

**INFORMATION QUANTITY, INFORMATION CONSISTENCY, AND
THE CONFIDENCE OF UNSOPHISTICATED INVESTORS**

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**INFORMATION QUANTITY, INFORMATION CONSISTENCY, AND
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Advances in technology, as well as regulatory and legislative actions (e.g., Regulation Fair Disclosure, Sarbanes-Oxley, new NYSE and NASDAQ requirements) have led to an increase in the quantity of information available to the public. In this dissertation, I describe two experiments that examine the effects of information quantity and consistency (holding information quality constant) on the judgments and trading behavior of unsophisticated investors. I find that increasing the quantity and the consistency of information causes unsophisticated investors to show greater confidence and trading aggressiveness. This relation is not explained by an increase in cognitive effort, suggesting a direct effect of information quantity on confidence. The effect of increased quantity reduces investors' expected and actual wealth in simulated experimental markets, while the effect of consistency on wealth depends on whether the additional, low-quality signals are consistent or inconsistent with the high-quality signal investors receive. Results highlight possible negative consequences of increased disclosure, and suggest directions for future experimental and archival research.

BIOGRAPHICAL SKETCH

Steven Darby Smith received Bachelor of Science and Master of Accountancy degrees from Brigham Young University in 1999. He began his doctoral studies at the Johnson Graduate School of Management at Cornell University in the fall of 1999. On completing his studies at Cornell, Steven joined the faculty at the University of Illinois at Urbana-Champaign as an Assistant Professor of Accountancy in the College of Business Administration. Steven is married to the former Heather Butters. They have three children: Darby, Trevor, and Kelli.

To Heather

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CHAPTER 1. INTRODUCTION

This dissertation examines how the confidence and wealth of unsophisticated investors are affected by changes in the quantity and consistency of their information, holding constant the quality (i.e., diagnosticity) of that information. I conduct two experiments in which student investors receive accounting signals for a number of firms, make predictions about the future performance of each firm, and provide reservation prices and trading decisions based on their predictions. Results of the first experiment show that unsophisticated investors are significantly more confident in their judgments (i.e., they provide more extreme reservation prices) and more aggressive in their trading behavior (i.e., they trade more shares) when either the quantity or the consistency of their signals is increased. Results of the second experiment indicate that the effect of information quantity on confidence is not mediated by investors' cognitive effort, supporting a direct quantity effect on confidence.

My experiments also allow me to simulate single-period markets in which unsophisticated investors trade with "sophisticated" investors who know the diagnosticity of their information. Results indicate that increasing information quantity (holding information quality constant) reduces unsophisticated investors' wealth. Increasing information consistency increases unsophisticated investors' wealth when low-quality signals are consistent with the high-quality signal, but decreases unsophisticated investors' wealth when low-quality signals are inconsistent with the high-quality signal.

I examine information quantity and consistency because they are relevant features of the current financial reporting environment. Recent regulatory and legislative interventions (e.g., Regulation Fair Disclosure [hereafter, "Reg FD"], the

Sarbanes-Oxley Act of 2002, new NYSE and NASDAQ requirements), as well as the advance of the Internet, have led to an increase in the quantity of available information about publicly-traded firms (Iglesias 2003). However, this increase in information quantity may not be matched by a commensurate increase in information quality (Bassett and Storrie 2003; Byrnes 2002; D'Avolio, Gildor, and Shleifer 2001; Štraser 2002). Furthermore, managers are likely to disclose information that tells a coherent, consistent story, even if much of that information is of low quality, so information consistency may also have increased over time.

The psychology literature suggests that information quantity and consistency are likely to be salient features that are relied on by unsophisticated investors who lack the knowledge and expertise necessary to distinguish between low- and high-quality information. Prior psychology research has shown that increasing the *quantity* of signals available for making a judgment increases confidence, often without a corresponding increase in accuracy (Oskamp 1965; Ryback 1967). My experiments extend this literature by showing an effect of quantity even in an investment setting where decision makers have monetary incentives and know that more sophisticated investors also exist in the market. Prior psychology research has also hypothesized (but not shown) that confidence increases with signal consistency (see Peterson and Pitz 1988). I examine an investment setting in which consistency is a salient feature of investors' information, and I find strong evidence of the predicted effect.

In the first experiment, I manipulate information quantity, while holding information quality constant, by providing additional, nondiagnostic (i.e., low-quality) signals in the information sets of half of the firms that investors evaluate. Specifically, investors receive two signals for each firm in the "low-quantity" condition and four signals for each firm in the "high-quantity" condition. Regardless of quantity condition, the quality (i.e., the predictive value) of the information sets is held

constant. I manipulate information consistency by varying the level of directional agreement among the signals. This experimental approach allows me to separate the effects of information quality, quantity, and consistency, which are typically confounded in archival data. It also allows me to examine two separate measures of investor confidence: reservation prices (which reflect confidence in absolute accuracy) and trading aggressiveness (which reflects confidence in relative accuracy). These features allow for clear inferences about the effects of information quantity and consistency on judgment confidence.

The results indicate that unsophisticated investors rely on information quantity and consistency when determining both their confidence and their aggressiveness. Mediating variables analyses show that the effects of quantity and consistency on unsophisticated investors' aggressiveness occur via their effects on confidence, suggesting that increased confidence in absolute accuracy generates increased confidence in accuracy relative to sophisticated investors. To examine how information quantity and consistency affect the wealth of unsophisticated investors, I also obtain data from "sophisticated" investors who perform the same task as unsophisticated investors but are given guidance about the predictive value of the signals they receive (unsophisticated investors do not receive any guidance). Sophisticated investors always receive the high-quantity signal set. Investor sophistication and quantity of information is common knowledge to all investors. This approach allows me to simulate single-period clearinghouse markets by aggregating the reservation prices and trading decisions of all investors to determine market prices and compensate investors according to their trading gains and losses. It also allows me to examine the wealth effects of important aspects of the adoption of Reg FD. Specifically, unsophisticated investors in the low-quantity condition face both an informational and an analytical disadvantage relative to sophisticated investors, while

unsophisticated investors in the high-quantity condition face only an analytical disadvantage (because all investors receive the same number of signals). Therefore, I can examine the effect on unsophisticated investors of shifting to a “level informational playing field,” as anticipated under Reg FD. I first compute *expected* wealth transfers by determining unsophisticated investors’ trading gains or losses under the assumption that sophisticated investors trade optimally on their information. Results show that unsophisticated investors systematically transfer wealth to sophisticated investors, and that wealth transfers are influenced by both the quantity and the consistency of the signals they receive. Specifically, unsophisticated investors’ losses are greater when they receive more signals, and are also greater when the low-quality signals investors receive are consistent with each other but are inconsistent with the high-quality signal they receive. The results from analyses of *actual* wealth transfers are similar to those of expected wealth transfers, except that the effect of information quantity does not reach statistical significance.

Overall, my results suggest that the current higher-quantity information environment may impair the welfare of unsophisticated investors, who are often intended to be the primary beneficiaries of regulations calling for greater disclosure (Securities and Exchange Commission [SEC] 2000). Challenges to the “more is better” approach to information quantity usually cite evidence on information overload, wherein limits to information processing capacity lead to lower-quality decisions beyond a critical level of signal quantity (see Paredes 2003). My approach is different. I show that increased information quantity can impair performance through purely psychological forces that increase confidence without increasing accuracy, and can therefore lead to welfare losses. I provide evidence that this result arises not from information overload, but from systematic reliance on information quantity and consistency as determinants of confidence in circumstances where those variables are

not correlated with information quality.

