rupar 2015) has found that the format of the output of sensitivity disclosures impacts on investors' judgments, suggesting that the impact of the format of determinants on investors' judgments should also be examined. This paper focuses on the format of one such determinant, namely the hypothetical change used. Previous financial disclosure research has shown that investors anchor on the parameters presented to them (Kennedy et al. 1998, Nelson and Rupar 2015), which affects their judgments on issues relating to information in the disclosure. I extend this finding by showing that the parameters of a disclosure may also affect investors' judgments of issues unrelated to the disclosure. Such spill-over effects of anchoring do not appear to have been examined in previous studies.

Although previous financial disclosure research has examined sensitivity disclosures (Koonce et al. 2005, Elliott et al. 2007b, Nelson and Rupar 2015), it has neither studied the relationship between the level of threat to investors' preferences and investors' reactions to sensitivity disclosures, nor the impact of sensitivity disclosures on investors' unrelated judgments. Importantly, previous research on sensitivity disclosures has focused on prospective investors, whereas I focus on current investors who have already invested in the company. Focusing on current investors is important because previous research has found that current and prospective investors react to financial information in different ways (Cianci 2008), and that having chosen to hold a particular stock may exacerbate the influence of emotions on judgments, which in turn affects behaviour (Summers and Duxbury 2012). Although my participants did not make the initial decision to buy shares in the company, they were responsible for making decisions on whether to sell or keep the company's shares. Such responsibility may prompt emotions such as anticipated regret. The participants were told that they would be given feedback on the returns on their portfolio, which was likely to induce anticipated regret (Zeelenberg 1999).

Previous financial disclosure research has also shown that individuals react differently to the same information depending on their directional preferences (Hales 2007). I complement this research by providing evidence that, even when directional preferences are the same, in that the information disclosed is *against* the directional preference of investors, the level of threat to these preferences has a differential impact on investors' judgements.

My study also has practical implications for regulators, managers and investors. It suggests that investors anchor on the parameters as long as the level of threat posed by such disclosures to their preferred conclusions is not too high, and that this anchoring spills over to their future,

unrelated judgments. Managers have flexibility to determine the magnitude of hypothetical changes used in sensitivity disclosures. Therefore, regulators might consider giving more guidance on this, and managers might consider paying greater attention when setting this magnitude. Furthermore, although using high percentages in a sensitivity disclosure may be an effective strategy for managers in signalling a risk factor to investors, managers should be aware that this may not always be the case, particularly when a company is otherwise doing well in terms of future prospects; in such cases, the information contained in the sensitivity disclosure would pose a high threat to investors' preferences for keeping shares in the company. Finally, investors who are aware of the effects of the magnitude of hypothetical changes on their related and unrelated judgments might take steps to eliminate any biases and thus make better judgments.

Section 2 presents the background to my research questions. In Section 3, I discuss the theory and develop hypotheses. The methodology is explained in Section 4 and the variables are defined in Section 5. Section 6 reports the results of the experiment and Section 7 provides concluding remarks.

2. Background: sensitivity disclosures

A sensitivity disclosure reports how the value of a financial reporting item such as earnings, or an asset or liability, would change according to hypothetical changes in an underlying input. I chose to examine sensitivity disclosures for two reasons. First, standard setters either require or encourage sensitivity disclosures in many standards, and such disclosures are likely to become more prevalent as a result of the shift from cost accounting to fair value accounting. For example, International Financial Reporting Standard (IFRS) 7 requires sensitivity analysis of market risk factors relating to financial instruments (International Accounting Standards Board (IASB) 2012); International Accounting Standard (IAS) 19 requires sensitivity disclosures relating to employee benefits (IASB 2011); and IAS 36 requires sensitivity analysis relating to impairment of assets (IASB 2013). Similarly, in the USA, Accounting Standards Codification (ASC) 715-20-50 requires sensitivity analysis for retirement benefits (Financial Accounting Standards Board (FASB) 1990, 2003), and ASC 860-20-50 (FASB 2000) requires sensitivity analysis for securitized financial assets. Many companies also voluntarily disclose sensitivity information on various financial statement items, such as inventory obsolescence, foreign currency transactions and financial liabilities.

Second, companies typically have flexibility in their choice of disclosure parameters for the same sensitivity, and there is considerable variation across companies' choice of parameters (Nelson and Rupar 2015; see Appendix 1 for examples). Previous financial disclosure literature on ways in which investors make inferences has concluded that flexibility in disclosure rules causes investors to make different inferences based on managers' choices (Botosan 1997, Fields et al. 2001, Sankar and Subramanyam 2001, Rennekamp 2012). For example, Hirst et al. (2007) find that a disaggregated management earnings forecast increases the credibility of such contracts, and Koonce et al. (2005) find that the labels used by firms to describe financial instruments and derivatives cause investors to assess economically equivalent instruments as different in terms of risk.

Even while describing the *same* sensitivity, companies may use different magnitudes of hypothetical change. For example, one company may use 1% as the hypothetical change and disclose that each 1% increase in the fair value of an asset (input) would decrease the earnings by $3000 (output). Another company may instead use 20% as the hypothetical change, and disclose that each 20% increase (decrease) in the fair value of the asset would decrease the earnings by $60,000.[2]

Many hypothetical changes are chosen arbitrarily, rather than reflecting companies' views of the magnitude of the probable change in the input, even when they suggest otherwise (see Appendix 1). For example, Swift Energy used 5% as a hypothetical increase for both natural gas and oil prices in its 2013 10K, even though price changes in these commodities had not been similar in recent years. Furthermore, a broad range of hypothetical changes is used for the same inputs, even among companies operating in the same industry. For example, in its 2013 10K Freddie Mac used 50 basis points (bp) in describing the relationship between a change in interest rates and the market value of its net assets and liabilities. On the other hand, Federal Home, a company operating in the home mortgage business like Freddie Mac, used 200 bp in describing a very similar relationship, between a change in interest rate and the market value of equity losses in the same period. Similarly, in the same period, Intel and 3D systems, both in the electronics industry, used hypothetical changes of 20% and 10%, respectively, in describing the effects of a change in Japanese yen on their revenue and income, while Alaska Air and JetBlue, both in the airline industry, used hypothetical changes of 1% and 10%, respectively, in the fuel price per gallon in describing the effect of a change in oil prices on their annual fuel expenses.

While most companies do not disclose whether or not the hypothetical changes used in their sensitivity disclosures are chosen arbitrarily, there are exceptions. Wells Fargo made the following disclaimer: 'The sensitivity analyses provided are hypothetical scenarios and are not considered probable. They do not represent management's view of inherent losses in the portfolio as of the balance sheet date.' In contrast, Intel provided the following explanation:

> a significant amount of our operating expenditures and capital purchases is incurred in our exposure to other currencies, primarily the euro, the Japanese yen, and the Israeli shekel. We considered the historical trends in currency exchange rates and determined that it was reasonably possible that a weighted average adverse change of 20% in currency exchange rates could be experienced in the near term.