Some of these results are consistent with unsophisticated investors behaving rationally under the naive assumption that all information is of high quality. However, other results indicate reactions to information quantity and consistency that are not rational but that are predicted from the psychology literature. Specifically, I find that investors respond to a higher quantity of inconsistent information by providing more extreme judgments (and by trading more shares). This response is not rational (a larger but no less ambiguous information set should render a judge equally or less confident), yet it is consistent with the psychological theory that increasing the quantity of information leads to greater judgment confidence (this result also highlights the benefit of separating and independently examining the effects of information quantity and consistency). An alternative explanation for the quantity effect in the low consistency condition is the possibly mediating role of cognitive effort. To test this explanation, the second experiment mirrors the first except that data on individual effort is collected in order to test for a mediating effect. The primary results of the second experiment replicate those of the first. However, consistent with a pure “quantity effect,” I find no evidence that cognitive effort mediates the effect of information quantity on unsophisticated investors’ judgment confidence.

This research contributes to the behavioral accounting and psychology literatures on the sources of miscalibration and its effects. Previous research has studied features of the information environment and confidence in financial judgments (e.g., Bloomfield, Libby, and Nelson 1999, 2003). This dissertation complements these studies by identifying information quantity and consistency as specific determinants of miscalibration in financial judgments. Also, prior research suggests that confidence in judgments may not necessarily transfer to confidence in decisions (Bukhszar 2003). This dissertation addresses this issue by showing effects of quantity

and consistency on confidence in both absolute accuracy (as measured by reservation prices) and relative accuracy (as measured by trading aggressiveness).

This dissertation also contributes to the literature on the effects of confidence on wealth in financial markets. Prior research shows that unsophisticated investors tend to be overconfident, trade too much, and transfer wealth to more-informed investors (Barber and Odean 2000; Bloomfield, Libby, and Nelson 1999). I contribute to this stream of research by drawing on literature from psychology to address specific features of the information environment that affect the confidence, calibration (i.e., appropriateness of confidence), and aggressiveness of unsophisticated investors' judgments. My results show that informational equality causes unsophisticated investors to transfer more wealth to sophisticated investors because they fail to appreciate their analytical disadvantage. Thus, increasing unsophisticated investors' ability to distinguish between high- and low-quality information, or to better understand the implications of their analytical disadvantage, may improve their welfare more than increasing the quantity of information available to them. Alternatively, unsophisticated investors who fall prey to the effects documented here may be better off relying on the summarized and filtered information that comes from information intermediaries such as financial analysts, rather than trying to interpret and act on what is often raw and unfiltered information that comes directly from the firms (Securities Industry Association [SIA] 2001).

The remainder of the dissertation is organized as follows. Chapter 2 reviews the relevant literature and presents the hypotheses. Chapters 3 and 4 describe the method and results of experiments 1 and 2, respectively. Chapter 5 concludes the dissertation with an overall discussion of the results, including limitation, extensions, and implications.

CHAPTER 2. BACKGROUND AND HYPOTHESES

2.1 INVESTOR SOPHISTICATION

One way in which unsophisticated investors differ from sophisticated investors is in the amount of knowledge they have about the appropriate signs and weights to apply to different signals when making forecasts and other predictions (see Bonner, Walther, and Young 2003). Professional analysts and other sophisticated investors have more experience with predicting firm performance (Potter 1992; Yunker and Krehbiel 1988), as well as greater resources to develop models and formulas for making their predictions (Opdyke 2000). Therefore, for purposes of this study, information quality is defined as its diagnosticity, or predictive value, and sophisticated investors are defined as those who have more knowledge of information diagnosticity (Salthouse 1991).

2.2 THE INFORMATION ENVIRONMENT

A great deal of regulatory and legislative activity in recent years has focused on increasing the amount of financial information available, particularly to smaller, less-sophisticated investors. For example, Reg FD was enacted in 2000 with the goal of eliminating selective disclosure, and was expected to give individual investors access to a greater quantity of material information (SEC 2000). In 2002, Congress passed the Sarbanes-Oxley Act, requiring greater disclosure about such issues as company audit committees, executive compensation, and management conflicts of interest (American Institute of Certified Public Accountants [AICPA] 2002). The New York Stock and NASDAQ exchanges have also issued requirements that call for greater disclosure of such issues as governance guidelines and audit qualifications (Goodwin Procter 2003). In addition, the advance of the Internet has reduced the cost

to firms of disclosing large amounts of information (VanGetson 2004). Consistent with expectations, anecdotal and empirical evidence suggests that the quantity of publicly available information has increased (Bailey et al. 2003; Byrnes 2002; Heflin, Subramanyam, and Zhang 2003; Iglesias 2003; Štraser 2002; Unger 2001).

While the increase in information *quantity* is relatively undisputed, the effect of these changes on the overall *quality* of information remains in question. Opponents of Reg FD argued that firms would respond to the regulation by communicating large amounts of irrelevant information (Bailey et al. 2003; SIA 2001). Bassett and Storrie (2003) similarly argued that the Sarbanes-Oxley Act and other political measures would cause an increase in the quantity but not necessarily the quality of financial reports. Štraser (2002) reports an increase in information asymmetry between more- and less-sophisticated investors since Reg FD, consistent with the quality of public information not increasing with quantity. Also, other studies provide evidence of increased information gathering effort by analysts and increased forecast dispersion (Agrawal and Chadha 2003; Bailey et al. 2003; Irani and Karamanou 2003; Mohanram and Sunder 2003; Shane, Soderstrom, and Yoon 2002). On the other hand, Heflin, Subramanyam, and Zhang (2003) do not find evidence consistent with impairment of the information environment, and some of their results are consistent with improvement. The objective of this study is not to determine whether information quality has increased post-FD; rather, I control for information quality so as to independently examine the effects of changes in information quantity and consistency. These variables would be difficult to deconfound using archival methods.

2.3 INFORMATION AND INVESTOR CALIBRATION

An environment characterized by more, but not better, information is unlikely to improve the accuracy of unsophisticated investors' judgments, and may impair it,

because investors tend to overweight low-quality information (Bloomfield, Libby, and Nelson 2000; Griffin and Tversky 1992). This by itself may not pose a problem if unsophisticated investors are aware of any impairment and adjust their investment activity accordingly. However, a salient increase in information quantity may affect the confidence with which unsophisticated investors make those decisions in ways that adversely affect their welfare.

The relation between judgment accuracy and confidence is called *calibration* in the judgment and decision making literature. Individual miscalibration commonly takes the form of overconfidence; i.e., individuals generally overestimate the precision of their knowledge or the extent of their abilities. Miscalibration has been shown among professionals as well as nonprofessionals, in a variety of tasks including individual knowledge, predictions of behavior or performance, personality impressions, and eyewitness testimony (Alba and Hutchinson 2000; Barber and Odean 1999; Dunning et al. 1990; Klayman et al. 1999; Swann and Gill 1997; Wells and Murray 1984). Of particular relevance for the study of unsophisticated investors, Kruger and Dunning (1999) find that the least accurate individuals are typically the least calibrated. In sum, the literature shows that confidence is influenced by factors other than accuracy, such that miscalibration is a common feature of individual judgment.

2.3.1 Information Quantity and Calibration

The quantity of information available for making a judgment has been shown to affect confidence (Gill, Swann, and Silvera 1998; Paese and Snizek 1991). Additional information tends to increase confidence, even when it does not increase accuracy (Oskamp 1965).

My experiment focuses on circumstances where unsophisticated investors

receive information of greater quantity, but not greater quality. Because these investors are relatively less able to distinguish diagnostic from nondiagnostic information, they are unlikely to recognize the low quality of their additional information. Rather, they are likely to assume that more information implies a higher-quality information set, and as a result show greater confidence, but not greater accuracy, in their judgments.

H1a: Unsophisticated investors' confidence increases as signal quantity increases.

H1b: Unsophisticated investors' calibration decreases as signal quantity increases.