This explains why the latter used 20% as the hypothetical change in its sensitivity analysis, suggesting that this magnitude reflects beliefs about how much change will occur in the near term. However, further examination reveals that Intel used exactly the same explanation in its 10Ks between 2003 and 2014, although changes in exchange rates were never near 20% in any of those years. Furthermore, there were significant variations between the exchange rates of the shekel, yen and euro, even though Intel's disclosure suggests that the potential expected change in these currencies was the same. Intel is not alone in using the same hypothetical percentage for different inputs. For example, in its 2013 10K, 3D used 10% as a hypothetical change for the euro, Australian dollar, British pound, Swiss franc, Korean won, Japanese yen and Indian rupee. Managers' choices in sensitivity disclosures do not yet appear to have been systematically examined by researchers. Therefore, I hand-collected sensitivity disclosure examples from the 2014 annual filings (10-K) of Fortune 100 companies (see Appendix 1). The data indeed suggest that sensitivity disclosures are widely used. Furthermore, different companies use different hypothetical percentages for the same inputs in the same year (e.g. interest rates); and the same companies use the same hypothetical changes for very different inputs within the same annual filing (e.g. Yen, Euro, Shekel).

Overall, such evidence suggests that managers' choices of hypothetical changes in sensitivity disclosures may be arbitrary, even when they suggest otherwise. Therefore, investors would do better not to anchor on these parameters in making their judgments. My study suggests that investors anchor on the parameters as long as the level of threat posed by such disclosures to their preferred conclusions is not too high, and that this anchoring spills over to their future, unrelated judgments.

3. Theory and hypotheses

Earlier studies in psychology and economics have documented the anchoring effect, whereby individuals use an initial piece of information to make a subsequent judgment (Tversky and Kahneman 1974, McAlvanah and Moul 2013). Previous financial disclosure research also suggests that investors anchor on the parameters presented to them. For example, Nelson and Rupar (2015) find that investors assess higher risk in response to a dollar-formatted disclosure, which typically has a higher value (e.g. $40 million) than an equivalent percentage-formatted disclosure with a lower value (e.g. 4%). Elliott et al. (2007b) find that investors' reliability judgments for the reported financial reporting item in a sensitivity disclosure decrease as the hypothetical change used in the sensitivity disclosure increases.

Consequently, I expect investors to anchor on parameters in the sensitivity disclosure, such as the magnitude of the hypothetical percentage and the resulting change in the estimated financial reporting item. Without changing the underlying sensitivity, a lower hypothetical percentage will lead to a smaller change in the estimated financial reporting item (output) than a higher hypothetical percentage. If investors are anchoring on the parameters presented to them rather than on the actual sensitivity, I expect them to perceive the risk to be lower when they are presented with a lower hypothetical change which would lead to a smaller change in the estimated financial reporting item. In contrast, I expect them to perceive the risk to be higher when they are presented with a higher hypothetical change which would lead to a larger change in the estimated financial reporting item. Consider the previous example which uses a lower hypothetical percentage: 'every one per cent increase in the fair value of an asset (input) would have decreased the earnings by $3,000.' The increase in the input is small (1%), and its effect on the value of the financial reporting item is also small ($3000). On the other hand, consider an example which uses a higher hypothetical change: 'every 20 per cent increase in the fair value of an asset (input) would have decreased the earnings by $60,000.' The increase in the input is large (20%), and its effect on the value of the financial reporting item is also large ($60,000). Therefore, although investors can easily calculate the underlying sensitivity, they would perceive, in anchoring on the parameters, the first scenario as being less risky than the second, whereas the underlying sensitivity is the same in both scenarios.

Cianci (2008) finds that current and prospective investors react to financial information in different ways. In particular, she posits that current investors do not want to discover information that would indicate that their previous information was a mistake. However, both Nelson and Rupar (2015) and Elliott et al. (2007b) target prospective investors in their settings. Since such investors have not yet invested in the target company, they have little preference, if any, regarding the future performance of the company.

Previous financial disclosure and psychology literature finds that investors' preferences influence their judgments (Witte 1998, Hales 2007). Therefore, it is important to examine a situation in which investors have a solid preference for the good performance of a company, as would typically be the case if they have already invested in the company. A current investor will prefer the company to perform well. The motivated reasoning and cognitive dissonance literature suggests that individuals process information in a manner that suits their goals (Festinger 1962, Akerlof and Dickens 1982, Wyer and Frey 1983, Ginossar and Trope 1987, Kunda 1999, Nyborg 2011), which may blind investors to undesirable facts, leading them to make poor choices. They may even avoid information that suggests bad news for their investment (see, for example, Karlsson et al. 2009). Previous financial disclosure research also finds that investors' judgments may be biased by their incentives to achieve a particular condition (Hales 2007). Hales (2007) finds that individuals are motivated to agree unthinkingly with information that aligns with their directional preferences, but to disagree with information that is not so aligned.

In his experiment, investors who were either long or short in a stock reached different judgments after reading the same information.

Psychology research finds that individuals tend to ignore information in a disclosure if it poses a high level of threat to their preferences (Janis 1967, Witte 1998). If an investor is keen to keep shares in a company because she believes that the shares will bring high returns, she is likely to ignore bad news about the company in order to reduce cognitive dissonance (Festinger 1962). Cognitive dissonance theory predicts that, having made decisions, people tend to discard information which suggests that those decisions may be in error, because they view themselves as smart, and the cognition that a decision is wrong conflicts with that view (Akerlof and Dickens 1982).

Therefore, I expect to see that the level of threat to preferred outcomes perceived by investors while reading a sensitivity disclosure plays a vital role in how they react to the magnitude of hypothetical change used in the disclosure. I predict that, when the threat is low, current investors will continue to anchor on the magnitude, as found in studies by Nelson and Rupar (2015) and Elliott et al. (2007b) focusing on prospective investors. However, when the threat is high, they will anchor less because they are more motivated to ignore the disclosure. As a result, I hypothesize the following:

> H1a: The magnitude of a hypothetical change used in a sensitivity disclosure has a greater effect on investors' perceptions of the disclosed risk when the information presents less threat to their preferences than when it presents greater threat.

Research on motivated reasoning and cognitive dissonance suggests that individuals may draw conclusions that suit their motivations if they can justify them and construct self-serving theories for this justification (Akerlof and Dickens 1982, Dunning et al. 1995, Kunda 1999). One way to justify ignoring a disclosed risk factor is to claim some uncertainty in the association between the disclosed risk factor and its impact on the estimated accounting item or, in other words, to be sceptical about the association. I therefore expect to see that when a sensitivity disclosure presents a greater threat to investors' preferences, they perceive more uncertainty in how company earnings would react, for example to a possible movement in natural gas prices, than when the sensitivity disclosure presents less threat. Thus, my next hypothesis is as follows:

> H1b: Investors perceive more uncertainty regarding the association between the estimated item and the disclosed risk factor when the information in a sensitivity disclosure presents a greater threat to their preferences than when it presents less threat.

Previous research on knowledge accessibility suggests that, even when information is not relevant to decision-making, the mere presence of it affects the judgments of individuals (Carlston 1980, Nisbett et al. 1981, Wyer et al. 1984, Feldman and Lynch 1988). Previous financial reporting research confirms this effect in audit settings (Hackenbrack 1992, Glover 1997, Bhattacharjee et al. 2007).

Tversky and Kahneman (1974) show that an anchoring effect exists even when the information is random and irrelevant to a decision. In their experiment, participants observed a wheel of fortune that stopped on either 10 or 65, and were asked to estimate various quantities, stated in percentages (for example, the percentage of African countries in the United Nations). Participants whose wheel stopped on 10 guessed significantly lower values (median 25) for the percentage of African countries in the United Nations than participants whose wheel stopped at 65 (median 45). This pattern was replicated in other experiments in different contexts. Moreover, pay-offs for accuracy did not reduce this effect. Similarly, in a financial reporting context,

Bhattacharjee et al. (2007) show that auditors' judgments for one client are influenced by judgments made for a previous client.

Based on the anchoring literature, I have so far predicted that investors will be anchored on the parameters given in a sensitivity disclosure when judging the risk identified in that disclosure. However, the literature discussed in the preceding paragraph suggests that anchoring is not limited to judgments that are directly relevant to the anchors, but may also affect judgments on unrelated issues. Therefore, I expect that the parameters given in a sensitivity disclosure will affect investors' judgments on an unrelated item. The previous literature does not appear to have examined whether anchoring spills over to future judgments where an individual has already made a judgment in the context of the anchor, yet no empirical evidence has been found to suggest that the effect of anchoring stops at the first judgment. Therefore, I predict that anchoring spills over to future judgments unrelated to the information given in the context of the anchors. My final hypothesis, therefore, is as follows:

H2: The magnitude of hypothetical changes used in a sensitivity disclosure has an impact on investors' future unrelated judgments.

4. Method

I conducted an experiment to answer my research questions in order to establish and test directly the causal links in which I was interested. For example, I was able to maintain underlying information, such as the business description and financial reports, while manipulating only the variables of interest. I manipulated the magnitude of a sensitivity disclosure while keeping the actual sensitivity constant, and manipulated participants' level of motivation to ignore the disclosure while keeping everything else constant.

4.1. *Participants*

Sixty-one graduate accounting students from a large state university in North America participated in the experiment as proxies for non-professional investors. On average, the participants had completed (or were currently enrolled in) 12 accounting and 3 finance classes. All but one had previously evaluated a company's financial statements. Twenty-five per cent of the participants had previous investment experience and 71% had plans to invest in the future. The appropriateness of a particular group of participants depends on whether they have sufficient knowledge for the task (Libby et al. 2002). Therefore, prior to conducting this study, I determined that a reasonable understanding of financial accounting concepts and basic finance would be sufficient for participants. I also determined that the task was low in integrative complexity, similar to those described in Elliott et al. (2007a),[3] whose study suggests that, in similar tasks, graduate business students such as MBAs are good proxies for non-professional investors.

I examined non-professional investors for the following reasons. First, they are an important investor group, owning nearly 45% of all shares as of 2008 in the USA. In 2015, 56% of US households owned stocks (McCarthy 2015). Empirical evidence on which information sources non-professional investors use is scant (Pennington and Kelton 2016). Nevertheless, existing research suggests that although many non-professional investors use filtered information provided by professional intermediaries, some use unfiltered information disclosed by company management, such as 10-Ks (Hodge and Pronk 2006, Elliott et al. 2008, Pennington and Kelton 2016). Importantly, financial regulators consider such investors in regulating financial disclosures (Elliott et al. 2011, Financial Reporting Council 2017).

Second, the format of sensitivity disclosures is likely to affect non-professional investors more than professional investors, as previous research shows that the former tend to rely more on the

management discussion, which is likely to include some sensitivity disclosures, whereas the latter tend to rely directly on financial statements (Hodge and Pronk 2006). Third, compared with professional investors, non-professional investors generally have ill-defined valuation models (SRI International 1987), and are thus more prone to the effect examined in this study.

4.2. *Task*

The participants were asked to play the role of an investor owning 2500 ACF shares at $4 per share.[4] ACF Inc. is a fictitious company that manufactures agricultural fertilizers. All participants received excerpts from ACF's financial statements, including a paragraph discussing its business risks based on an actual company listed on the New York Stock Exchange, stating that natural gas is an important raw material in ACF's production and that ACF buys natural gas from North America, where prices are highly volatile. The document then stated:

> Many of ACF Inc.'s competitors benefit from access to lower-priced natural gas through manufacturing facilities in regions with abundant supplies of natural gas. For that reason, ACF Inc. is not able to pass along the resulting higher operating costs to its customers in the form of higher product prices. Thus, when natural gas prices go up, ACF Inc.'s earnings go down, and when the prices go down, its earnings go up.

After reading this background information, participants answered a pre-manipulation question assessing the seriousness of the risk of an increase in natural gas prices for ACF Inc.[5] They then read a sensitivity disclosure depicting the relationship between earnings and natural gas prices, at which point the first manipulation took place. Based on random assignment, half the participants read a sensitivity disclosure using a higher hypothetical percentage ('A 20% increase (decrease) in natural gas price/gallon would have decreased (increased) earnings by $60 million'), while the other half read the same disclosure using a lower hypothetical percentage ('A 1% increase (decrease) in natural gas price/gallon would have decreased (increased) earnings by $3 million'). Note that the sensitivity of the estimated item to the risk factor was the same across both conditions – each 1% change in the risk factor impacted earnings by $3 million – and participants were able to calculate this sensitivity.

Participants were next asked to decide whether or not to sell some or all their ACF shares. If they sold any shares, the proceeds would be invested in an S&P 500 Index fund at the same price as the ACF shares. Participants were given some information about the one-year expected returns on ACF shares and the S&P Index fund, and were told that they would be paid according to their portfolio return at the end of one year, which they would learn at the end of the experiment. Specifically, they would be paid one dollar if their return was less than or equal to 25%, and five dollars otherwise. Based on random assignment, half the participants read that ACF was expected to earn a return of 35% if there was no change in natural gas prices, which was significantly more than 25%, the trigger rate for earning the reward; whereas the other half read that ACF's return was expected to be equal to 25%. This was the second manipulation. All participants were told that the expected return for the S&P Index fund, the alternative investment, was 25%. The target return of 25% was the return on the participants' alternative investment option. They were rewarded substantially more if they could exceed this return. In one condition, participants' current investment (ACF Inc. shares) was expected to rise by around the same amount as the alternative investment, and in the other condition, it was expected to rise substantially more. This design was chosen to manipulate the extent to which participants were motivated to hold their ACF Inc. shares.