2.3.2 Information Consistency and Calibration

Another factor that may influence investors' confidence is the consistency of the information they receive. Gill, Swann, and Silvera (1998) argue that if information is consistent in its implications, the individual's mental representation is likely to be richer, producing greater confidence. Peterson and Pitz (1988) suggest that consistency should affect an individual's confidence to the extent that he or she believes it affects the accuracy of his or her judgments. However, they do not find a significant effect of consistency on confidence (see their experiment 4), and attribute their lack of results to information consistency not being a salient feature of their experimental setting. Information consistency is likely to be a salient feature of unsophisticated investors' information in trading contexts, so my experimental setting provides a more powerful test of the effect of information consistency on judgment confidence.

If managers increase the quantity of information in public disclosures by including more low-quality information, it is likely that they will try to convey a

consistently favorable impression of the firm. To the extent that unsophisticated investors fail to recognize and ignore low-quality information, their judgments, and their confidence in those judgments, are likely to be affected by the consistency of the information they receive, with high consistency information sets producing relatively high judgment confidence. However, the effects of consistency on *calibration* will depend on how consistency relates to the high-quality information in the set. If an information set as a whole is consistent with the high-quality information contained therein, reliance on consistency should improve calibration. If an information set is inconsistent (on the whole) with the high-quality information contained therein, reliance on consistency should reduce calibration. Thus, I anticipate the largest reduction in calibration when an information set is of relatively high consistency but conflicts directionally with the high-quality information.

H2a: Unsophisticated investors' confidence increases as signal consistency increases.

H2b: Unsophisticated investors' calibration increases with the degree of directional agreement between the information set as a whole and the high-quality signal contained therein.

2.4 TRADING AGGRESSIVENESS AND WEALTH EFFECTS

The confidence investors have in their financial judgments is a key factor in the aggressiveness with which they participate in the capital markets (Bloomfield, Libby, and Nelson 1996). Thus, the calibration of those judgments should be a key factor in determining their trading profits. Prior research provides evidence that miscalibration can be costly. For example, Barber and Odean (2000) analyze actual trade data and find evidence that individual investors are overconfident in their own opinions, which causes them to trade too much and suffer reduced returns as a result. In an experimental study, Bloomfield, Libby, and Nelson (1999) find that less-

informed investors are overconfident and consequently transfer wealth to more-informed investors who are able to develop more accurate estimates of security values. Similarly, an increase in information quantity and consistency may cause unsophisticated investors to feel more confident not only in their absolute accuracy, but in their accuracy *relative to sophisticated investors*, which should be reflected in more aggressive trading behavior.

H3a: Unsophisticated investors trade more shares as signal quantity increases.

H3b: Unsophisticated investors trade more shares as signal consistency increases.

The effects of information quantity and consistency have economic implications for investors. I expect unsophisticated investors to be generally miscalibrated given their disadvantage relative to sophisticated investors, and to transfer wealth as a result. However, unsophisticated investors' wealth transfers should track their calibration and aggressiveness, which I hypothesize are affected by the quantity and consistency of investors' information.

H4a: Unsophisticated investors transfer wealth to sophisticated investors.

H4b: Unsophisticated investors transfer more wealth to sophisticated investors as signal quantity increases.

H4c: Unsophisticated investors' wealth transfers to sophisticated investors decrease with the degree of directional agreement between the information set as a whole and the high-quality signal contained therein.

CHAPTER 3. EXPERIMENT 1

3.1 METHOD

3.1.1 Overview

I conduct an experiment in which forty-eight MBA and Masters of Accounting students make predictions and trading decisions for twenty-four firms based on accounting information from a given year. Participants (hereafter “investors”) predict whether each firm’s Return on Equity (ROE) in the following year will be above or below the median ROE of a large sample of public firms, provide reservation prices for securities of the firms, and indicate the number of shares they want to buy at prices below their reservation prices and sell at prices above their reservation prices. Investors do not interact in real time markets, yet these data allow me to determine the market results that would occur if interaction took place.

3.1.2 Experimental Design

Thirty-two investors serve as unsophisticated investors in a 2×4 incomplete factorial design, shown in Table 1. Signal consistency is manipulated within subjects at four levels; signal quantity is manipulated within subjects at two levels. Information quality is constant in all cells of the experiment. Specifically, only one of the signals has significant predictive value, and it is given for all firms. The other signals are all of low quality, in that they are not significantly correlated with the prediction variable, nor do they add to the predictive value of the information set beyond the high-quality signal.

To test for the predicted wealth effects, sixteen investors serve as “sophisticated” investors. Sophisticated investors always receive the high-quantity

TABLE 1.
Experimental design:
Manipulation of unsophisticated investors' information quantity and consistency

	Low-Quantity (2 signals per firm)			
Consistency*	<i>Low (AB)</i>			<i>High (AA)</i>
# of firms	6			6
	High-Quantity (4 signals per firm)			
Consistency	<i>Low (AABB)</i>	<i>Intermediate (ABBB)</i>	<i>Intermediate (AAAB)</i>	<i>High (AAAA)</i>
# of firms	4	2	2	4

* “Consistency” refers to the degree to which a firm’s information set is consistent with the diagnostic signal. Two signals are defined as consistent if both of their values are either greater than 65 or less than 35. For analysis purposes, each firm was assigned a consistency code. The high-quality signal (CFO to LT Debt Ratio) was coded as “A” and each additional signal was coded as “A” if it was consistent with the high-quality signal and as “B” if not. Therefore, firms whose signals were of the form AABB (or AB in the case of the 2-signal firms) were given a consistency value of 0 (representing low consistency), firms whose signals were of the form ABBB (AAAB) were given a value of 1(2), and firms whose signals were of the form AAAA (or AA in the case of the 2-signal firms) were given a value of 3 (representing high consistency).

information set, and also receive guidance about the predictive power (i.e., the quality) of the signals that all investors receive, both individually and together with the other signals. The guidance includes both the correlation between each signal and the predicted ROE variable, and the percentage of correct predictions that would result from relying on each individual signal and on the information set as a whole. Unsophisticated investors do not receive any guidance about the quality of their signals, but all investors are informed of the makeup of the market setting.¹

¹ Including twice as many unsophisticated as sophisticated investors makes it more likely that unsophisticated investors can influence the market price, thereby encouraging sophisticated investors to exploit unsophisticated investors’ lack of knowledge of information quality.

3.1.3 Dependent Variables

For each security, investors make a binary prediction about whether the firm's future ROE will be above or below the median ROE. They also provide a reservation price (between \$0 and \$1) for a security that pays \$1 if ROE is above the median and \$0 otherwise. The reservation price represents the price at which they would be indifferent to either buying or selling a share of the security. Finally, investors indicate the number of shares (between 0 and 10 shares) they would like to buy or sell.

Confidence is measured by converting each reservation price to a probability judgment; for reservation prices greater than \$0.50, confidence = reservation price, for reservation prices below \$0.50, confidence = 1 – reservation price. Thus, a more extreme reservation price is interpreted as indicating greater absolute confidence in one's prediction (Bloomfield, Libby, and Nelson 2000; Ronis and Yates 1987).² Aggressiveness is measured by the number of shares traded. Thus, more shares traded is interpreted as indicating greater relative confidence in one's prediction.

3.1.4 Independent Variables

3.1.4.1 *Information Quantity*

Information quantity is held constant for sophisticated investors, who receive four signals for all twenty-four firms. Unsophisticated investors' information quantity is manipulated within subjects. Unsophisticated investors receive two signals for each of twelve "low-quantity" firms and four signals for each of twelve "high-quantity" firms. The change in unsophisticated investors' signal quantity is common knowledge to all investors, and the order in which unsophisticated investors receive the 2-signal group or the 4-signal group is balanced.

² Because the reservation price is equivalent to a probability estimate, this measure of confidence is consistent with the psychology literature on confidence and miscalibration (see Lichtenstein, Fischhoff, and Phillips 1982).

3.1.4.2 *Information Consistency*

Consistency is manipulated by varying the directional agreement of the signals. Two signals are defined as consistent if they agree directionally in their prediction of security value. In the 2-signal condition, six “high consistency” firms have consistent signals, and six “low consistency” firms have inconsistent signals. In the 4-signal condition, four high consistency firms have all four signals consistent, while four low consistency firms have two signals in each direction. In addition, four “intermediate consistency” firms have three signals in one direction and one in the other direction. These four firms are balanced with respect to whether or not the weight of consistency is in the direction of the high-quality signal.³

3.1.5 Firms and Signals

The experimental design requires securities with the following characteristics: values determined by a binary variable, signals with varying predictive power, and signal sets for which information quality can be held constant while manipulating information quantity and consistency. To meet these requirements, I drew a large sample from the set of all firms in the Compustat database from 1998 to 2002. I coded a binary variable, “ROE”, equal to 1 (0) if a firm’s ROE in a given year was greater than (less than) the median ROE of all firms in that year. I then selected a large number of accounting signals based on Table 2 of Ou and Penman’s (1989, p. 304) study of the predictive value of financial statement items. To simplify the task and to increase the predictive power of the signals, I replaced the value of each signal with its percentile rank, equal to the percentage of all firms in that year that had lower values

³ Balancing the consistency of the firms in this way ensures that the correlations between each signal and the ROE variable for the 24 specific firms used in the experiment are relatively unchanged from those in the large dataset from which the securities were drawn.

of that signal.⁴ I conducted univariate analyses to determine the power of each signal in predicting the value of the ROE variable. For each signal, I computed the percentage of firms for which that signal alone correctly predicts the value of the ROE variable, using a cutoff probability of 0.50.⁵ The signals were selected for the experiment based on the results of these analyses.

Table 2 shows the signals received by the different investor groups, the correlation between each signal and the ROE variable, and the percentage of correct predictions for each signal and for each information set as a whole. Panel A shows that in the 2-signal condition, unsophisticated investors receive one high-quality signal (the ratio of Cash from Operations to Long-term Debt) and one low-quality signal (the percentage change in Gross Margin Ratio). In the 4-signal condition, shown in Panel B, unsophisticated investors receive the same two signals plus two additional, low-quality signals (Inventory Turnover Ratio and Percentage Change in Working Capital). In addition to their quality, the signals were selected so as to appear at least somewhat diagnostic to an investor who lacks specific knowledge of signal quality. Statistically, however, the three low-quality signals are in fact nondiagnostic, as none are significant in predicting the ROE variable in univariate tests, and the percentage of correct prediction is no higher for the information set as a whole than it is for the high-quality signal, “CFO to LT Debt Ratio” (72%).⁶ Sophisticated investors receive the 4-signal set (shown in Panel B) for all twenty-four firms.

⁴ For example, if a firm’s Change in Gross Margin Ratio was greater than 40% of that of all other firms in a given year, the value for that measure was 40 for that firm-year.

⁵ For each signal, I assigned to each firm a value of 1 if the univariate analysis yielded a predicted value greater than 0.5 and a value of 0 if not. The percentage of correct prediction is computed as the percentage of firms for which this binary value matches the actual value of the ROE variable.

⁶ Because these variables are used to predict a binary dependent measure, a purely nondiagnostic signal will predict correctly about 50% of the time on average, by pure chance. Thus, the closer a variable’s correct prediction percentage is to 50%, the less diagnostic that variable is.

3.1.6 Trading Decisions and Market Prices

After the experiment, I aggregate reservation prices and share numbers to determine the market-clearing price for each security in a clearing-house market. All transactions are executed at this market-clearing price, and investors are compensated on that basis. If an investor's reservation price is below (above) the market price, s/he sells (buys) shares. After all transactions are executed, shares are converted into their true values, and trading gains and losses are computed for each participant.

3.1.7 Instructions and Procedure

Investors received the experimental materials in a packet of four envelopes. Written instructions contained in the first envelope (shown in Appendix A) were also reviewed verbally by the proctor, and investors were free to ask questions publicly. The instructions reviewed the task, the firms, and how money could be earned. Investors were also informed that there were two types of investors in the market: Sophisticated investors (called "Type 2 investors" in the experiment) would receive some guidance about the explanatory power of all investors' information, while unsophisticated investors (called "Type 1 investors") would not receive any guidance. Investors were also informed that sophisticated investors would receive four signals for each firm, while unsophisticated investors would receive either two signals or four signals for each firm. Investors were not informed that the quantity of signals received by unsophisticated investors would change during the experiment.⁷ They were told that investor type was assigned randomly, and that they would find out what type they

⁷ Whether unsophisticated investors received the 2- or 4-signal group first was balanced. However, in order to discuss verbally the differences between unsophisticated and sophisticated investors, it was necessary to separate the unsophisticated investors who received the 2-signal group first from those who received the 4-signal group first. Therefore, sessions with each group of unsophisticated investors were conducted separately. Investors were randomly assigned to treatments and sessions.

TABLE 2.
Information signals

Panel A: Signals received by unsophisticated investors in the 2-signal condition:

Accounting measure	Correlation with prediction variable	Percentage of correct prediction when using the measure perfectly
CFO to LT Debt Ratio	0.439	72%
Percentage Change in Gross Margin Ratio	0.087	59%
Entire information set	0.450	72%

Panel B: Signals received by unsophisticated investors in the 4-signal condition, and by sophisticated investors for all firms:

Accounting measure	Correlation with prediction variable	Percentage of correct prediction when using the measure perfectly
CFO to LT Debt Ratio	0.439	72%
Percentage Change in Gross Margin Ratio	0.087	59%
Inventory Turnover Ratio	0.080	59%
Percentage Change in Working Capital	0.060	59%
Entire information set (all 4 items)	0.454	72%

This table presents the accounting signals received by unsophisticated and sophisticated investors. When unsophisticated investors were in the low-quantity condition, they received the two signals shown in Panel A. The signals shown in Panel B were given to unsophisticated investors in the high-quantity condition, and to sophisticated investors for all firms. For each accounting signal, investors received a number representing the percentage of firms for which the value of that accounting signal was lower than the firm they were evaluating. Thus, all signals were percentages between 0 and 99. “Correlation with prediction variable” is the correlation between each signal and the binary ROE variable investors were predicting, estimated in the large dataset from which the experimental securities were drawn. “Percentage of correct prediction when using the measure perfectly” is the percentage of firms in the large dataset for which that signal or combination of signals correctly predicts the value of the binary ROE variable, using a cutoff of 0.50. Thus, if the predicted value of the ROE variable using the signal is less than (greater than or equal to) 0.50, the signal has a predicted binary value of 0 (1).

had been assigned in the second envelope. The verbal discussion allowed all investors to have common knowledge about the information that each investor type would receive.

In the second envelope, investors learned their assigned type and the signals they would receive (also shown in Appendix A). Sophisticated investors also received guidance (similar to Table 2) about the information sets of unsophisticated investors as well as their own. All investors also completed comprehension checks to ensure their understanding of the materials, their assigned investor type, and how investor types differed. Sophisticated investors were also asked about the explanatory power of the signals.

The third envelope contained the first twelve firms. After reviewing the signals for a firm, investors were asked to predict whether the firm's ROE in the next year would be above or below the median ROE of all firms in the database in the next year. They were then asked to provide, on a continuous scale, a reservation price (called a "cutoff price") for shares of securities of the firm. Investors were constrained to select a reservation price in the range (\$0, \$0.50) if they had predicted below-median ROE and in the range (\$0.50, \$1) if they had predicted above-median ROE. This was explained as reflecting that the reservation price was an expression of the probability that future ROE would be above median ROE (i.e., if they predicted below-average ROE, they must believe that probability to be below 0.50, and vice versa). Finally, they were asked to indicate, on a discrete scale ranging from 0 to 10, the number of shares of the firm they were willing to trade. After indicating their share number, they immediately went on to the next firm.