As the participants were notified about the expected returns on both investment alternatives, they were likely to experience anticipated regret, which would shape their behaviour (Zeelenberg 1999). They were allowed to sell some or all of their shares and buy shares in the index fund

instead; therefore, they were responsible for the future returns generated by their portfolio. This highlights the distinction between current and prospective investors. Previous literature on sensitivity disclosures has focused on prospective investors (Koonce et al. 2005, Elliott et al. 2007b, Nelson and Rupar 2015) who are not responsible for the returns generated by a company. However, extant research (Summers and Duxbury 2012) suggests that responsibility for an investment decision exacerbates the influence of emotions on judgments, which in turn affects behaviour. Therefore, current investors who have made decisions on their investments may not behave in the same way as prospective investors, who have been the subject of previous studies of sensitivity disclosures.

In this study, the information presented in the sensitivity disclosure posed some threat to *all* participants' preferences, and the strength of this threat was manipulated. This design feature allowed me to examine the implications of a low versus high threat to investors' directional goals for their perceptions of the threat. Recall that the sensitivity disclosure specified a risk factor, namely a possible volatility in natural gas prices having an impact on company earnings. As long as investors preferred to keep the company's shares, this information presented a threat to their preferences.

I took the following steps to ensure that, on average, participants would tend to keep rather than sell the company shares. First, the reward pattern was asymmetric: participants earned significantly more ($5 versus $1) when their return was more than 25% than when it was equal to or less than 25%.[6] Second, participants' only alternative investment, the index fund, was expected to make 25%, a return insufficient to earn the $5 award. Third, the status quo was owning shares in the company: participants were told that they owned some shares in the company, and could sell some or all and buy some index fund shares if they wished. Previous literature suggests that individuals tend to preserve the status quo (Thaler 1980, Kahneman et al. 2000), which in this case was to keep their shares in the company. Therefore, even when participants were told that the company was expected to make a return of 25% (a return insufficient to earn the reward, but no worse than the alternative),[7] they would be more motivated to keep shares in the company than to sell them.[8] According to motivated reasoning theory (Kunda 1999), this in turn would give them some incentive to ignore the risk factor depicted in the sensitivity disclosure that suggested that the company might perform worse than at present. However, this incentive would be much stronger if they were told that, holding the risk factor constant, the company was expected to earn a return of 35%, which was more than sufficient to earn the reward.

To summarize, the participants would be rewarded significantly more when their return was higher than the market return. Hence, when the shares they held were expected to bring a higher return than the market return, they would have a much stronger preference to keep the shares, and would be more likely to overlook the sensitivity disclosure that posed a threat to this preference and thus less likely to be affected by its parameters. Therefore, I expected that investors would be more inclined to keep the company shares when the company was expected to beat the market, and would anchor less on the hypothetical percentages given in the sensitivity disclosure.

After reading the information given to them and making their investment decision, the participants answered some questions relating to the information given in the sensitivity disclosures. When they had finished answering all questions, including demographic questions, they were told that ACF was in the process of buying an oil-producing company as a subsidiary. They were also given some information about the relationship between natural gas and oil prices which suggested that there was not necessarily any relationship between the two. Finally, the participants were notified that oil prices would not affect ACF's returns for at least two years. This informed participants that their returns would be unaffected by movements in oil prices, and disentangled the effects of motivated reasoning from the effect of anchoring on parameters for future, unrelated judgments. The participants read the following excerpt about oil prices:

> ACF Inc. is planning to buy HKO Oil Industries, an oil production company. The purchase is likely to take place in 2016; therefore, the change in oil prices will begin to affect ACF Inc.'s returns after two years. A number of academic papers have examined the relationship between natural gas prices and crude oil prices. There has been no consensus about the relationship: some authors argue that when crude oil prices increase, natural gas prices also increase; others argue that the relationship is negative – a decrease in the price of one energy supply is accompanied by a decrease in the price of the other. Yet other authors posit that natural gas and oil prices have become decoupled from each other in the last decade.

Having been given this information, the participants answered a question about the likelihood of oil prices increasing within a year. In asking participants to answer the demographic questions after they had completed the part about natural gas prices but before starting the section on oil prices, I aimed to create a distraction task and a delay.

After the participants had answered the question about the likelihood of an oil price increase, they were notified about the returns for ACF and the index fund, and were paid according to the return on their portfolio ($1 or $5). The experiment concluded at this point.

A diagrammatic representation of the experimental timeline is given in Figure 1.

4.3. *Manipulations*

I manipulated the magnitude of hypothetical changes used in the sensitivity disclosures and the level of threat to investors' preferences. The former was manipulated by using different percentages to describe how ACF's earnings might be influenced by a change in natural gas prices. Half the participants, randomly assigned, read a sensitivity disclosure using 1% as the hypothetical change and the other half read a sensitivity disclosure using 20%, although the underlying sensitivity was the same in both conditions. The sensitivity disclosures in the two conditions read as follows: for the high-magnitude condition, 'A 20% increase/decrease in natural gas price per gallon would have decreased/increased earnings by $60 million'; and for the low-magnitude condition, 'A 1 per cent increase/decrease in natural gas price per gallon would have decreased/increased earnings by $3 million.'

My second manipulation was the level of threat to investors' preferences. As mentioned above, information presented in the sensitivity disclosure, namely the risk in the volatility of

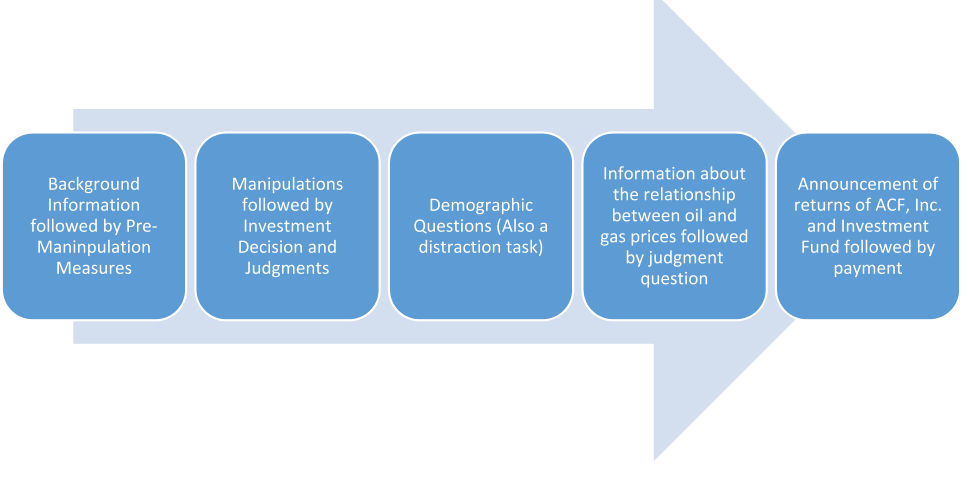

Figure 1. Experimental timeline.

natural gas prices, presented some threat to all participants' preferences. I operationalized the level of threat to participants' preferences by manipulating the strength of participants' preferences for keeping ACF stocks: the information suggested that ACF would have either an above-the-market return, or a return equal to the market, holding the natural gas price risk constant. Recall that, according to the payment scheme, participants had an incentive to earn a return above the market. Their only option to control the risk of an increase in natural gas prices was to sell ACF Inc. shares; therefore, when ACF Inc. was otherwise expected to beat the market, the level of threat posed to participants' preferences by the sensitivity disclosure was higher. In other words, participants had a stronger incentive to deny the risk communicated in the sensitivity disclosure.