At the end of the third envelope, all investors were informed that for the last twelve firms, unsophisticated investors would receive four (two) signals instead of two (four), and any new signals were defined. Investors were also informed that

sophisticated investors' information would not change. Sophisticated investors were given guidance about the explanatory power of the information that unsophisticated investors would receive for the last twelve firms. All investors again completed comprehension checks to ensure their understanding of the changes, at which time they moved to the fourth envelope to evaluate the last set of firms. After completing the study, investors were asked a series of debriefing questions.

3.2 RESULTS

3.2.1 Consistency Coding

For each firm, I code the high-quality signal as “A”, and I code each additional signal as “A” if it is consistent with that signal and as “B” if not. I assign each firm a consistency code according to the following convention: firms whose signals are of the form AABB (or AB in the case of the 2-signal firms) are assigned a consistency value of 0 (representing low consistency), firms whose signals are of the form ABBB (AAAB) are assigned a value of 1(2) (representing intermediate consistency), and firms whose signals are of the form AAAA (or AA in the case of the 2-signal firms) are assigned a value of 3 (representing high consistency).

3.2.2 Comprehension and Manipulation Checks

All participants correctly identified their assigned investor type, the number of signals each investor type would receive, and whether they and investors of the other type would receive any guidance about the predictive value of their signals. After the first 12 firms had been completed, all participants correctly identified the change in unsophisticated investors' information.

Analysis of the predictive accuracy of the two investor groups serves as a check on the success of the sophistication manipulation. The mean absolute difference

between unsophisticated investors' reservation prices and the securities' expected values is 0.250; the mean absolute difference for sophisticated investors is 0.132. The difference is statistically significant ($F = 28.67$; $p < .0001$), suggesting that sophisticated investors were better able to rely on the high-quality signal when making their predictions, and were more accurate as a result. Thus, the manipulation of investor sophistication was successful.

3.2.3 Effects of Information Quantity and Consistency on Unsophisticated Investors' Confidence, Calibration, and Trading Aggressiveness

I predict that, holding information quality constant, increasing the quantity and consistency of unsophisticated investors' information leads to increased judgment confidence and trading aggressiveness. As a result, I expect calibration and wealth to decrease with information quantity and with the degree to which the information set is inconsistent with the high-quality signal. Panel A of Table 3 shows unsophisticated investors' mean confidence, calibration, and shares traded, by quantity condition and consistency. Figure 1 shows the means, along with the predicted patterns, graphically. For each of the dependent measures, I conduct a repeated measures, fixed effects analysis with quantity and consistency as categorical independent variables. I omit intermediate-consistency firms (i.e., firms coded as ABBB and AAAB) to analyze the effect of information quantity, as no intermediate-consistency firms are represented in the low-quantity condition. The results of the analyses are shown in Panel B of Table 3. Quantity and consistency do not interact significantly in any analysis, so Panel B focuses on predicted main effects and contrasts.

3.2.3.1 Confidence

Supporting H1a, the effect of quantity on confidence is significant ($F = 9.31$; $p = 0.0024$), with unsophisticated investors more confident when they receive more signals. Supporting H2a, the effect of consistency on confidence is also significant ($F = 50.51$; $p < 0.0001$). To provide a stronger test of the effect of consistency, I conduct a planned contrast which includes the intermediate-consistency firms (i.e., ABBB and AAAB firms). For this contrast, firms with signals of the form AABB, ABBB, AAAB, and AAAA are assigned weights of -1 , 0 , 0 , and 1 , respectively, corresponding to the number of consistent signals in each information set.⁸ The contrast is significant ($F = 26.05$; $p < 0.0001$), again supporting H2a. The effect of consistency is not significant when the AAAA firms are eliminated. Thus, unanimity (i.e., all signals in the same direction) seems important for information consistency to affect judgment confidence (see Figure 1, Panel A).

⁸ These and all other contrast results are robust to a number of alternative weighting conventions.

TABLE 3.
Experiment 1: Effects of quantity and consistency on unsophisticated investors' judgments

*Panel A: Descriptive Statistics**

Low-Quantity

	Low Consistency (AB)		High Consistency (AA)	<i>Average</i>
Confidence	0.713		0.776	0.744
Calibration	-0.132		-0.050	-0.091
Shares	5.750		6.302	6.026

High-Quantity

	Low Consistency (AABB)	Intermediate Consistency (ABBB) (AAAB)		High Consistency (AAAA)	<i>Average</i>
Confidence	0.734	0.749	0.735	0.816	0.764
Calibration	-0.127	-0.171	-0.054	-0.068	-0.103
Shares	6.203	6.156	6.203	7.078	6.487

TABLE 3 (Continued)*Panel B: Fixed Effects and Contrast Analyses for H1, H2, and H3*

Dependent Measure	Hypothesis	Effect	Den df	F	p-value (one-tailed)
Confidence	H1a	Quantity	31	9.31	0.0024
	H2a	Consistency	31	50.51	< 0.0001
	H2a	<i>Contrast: Consistency</i> ⁺	93	26.05	< 0.0001
Calibration	H1b	Quantity	31	0.59	0.4469
	H2b	Consistency	31	70.19	< 0.0001
	H2b	<i>Contrast: Consistency</i>	93	43.51	< 0.0001
Trading Aggressiveness (Shares)	H3a	Quantity	31	12.85	0.0006
	H3b	Consistency	31	17.32	0.0001
	H3b	<i>Contrast: Consistency</i>	93	11.63	0.001

* “Confidence” is measured as the reservation price when it is above 0.50, and as 1 – reservation price when it is below 0.50. “Shares” represents the number of shares traded. “Calibration” is measured as (–1) times the squared difference between the reservation price and the expected value of the security, per investor, per security.

The fixed effects analyses omit firms coded as ABBB and AAAB because intermediate–consistency firms are not represented in the low-quantity condition. Thus, the tests analyze the 2X2 Quantity (High vs. Low) by Consistency (High vs. Low) results. All consistency levels are used in the contrast analyses.

⁺ The weights for the consistency contrast analyses are as follows: For Confidence and Shares: AABBB, –1; ABBB, 0; AAAB, 0; AAAA, 1. For Calibration and Wealth Transfers: ABBB, –1.5; AABBB, –0.5; AAAB, 0.5; AAAA, 1.5.