For the manipulation of this second independent variable, having been told that the S&P 500 Index fund was expected to make a return of 25% ± 3%, participants in the low-threat condition were told that ACF was expected to make a return of 25% ± 3%, while participants in the high-threat condition were told that ACF was expected to make a return of 35% ± 3% as long as there was no significant change in natural gas prices.

5. Variables

To control for potential heterogeneity in participants' *ex ante* risk assessments of financial statement items, after giving them some background information about the relationship between natural gas prices and the company's earnings, but before giving them the sensitivity disclosures, I asked participants to assess the risk of a natural gas price increase by responding to the statement 'According to the given information, an increase in natural gas prices is a serious risk for ACF Inc.', on an 11-point scale from '1-Completely disagree' to '11-Completely agree'. This variable had a significant influence on the dependent variables of my hypotheses, but neither the independent variables nor their interaction had a significant effect on them (all p-values > .1, two-tailed, not tabulated). Therefore, I used this variable as a covariate in all tests unless otherwise indicated.

The first independent variable was the magnitude of hypothetical changes used in the sensitivity disclosures and the second was the level of threat to investors' preferences, both described above.

The first dependent variable was investors' perceptions of risk as presented in the sensitivity disclosure, which is incorporated in H1a. To measure this variable, I asked participants to respond to the statement 'According to the given information, an increase in natural gas prices is a serious risk for ACF Inc.' on an 11-point scale, ranging from '1-Completely disagree' to '11-Completely agree'.

The second dependent variable was investors' perceptions of uncertainty regarding the association between the risk factor and the estimated financial reporting item in the sensitivity disclosure, which is incorporated in H1b. To measure this variable, I asked the question 'How much uncertainty is involved regarding where the earnings would go in response to a possible movement in natural gas prices?' on an 11 point scale, ranging from '1-No uncertainty' to '11-A lot of uncertainty'.

The third dependent variable was investors' perceptions of the likelihood of a rise in oil prices, which is incorporated in H2. To measure this variable, I asked the question 'How likely do you think it is that natural gas prices will rise substantially by the end of one year from now?' on an 11-point scale, ranging from '1-Very unlikely' to '11-Very likely'.

6. Results

6.1. *Manipulation checks*

The first independent variable was the magnitude of the hypothetical change in the sensitivity disclosure. I argue that investors anchor on the parameters presented to them rather than on the actual

Table 1. Risk judgments relating to a rise in natural gas prices.

	Hypothetical change		
Level of threat to preferences	Low (1%)	High (20%)	Average
Panel A: Risk judgments relating to a rise in natural gas prices – adjusted least squares mean [standard error]			
Low	8.556 [0.301] $N = 15$	9.961 [0.300] $N = 15$	9.258 [0.211] $N = 30$
High	9.118 [0.299] $N = 15$	9.468 [0.290] $N = 16$	9.293 [0.208] $N = 31$
Average	8.837 [0.213] $N = 30$	9.714 [0.209] $N = 31$	

Panel B: ANCOVA model of risk judgments for a rise in natural gas prices

Source of variation	SS	df	MS	F-Stat	p-Value
Percentage	11.309	1	11.309	8.474	<.01
Level of threat to preferences (Threat)	0.018	1	0.018	0.014	.45
Percentage × Threat	4.224	1	4.224	3.165	.04
Pre-risk Judgment.	89.501	1	89.501	67.063	<.001
Error	74.736	56	1.335		

Panel C: Follow-up simple effects tests for Hypothesis 1

Source	SS	df	MS	F-Stat	p-Value
Low threat	14.357	1	14.357	7.592	<.01
High threat	0.864	1	0.864	1.024	.16

Notes: This table presents the adjusted means, ANCOVA and follow-up simple effects test for the measure used to capture participants' risk judgments for a rise in natural gas prices. The first independent variable (percentage) is whether the hypothetical percentage used in the sensitivity disclosure about the change in natural gas prices is low (1%) or high (20%). The second independent variable (Threat) is whether the information in the sensitivity disclosure poses a relatively low or high threat to investors' preferences. The covariate (Pre-risk judgment) captures participants' risk judgments before seeing the manipulations but after reading some background information about the company. The dependent variable captures the same judgments after seeing the sensitivity disclosure. In both instances, participants answered the following question: 'According to the given information, an increase in natural gas prices is a serious risk for ACF Inc.' using an 11-point scale anchored on 1 ('Completely disagree') and 11 ('Completely agree'). All p-values are one-tailed given directional predictions.

sensitivity, and therefore perceive the risk to be lower when they are presented with a lower hypothetical change. This leads to a smaller change in the estimated financial reporting item than when they are presented with a higher hypothetical change, even when the underlying sensitivity is the same. The adjusted means and ANCOVA results tabulated in Table 1 confirm that investors perceived the risk to be significantly lower when they were presented with a lower hypothetical change than a higher hypothetical change ($p < .01$, one-tailed).

The second independent variable was the extent to which the sensitivity disclosure presented a threat to investors' preferences. I operationalized the strength of the threat by manipulating participants' preferences for holding rather than selling ACF Inc. shares. If participants had a stronger preference for holding the shares, a sensitivity disclosure suggesting a particular risk to the company should present a greater threat to this preference. An ANOVA, setting the magnitude of the hypothetical percentage change and the level of threat as independent variables[9] and the number of ACF Inc. shares kept by participants as the dependent variable, confirmed that participants in the high-threat condition kept significantly more ACF Inc. shares ($p = .03$, one-tailed, not tabulated; mean = 1469) than participants in the low-threat condition (mean = 1218).[10]

6.2. *Hypotheses tests*

H1a predicts that when information contained in a sensitivity disclosure presents less threat to investors' preferences, the magnitude of the hypothetical change used in a sensitivity disclosure

has a greater effect on their perceptions of the disclosed risk than when it presents a greater threat. Recall that cognitive dissonance and motivated reasoning theories predict that when people make a decision they tend to ignore information (the threat) that suggests that the decision may be wrong. In my setting, the decision was to keep (or sell) shares in the company. Half the participants in my experiment were given greater motivation to keep their shares, being advised that if the risk depicted in the sensitivity did not materialize, the company was expected to make greater returns so they would earn higher rewards. As expected, these participants kept more shares in the company (see Section 6.1), and I therefore predicted that these participants would be less anchored to the parameters in the disclosure, as they would be more inclined to ignore the sensitivity disclosure.

To test this hypothesis, I conducted an ANCOVA using investors' perceptions of the disclosed risk as the dependent variable, the level of threat presented to investors' preferences by the sensitivity disclosure (threat) and the magnitude of hypothetical changes in the sensitivity disclosure (percentage) as the independent variables, and their risk judgments before reading the sensitivity disclosure as the covariate (pre-risk perception). The adjusted mean squares are reported in Panel A and ANCOVA results are reported in Panel B of Table 1. The results reveal that the interaction of the percentage and incentive variables ($p = .04$, one-tailed) had a significant effect on investors' risk judgments.

The adjusted means show that, while a higher (lower) hypothetical change increased (decreased) investors' risk judgments, it had less effect on investors' risk judgments when the sensitivity disclosure presented a higher level of threat to participants' preferences. Follow-up simple effect tests, reported in Table 1 Panel C, support H1a. When the level of threat is higher, percentage has an insignificant effect on investors' risk perceptions ($p = .16$, one-tailed); however, when the level of threat is lower, percentage has a significant effect on their risk perceptions ($p < .01$, one-tailed). Figure 2 describes these results graphically.

H1b predicts that investors perceive more uncertainty regarding the association between the estimated financial reporting item and the disclosed risk factor when the information contained in a sensitivity disclosure presents a greater threat to their preferences than when it presents less threat. To test this hypothesis, I conducted an ANCOVA, using investors' perceptions of the association between natural gas prices and earnings as the dependent variable, the level of threat presented to investors' preferences by the sensitivity disclosure (threat) and the magnitude of hypothetical changes in the sensitivity disclosure (percentage) as the independent variables, and their risk judgments before reading the sensitivity disclosure as the covariate (pre-risk perception). The ANCOVA results reported in Table 2 Panel B, reveal that the level of threat to participants' preferences presented by the sensitivity disclosure had a marginally significant impact on their judgments of the association between natural gas prices and their impact on earnings ($p = .07$, one-tailed). I measured this variable by asking participants 'how much uncertainty is involved regarding where the earnings would go in response to a possible movement in natural gas prices?' on an 11-point scale, ranging from '1-No uncertainty' to '11-A lot of uncertainty'. The adjusted means (see Table 2 Panel A) show that when the level of threat to participants' preferences presented by the sensitivity disclosure was high, and therefore participants had a stronger incentive to ignore the sensitivity disclosure, they perceived more uncertainty in the association between a change in natural gas prices and its impact on earnings than participants who had a weaker incentive to ignore the sensitivity disclosure.

To test H2, which predicts that investors will also anchor on the magnitude of hypothetical change given in the sensitive disclosure for future unrelated judgments, I conducted an ANCOVA, using investors' judgments of the likelihood of a rise in oil prices as the dependent variable, the level of threat to investors' preferences presented by the sensitivity disclosure (threat) and hypothetical changes in the sensitivity disclosure (percentage) as the independent

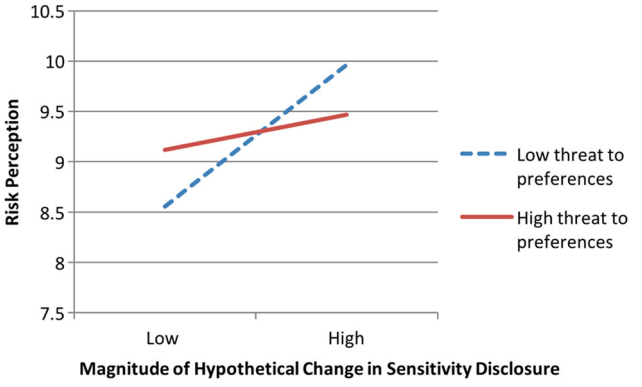

Figure 2. Risk judgments when level of threat to investors' preferences presented by sensitivity disclosure is low versus high (H1a).
Notes: This figure represents the results for H1a. See Table 1 for the variables used in the test.

variables, and their risk judgments before reading the sensitivity disclosure as the covariate (pre-risk perception). The adjusted means, reported in Table 3 Panel A, reveal that the percentage used in the sensitivity disclosure regarding natural gas prices significantly influenced participants' judgments of the likelihood of a rise in oil prices ($p = .04$, one-tailed), confirming my hypothesis. I measured this variable by asking participants 'how likely do you think it is that oil prices will rise substantially by the end of one year from now?' on an 11-point scale, ranging from '1-very unlikely' to '11-very likely', after giving them some information which concluded that there was not necessarily any relationship between natural gas and oil prices.

A follow-up simple effects test confirmed a similar pattern in investors' judgments of natural gas and oil prices, as reported in Table 3 Panel C. When the level of threat presented by the sensitivity disclosure was lower, the magnitude of the hypothetical change used in the sensitivity disclosure had a significant effect on their judgments ($p = .035$, one-tailed). On the other hand, when the level of threat to investors' preferences presented by the sensitivity disclosure was higher, giving investors a stronger incentive to ignore the depicted risk, the magnitude of the hypothetical percentage used in the sensitivity disclosure did not have a significant impact on their judgments of oil prices ($p = .19$, one-tailed). Figure 3 compares the results for participants' natural gas and oil price judgments graphically. This is the opposite of the relationship observed in participants' risk

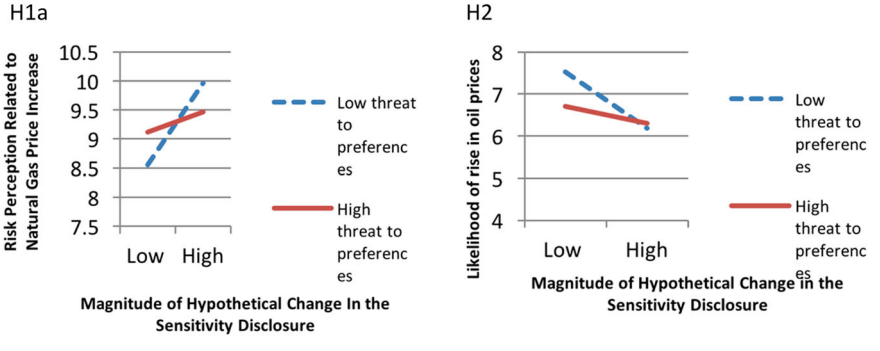

Figure 3. Comparison of investors' judgments relating to increases in natural gas price and oil price.
Notes: This figure compares the results of the hypotheses H1a and H2. See Table 1 for the description of variables used in testing H1a and Table 3 for the description of variables used in testing H2.

Table 2. Judgments for the uncertainty of the association between a change in natural gas prices and its impact on earnings.