Panel A: Confidence

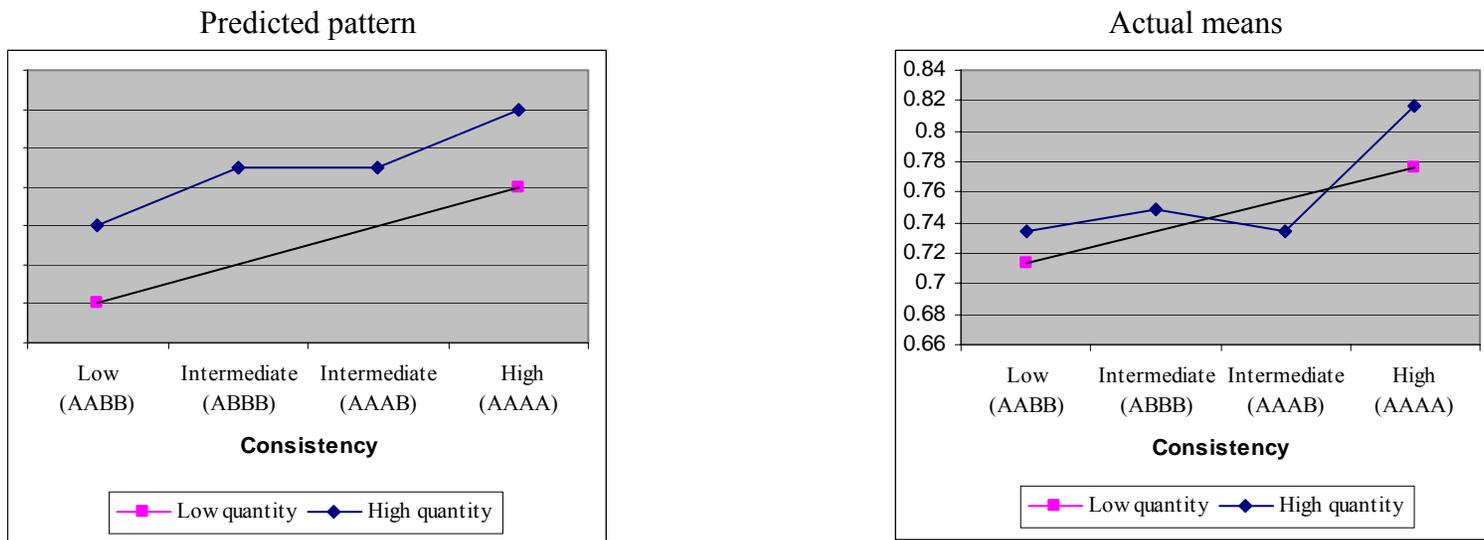


FIGURE 1.
Experiment 1: Effects of quantity and consistency on unsophisticated investors' judgments

FIGURE 1 (Continued)

Panel B: Calibration

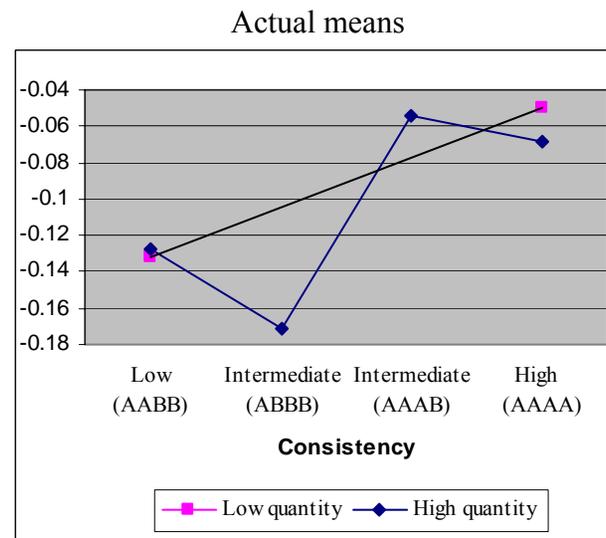
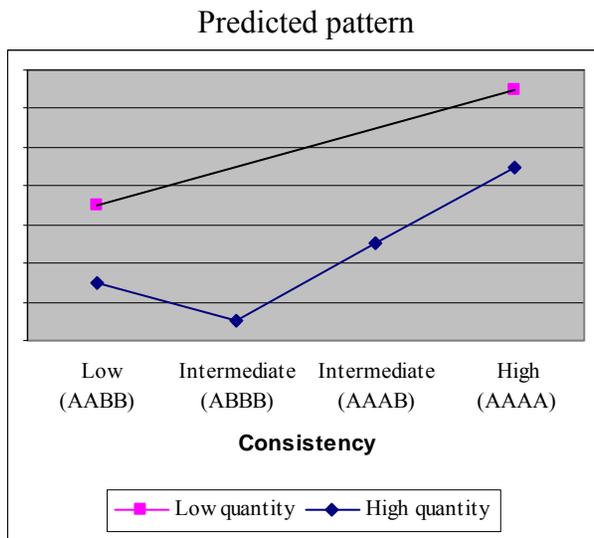
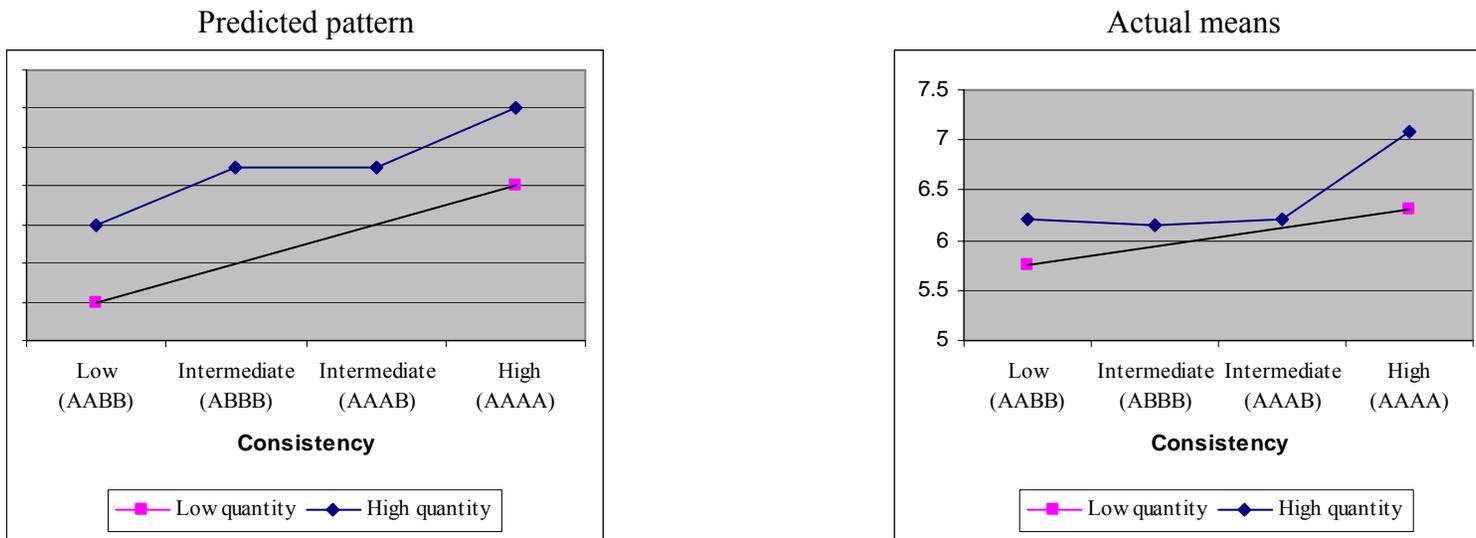


FIGURE 1 (Continued)

Panel C: Trading Aggressiveness (Shares Traded)



3.2.3.2 Calibration

Calibration is measured as the squared difference between an investor's reservation price for a security and the security's *expected value*. Thus, calibration captures the accuracy of investors' confidence assessments. To simplify interpretation, I multiply this measure by -1 so that higher values indicate greater calibration.

Each firm's expected value is calculated from a regression equation obtained from the large dataset from which the experimental securities were drawn. The regression equation includes an intercept and the beta coefficient associated with the high-quality signal. The predicted value from this equation thus represents investors' optimal reservation price (given that all other signals are nondiagnostic and should be ignored). The use of the security's expected value also provides a less noisy calibration measure than would use of the security's actual value.⁹

The results of the analysis of unsophisticated investors' calibration are shown in Panel B of Table 3. Counter to H1b, the main effect of quantity is not significant ($F = 0.59$; $p = 0.4469$). This lack of a significant effect appears to be driven by the low consistency condition (see Figure 1, Panel B). To examine this issue further, I conduct simple effects tests and find that the effect of quantity is significant in the high consistency condition ($F=4.01$; $p=.027$), but not in the low consistency condition ($F=0.16$; $p=.688$). The explanation for this result lies in unsophisticated investors' signal reliance. Regression analyses (not shown) indicate that unsophisticated investors rely considerably on the low-quality signal (Change in Gross Margin Ratio) when making their predictions. Because this signal is always in the opposite direction of the high-quality signal (CFO to LT Debt Ratio) for the AB firms, reliance causes unsophisticated investors to be less accurate (i.e., to show a larger difference between reservation price and expected value) for the AB firms than they are for the ABB

⁹ Results are robust to alternative specifications of expected value, and also to using actual value in place of expected value.

firms, for which the two signals are not always in the opposite direction.¹⁰ As a result, although confidence is higher for the AABB firms than for the AB firms, accuracy is also higher, leaving calibration insignificantly different between the AB and AABB conditions.

Supporting H2b, the effect of consistency is significant ($F = 70.19$; $p < 0.0001$). To provide a stronger test that calibration increases with the degree to which a firm's information set is consistent with the high-quality signal, I conduct a planned contrast which includes the intermediate-consistency firms (i.e., ABBB and AAAB firms). I expect calibration to be lowest for ABBB firms, followed (in order) by AABB, AAAB, and AAAA firms. Therefore, for this contrast, firms with signals of the form ABBB, AABB, AAAB, and AAAA are assigned weights of -1.5 , -0.5 , 0.5 , and 1.5 , respectively, corresponding to the number of signals that are consistent with the high-quality signal in each information set. The contrast is significant ($F = 43.51$; $p < 0.0001$; see Figure 1, Panel B), again supporting H2b. Thus, calibration increases with the degree to which the information set as a whole is consistent with the high-quality signal.

3.2.3.3 Trading Aggressiveness

Greater trading aggressiveness is indicated by trading more shares. Panel B of Table 3 shows the results of the analysis of unsophisticated investors' aggressiveness. Supporting H3a, the effect of quantity is significant ($F = 12.85$; $p = 0.0006$). This evidence of increased aggressiveness in the high-quantity condition shows that unsophisticated investors are more confident not only in their absolute accuracy, but also in their accuracy *relative to sophisticated investors*. The effect of consistency is also significant ($F = 17.32$; $p = 0.0001$). I again conduct a planned contrast to test for

¹⁰ Also, unsophisticated investors' reliance on the Change in Gross Margin Ratio signal is reduced in the high-quantity condition. This also contributes to their increased accuracy.

the prediction in H3b that trading aggressiveness increases with consistency. The weights used for this contrast are the same as those used to test the effect of consistency on confidence, as the predicted pattern is the same (i.e., AABB, AB BB, AAAB, and AAAA firms are weighted -1 , 0 , 0 , and 1 , respectively). The contrast is significant ($F = 11.63$; $p = 0.001$; see Figure 1, Panel C), supporting H3b. Thus, trading aggressiveness increases with the quantity and the consistency of the signals.

To determine if quantity and consistency affect aggressiveness via their effects on confidence, I conduct a mediating variables analysis (not shown) using the process described by Baron and Kenny (1986). Univariate regression analyses confirm that quantity ($t = 2.37$; $p = .017$) and consistency ($t = 3.20$; $p = .001$) are both significant predictors of aggressiveness, as is confidence ($t = 15.42$; $p < .0001$). When all three variables are used in the regression equation, however, confidence remains highly significant ($t = 15.29$; $p < .0001$), while quantity ($t = 1.65$; $p = .098$) and consistency ($t = 0.34$; $p = .7369$) do not. Thus, confidence mediates the effects of quantity and consistency on aggressiveness, indicating that the increase in unsophisticated investors' confidence in their absolute accuracy increased their confidence in their relative accuracy.

3.2.4 Effects of Information Quantity and Consistency on Unsophisticated Investors' Wealth

I compute two measures to examine wealth effects. First, I multiply the number of shares traded times the absolute difference between an investor's reservation price for a security and the security's expected value. This "expected winnings" measure captures what an unsophisticated investor could be expected to earn, given his or her judgments and trading decisions, by trading with a perfectly calibrated investor. Second, I compute "market winnings" based on the price obtained

in the simulated clearinghouse market. Specifically, market winnings are computed as the number of shares bought or sold times the difference between the market price and the expected value.¹¹ Table 4, Panel A shows mean values of both wealth measures (expected and market winnings), by quantity and consistency. Figure 2 shows the predicted patterns and actual means graphically.

H4c predicts that the effect of consistency on unsophisticated investors' wealth will follow the same pattern as its effect on calibration; that is, I expect unsophisticated investors' wealth to be lowest for ABBB firms, followed (in order) by AABB, AAAB, and AAAA firms. To test for this pattern, planned contrasts for both wealth measures use weights of -1.5 , -0.5 , 0.5 , and 1.5 , respectively.

3.2.4.1 *Expected Winnings*

Panel B of Table 4 shows the results of fixed effects and contrast analyses for the effects of quantity and consistency on expected winnings. Supporting H4a, unsophisticated investors' average expected winnings are significantly less than zero ($t = -28.25$; $p < 0.0001$). Supporting H4b, the effect of quantity is significant ($F = 4.09$; $p = 0.0259$). Supporting H4c, the effect of consistency is also significant ($F = 22.22$; $p < 0.0001$), and the planned contrast shows the data follow the predicted pattern ($F = 16.38$; $p = 0.0001$; see Figure 2, Panel A). Thus, unsophisticated investors' expected winnings are lower when they receive more signals, and move with the degree to which the information set is consistent with the high-quality signal.

Simple effects analyses (not shown) indicate that the effect of quantity is significant in the high consistency condition ($F=12.32$; $p=.0007$) but not in the low consistency condition ($F=0.00$; $p=.9799$). This reflects the previous result that

¹¹ Investors predicted and were paid based on a binary value (0 or 1) for each security, but measuring investors' actual winnings based on each security's expected value allows for a more accurate assessment of wealth effects. Similar results are obtained if based on the binary value of the security.

calibration is slightly improved with more information in the low consistency condition, such that the effect of unsophisticated investors' increased aggressiveness in the high-quantity condition is offset by their slightly improved calibration, leaving expected winnings unchanged.

3.2.4.2 *Market Winnings*

The results of the analysis of market winnings are also shown in Panel B. Supporting H4a, unsophisticated investors transfer wealth to sophisticated investors on average; the mean winnings (per unsophisticated investor, per security) of $-\$0.12$ are significantly less than zero ($t = -3.83$; $p = 0.0001$). Counter to H4b, although the effect of quantity is in the predicted direction (with unsophisticated investors transferring more wealth to sophisticated investors in the high-quantity condition), it is not statistically significant ($F = 0.17$; $p = 0.3413$). I attribute the difference in effect of information quantity between expected and market winnings to decreased power from the noise added by sophisticated investors. Supporting H4c, the effect of consistency is significant ($F = 8.33$; $p = 0.0036$), and the planned contrasts show that the data follow the predicted pattern ($F = 8.48$; $p = 0.0002$; see Figure 2, Panel B). Unsophisticated investors transfer less wealth to sophisticated investors when the information set they receive is consistent with the high-quality signal.

TABLE 4.
Experiment 1: Unsophisticated investors' wealth transfers

Panel A: Descriptive Statistics

		Information Consistency									
		Low AB / AAB		Intermediate ABBB		Intermediate AAAB		High AA / AAAA		Average	
		Expected*	Market [#]	Expected	Market	Expected	Market	Expected	Market	Expected	Market
Information Quantity	Low	-1.93	-0.19					-1.17	0.03	-1.55	-0.08
	High	-1.93	-0.21	-2.41	-0.44	-1.30	-0.05	-1.63	-0.02	-1.80	-0.16
Average		-1.93	-0.20	-2.41	-0.44	-1.30	-0.05	-1.35	0.01	-1.68	-0.12

TABLE 4 (Continued)*Panel B: Fixed Effects and Contrast Analyses for H4*

Dependent Measure	Hypothesis	Effect	Den df	Test statistic	p-value (one-tailed)
Expected Loss	H4a	Overall Wealth Transfer	31	-28.25 (t)	< 0.0001
	H4b	Quantity	31	4.09 (F)	0.0259
	H4c	Consistency	31	22.22 (F)	< 0.0001
	H4c	<i>Contrast: Consistency</i> ⁺	93	16.38 (F)	0.0001
Market Winnings	H4a	Overall Wealth Transfer	31	-3.83 (t)	0.0001
	H4b	Quantity	31	0.17 (F)	0.3413
	H4c	Consistency	31	8.33 (F)	0.0036
	H4c	<i>Contrast: Consistency</i>	93	8.48 (F)	0.0045

* Expected loss is measured as the number of shares traded times the absolute difference between the reservation price and the security's expected value.