	Hypothetical change		
Threat to preferences	Low (1%)	High (20%)	Average
Panel A: Judgments for the uncertainty of the association between a change in natural gas prices and its impact on earnings – adjusted least squares mean [standard error]			
Low	4.870 [0.592] $N = 15$	5.954 [0.589] $N = 15$	5.412 [0.415] $N = 30$
High	6.424 [0.587] $N = 15$	6.143 [0.570] $N = 16$	6.283 [0.408] $N = 31$
Average	5.647 [0.418] $N = 30$	6.049 [0.412] $N = 31$	

Panel B: ANCOVA model of judgments for the uncertainty of the association between a change in natural gas prices and its impact on earnings

Source of variation	SS	df	MS	F-Stat	p-Value
Percentage	2.373	1	2.373	0.461	0.25
Threat to Preferences (Threat)	11.541	1	11.541	2.241	0.07
Percentage × Threat	7.080	1	7.080	0.461	0.17
Pre-risk Jdgmnt.	11.970	1	11.970	2.324	0.065
Error	288.434	56	3.450		

Notes: This table presents the adjusted means and ANCOVA for the measure used to capture participants' uncertainty judgments for the association between a change in natural gas prices and its impact on earnings. The first independent variable (percentage) is whether the hypothetical percentage used in the sensitivity disclosure about the change in natural gas prices is low (1%) or high (20%). The second independent variable (Threat) is whether the information in the sensitivity disclosure poses a relatively low or high threat to investors' preferences. The covariate (Pre-risk judgment) captures participants' risk judgments before seeing the manipulations but after reading some background information about the company. This variable is measured by participants' responses to the question 'According to the given information, an increase in natural gas prices is a serious risk for ACF Inc.' using an 11-point scale anchored on 1 ('Completely disagree') and 11 ('Completely agree'). The dependent variable captures the association between a change in natural gas prices and company earnings, which was asked after participants had reviewed the sensitivity disclosure. This variable is measured by participants' responses to the question 'How much uncertainty is involved regarding where the earnings would go in response to a possible movement in natural gas prices?' using an 11-point scale anchored on 1 ('No uncertainty') and 11 ('A lot of uncertainty'). All p-values are one-tailed given directional predictions.

judgments measured by the statement 'According to the given information, an increase in natural gas prices is a serious risk for ACF Inc.' These results suggest that investors perceived natural gas and oil prices to be negatively associated.

An alternative explanation for these results is that participants did not understand the text explaining that there was not necessarily any relationship between natural gas and oil prices. To examine this possibility, I analysed participants' answers to a comprehension question, 'As you know, a number of academic papers examined the relationship between natural gas prices and crude oil prices. What was the consensus reached by those papers about the relationship between the natural gas prices and crude oil prices?' This had the following answer choices given in randomized order: 'No consensus was reached'/'That there is a positive relationship between natural gas prices and crude oil prices'/'That natural gas prices and crude oil prices decoupled from each other in the last decade'/'That there is a negative relationship between natural gas prices and crude oil prices.' Forty-one out of 61 participants answered this question correctly ('No consensus was reached'). When I limited my analysis to participants who correctly answered this question, H2 was still supported. The magnitude of the hypothetical percentage used in the sensitivity disclosure had a significant impact on participants' judgment of oil prices ($p = .02$, one-tailed, not tabulated), and participants who viewed the larger percentage judged the likelihood of an oil price increase as significantly lower (adjusted mean = 6.07) than

Table 3. Risk judgments for a rise in oil prices.

	Hypothetical change		
Level of threat to preferences (Threat)	Low (1%)	High (20%)	Average
Panel A: Risk judgments for a rise in oil prices – adjusted least squares mean [standard error]			
Low	7.522 [0.485] $N = 15$	6.185 [0.482] $N = 15$	6.853 [0.339] $N = 30$
High	6.707 [0.480] $N = 15$	6.300 [0.466] $N = 16$	6.503 [0.334] $N = 31$
Average	7.114 [0.342] $N = 30$	6.242 [0.337] $N = 31$	

Panel B: ANCOVA model of risk judgments for a rise in oil prices

Source of variation	SS	df	MS	*F*-Stat	*p*-Value
Percentage	11.168	1	11.168	3.238	0.04
Level of threat to preferences (Threat)	1.861	1	1.861	0.539	0.23
Percentage × Threat	3.284	1	3.284	0.952	0.17
Pre-risk Jdgmnt.	10.440	1	10.440	3.027	0.04
Error	193.176	56	3.450		

Panel C: Follow-up simple effects tests for Hypothesis 2

Source	SS	df	MS	*F*-Stat	*p*-Value
Low threat	9.871	1	9.871	3.494	0.035
High threat	2.814	1	2.814	0.774	0.19

This table presents the adjusted means, ANCOVA, and follow-up simple effects test for the measure used to capture participants' risk judgments for a rise in oil prices. The first independent variable (percentage) is whether the hypothetical percentage used in the sensitivity disclosure about the change in natural gas prices is low (1%) or high (20%). The second independent variable (Threat) is whether the information in the sensitivity disclosure poses a relatively low or high threat to investors' preferences. The covariate (Pre-risk judgment) captures participants' risk judgments before seeing the manipulations but after reading some background information about the company. This variable is measured by participants' responses to the question 'According to the given information, an increase in natural gas prices is a serious risk for ACF Inc.' using an 11-point scale anchored on 1 ('Completely disagree') and 11 ('Completely agree'). The dependent variable is measured by participants' responses to the question 'How likely do you think it is that oil prices will substantially rise by the end of one year from now?' using an 11-point scale anchored on 1 ('Very unlikely') and 11 ('Very likely'). All *p*-values are one-tailed given directional predictions.

participants who viewed the smaller percentage (adjusted mean = 7.39). Moreover, participants' answers to the comprehension question did not have a significant impact on the dependent variable for H2 ($p = .645$, two-tailed). As an additional robustness check, I omitted participants who said that there was a negative relationship between natural gas prices and crude oil prices, as the results suggested that participants perceived natural gas and oil prices to be negatively correlated, as shown in Figure 3. The results were still significant ($p = .027$, one-tailed). Overall, the robustness tests suggest that the results were produced by an anchoring effect rather than a misunderstanding of the text.

7. Conclusion

This study investigated how the format of an estimate in a sensitivity disclosure and the level of threat presented to investors by the disclosure interact to influence investors' judgments, both on an issue related to the information depicted in the sensitivity disclosure and on an unrelated issue. First, I found that investors are more sensitive to variations in an estimate when the information presents less threat than when it presents a greater threat. Second, I found that investors perceive more uncertainty regarding the association between the disclosed risk factor and the estimated financial reporting item when the information presents a greater threat. Finally, and importantly,

I found that the format of the estimate also has a significant impact on investors' judgments on an unrelated issue, but this effect is only significant when the information presents less threat. My study suggests that current investors anchor on parameters as long as the level of threat posed by such disclosures to their preferred conclusions is not too high, and that this anchoring spills over to their future, unrelated judgments.

As with any experimental research, this study has limitations. The experimental materials used in this study are not entirely representative of what would normally be available when investors make decisions. Providing participants with that level of detail would require more time to complete the materials than could realistically be requested. Therefore, this study is subject to the same caveats as other experimental studies, since a perfect replication of the real world is impossible in any experimental study.

This paper suggests directions for future research. As suggested by previous accounting research (Elliott et al. 2007a, Nelson and Rupar 2015) and the hand-collected data referred to in this paper, the parameters used in sensitivity disclosures are often selected arbitrarily, yet investors seem to anchor on them as long as the threat presented to their preferred conclusions is not too high. Therefore, future research might examine mechanisms to reduce this anchoring effect.

As there is considerable variation across companies' choices of parameters, researchers might examine factors that managers take into account in choosing the magnitude of hypothetical changes in sensitivity disclosures. This study examined the judgements of non-professional investors, and it is possible that professional analysts would react differently to sensitivity disclosures. They would be less likely to anchor on the parameters presented to them; however, they might be more sensitive to management's intentions in choosing a specific magnitude of hypothetical change. Therefore, it might be worthwhile for researchers to examine professional investors' reactions to the magnitude of changes used in sensitivity disclosures.

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Supplemental data

Supplemental data for this article can be accessed at https://doi.org/10.1080/00014788.2017.1367915.

Notes

1. There are a few exceptions to this rule, such as SEC Financial Reporting Release No. 48 (FRR 48), which requires the magnitude of a hypothetical change used in a sensitivity disclosure to be at least 10% if there is no justification for using a lower percentage.
2. This assumes a linear or approximately linear relationship between the input and the output. Although such a linear relationship may not always exist, examination of corporate disclosures reveals ample examples. For example, see different scenarios in United Inc.'s 2013 10K for sensitivity analysis of

oil prices and fuel costs, Amazon's 2013 10K for sensitivity analyses of foreign exchange rates and fair value of foreign funds, and Capital One's 2013 10K for sensitivity analyses of interest rates and interest income. Nevertheless, neurobiological research suggests that humans code distances between numbers on a logarithmic rather than a linear scale (Dehaene 2003).

3. Elliott et al. (2007a) define tasks with high integrative complexity as those requiring participants to draw relatively *complex connections* between different pieces of financial statements and the notes therein. In their study, the task with high integrative complexity required participants not only to calculate several ratios for two companies, but also to adjust one firm's income statement to reflect the information in a footnote. My study did not require any such complex calculations; my participants were merely expected to use the information on possible price movements in their judgments relating to these price movements.
4. The participants were told that they owned these shares; they did not pick the shares themselves.
5. The pre-manipulation question was asked in order to control for heterogeneity in participants' beliefs.
6. I introduced this big difference in payments to create motivated reasoning in a laboratory environment. If the difference had been smaller, I may not have been able to manipulate motivated reasoning across participants in this setting, which was crucial to test my first hypothesis. Indeed, several accounting scholars posit that mundane realism, or the extent to which laboratory events are similar to real-world events (Swieringa and Weick 1982), may undermine manipulations of theoretically important factors, such as motivated reasoning in my experiment. See Swieringa and Weick (1982), Peecher and Solomon (2001) and Elliott (2015) for a discussion of mundane realism in accounting experiments.
7. Holding the natural gas price change risk constant.
8. The results show that 60% of participants in this low-threat condition kept at least half of their shares, suggesting that even participants in the low-threat condition tended to keep their shares, as expected.
9. Participants' pre-manipulation risk judgments did not have a significant effect on the number of shares they kept; therefore, this is not presented in the analysis.
10. The magnitude of sensitivity disclosures did not have a significant effect on investors' judgments about the number of shares they wanted to keep. As explained in the methodology section, this was by design; I wanted to create a setting in which sensitivity disclosures posed some threat to investors. Therefore, it is unsurprising that participants did not use the information depicted in the disclosures in their buy/sell decisions. I wanted to create this setting to test my prediction that anchoring, and thereafter spill-over of the anchoring, exist even when investors have an incentive to ignore the sensitivity disclosures, as long as the incentive is not very high.

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Appendix 1. Examples of different parameters from the sensitivity disclosures of Fortune 100 companies in 2014 10-Ks

Input	Parameter	Company	Output
Oil prices	$1 per barrel	Exxon	Income
	10%	Plains GP Holdings	Fair value of commodity derivatives
Discount rate	0.25%	Chevron, Valero Energy, Twentieth Century Fox	Pension liability, Pension Expense, Expected Return on Pension Plan Assets
	1%	McKesson, Walt Disney, Kroger, Safeway	Pension liability, Pension expense
	0.5%	Verizon	Pension liability, Pension expense

(*Continued*)

Continued.

Input	Parameter	Company	Output
	25 basis points	Boeing, United Technologies, United Parcel Service, Honeywell	Pension liability, Pension expense
	50 basis points	Coca Cola, Fed Ex, Mondelez International	Pension liability, Pension expense
	10%, 20%	Goldman Sachs (*), Citi Group (*)	Fair value of retained interest (*), fair value of mortgage instruments(*)
	100 basis points	Sears, Super Valu	Goodwill
Interest rate	100 basis points	Apple, Fannie Mae(*), Freddie Mac(*), WellPoint (Anthem) Cigna, Oracle	Fair value of financial instruments(*), income from financial instruments(*), interest expense
	50 basis points, 25 basis points	Fannie Mae(*), Freddie Mac(*)	Fair value of financial instruments(*), income from financial instruments(*)
	1%	Excess Scripts, Humana, World Fuel Services	Fair value of financial instruments, interest expense
	10%	IBM, Met Life, Lock Heed Martin, John Deere	Fair value of financial instruments, fair value of debt
	10 basis points	AmeriSource Bergen	Interest expense
	15%	Humana	Fair value of debt
USD/ Foreign currency	10% (For different currencies including Euro, British Pound, Yuan, Yen, Bolivar)	Hewlett Packard, Costco, Comcast, Sysco, Merck, United Continental Holdings, Direct TV Group, Du Pont	Foreign exchange fair value loss, fair value of contracts, income, sales, fair value of hedges, foreign currency translation adjustments
	20% (For different currencies including Euro, Yen, Yuan, Shekel, Australian Dollar, British Pound)	Intel, Google	Income

(*) Sensitivity disclosure has been disclosed by giving more than one parameter such as depicting the scenario under one hypothetical change and depicting another scenario under another hypothetical change.

Other inputs in the data set include market rate of debt, casualty losses, health care cost trend, estimated take rate for recall campaigns, returned vehicles, uncollectibles, completion factor for insurance, housing prices, internal risk ratings for commercial loans, commodity prices, constant prepayment rate, repurchase rate, cash flows for stores, inventory valuation allowance, average claim cost, equity market prices, estimates of proved reserves, anticipated credit losses, return on assets, selling prices for excess properties, products considered obsolete, store closing lease liability, self-insurance liability, fair value of each reporting unit, price movement in natural gas, price change of securities, stock based compensation expense, variable rate debt, future mortality rates, expected frequency trend for professional liability claims, fuel prices, credit spread level, foreign currency contracts, losses in credit card member loans, and S&P 500 with many different outputs and parameters.