Actual loss is measured as the number of shares bought or sold times the distance between the market price (determined by aggregating unsophisticated and sophisticated investors' reservation price and share numbers in a simulated clearinghouse market) and the security's expected value.

⁺ The weights for the consistency contrast analyses for both wealth measures are: AABB, -0.5; ABBB, -1.5; AAAB, 0.5; AAAA, 1.5.

Panel A: Expected winnings

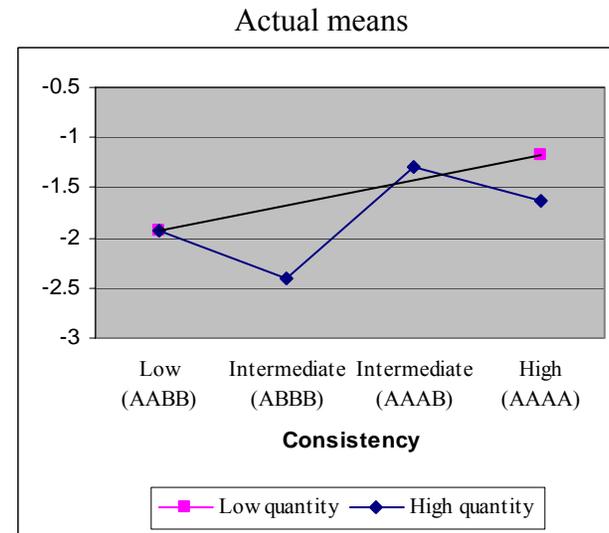
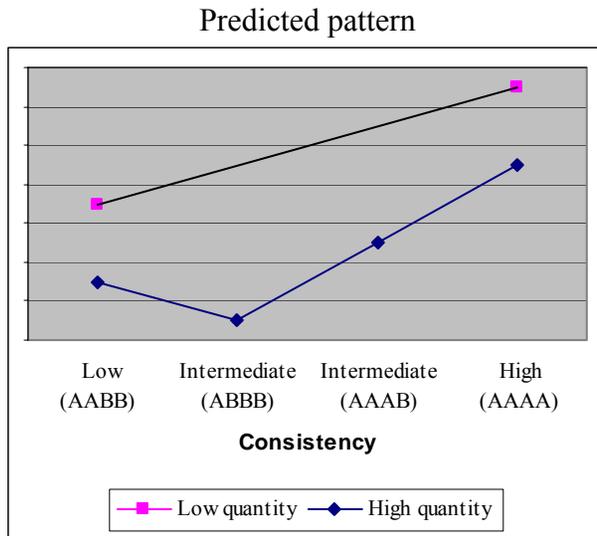
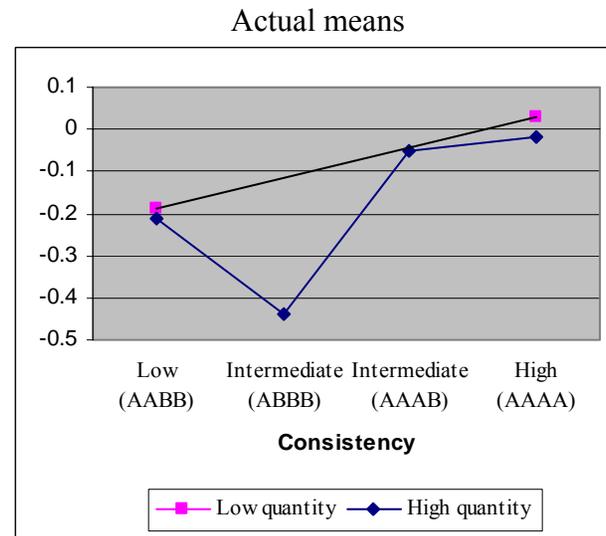
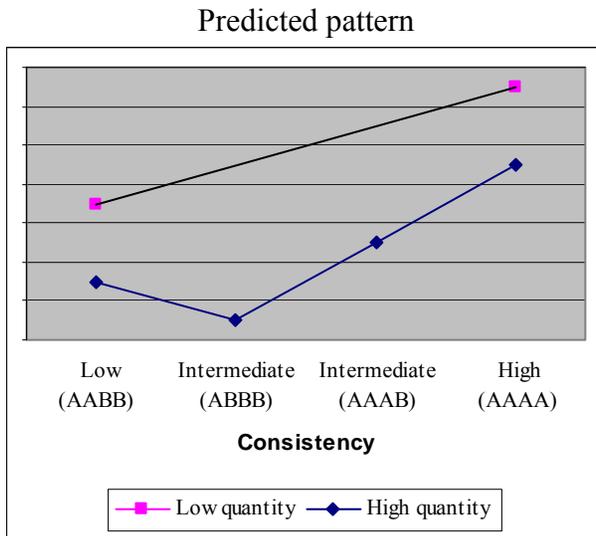


FIGURE 2.
Experiment 1: Unsophisticated investors' wealth transfers

FIGURE 2 (Continued)

Panel B: Market winnings



3.3 DISCUSSION

The results of experiment 1 show that unsophisticated investors are more confident in their judgments and more aggressive in their trading behavior when they receive information in greater quantity and consistency. Because the additional signals represent low quality information, unsophisticated investors' increased confidence and aggressiveness lead them to transfer wealth to sophisticated investors who are able to develop more accurate estimates of security values.

The evidence that confidence and aggressiveness increase as signal consistency increases, or as the quantity of consistent signals increases, can be reconciled with investors behaving rationally under the assumption that all information is of high quality. Under that assumption, the probability that the security takes the value suggested by the signals increases with the consistency of those signals, and with the quantity of consistent signals. However, the evidence that confidence and aggressiveness increase as the quantity of *inconsistent* signals increases cannot be explained as a rational response to the information. Statistical theory would predict that as the signals in an information set become more inconsistent, judgments should be more moderate (i.e., closer to the mean of the distribution).¹² This suggests that investors' reservation prices should have been equally or less extreme in the high quantity, low consistency condition (AABB) compared to the low quantity, low consistency condition (AB). Instead, reservation prices were more extreme in the AABB condition.

This result implies a pure "quantity effect" that is independent of signal consistency, whereby an investor's judgment confidence is greater when that judgment

¹² See Peterson and Pitz (1988). This follows from the fact that when the distributional properties of information are known (as they are in Experiment 1), the variance of a probability distribution should decrease as the number of signals increases (i.e., the denominator of the sample variance increases). If the signals are inconsistent, the mean of the signals (which should be taken by unsophisticated investors as the best estimate of the ROE probability) will shift towards the center of the distribution, and the variance of the probability distribution (i.e., the range of possible outcomes) should decrease as more signals are observed.

is based on a greater quantity of information, even if the information is inconsistent. However, an alternative explanation is that the effect of quantity on confidence is mediated by cognitive effort; that is, that effort increases with the quantity of inconsistent information, and that investors base their confidence on the amount of effort they exert. Discriminating between these two competing explanations is the purpose of experiment 2.

CHAPTER 4. EXPERIMENT 2

4.1 INTRODUCTION

The results of experiment 1 suggest that unsophisticated investors are influenced by a pure information quantity effect, wherein confidence is higher when more information is available for decision making, even when the overall information is directionally inconsistent. An alternative explanation for investors' increased confidence involves the possibly mediating role of cognitive effort. In the next section I describe research relevant to both of these explanations, and then report an experiment designed to discriminate between them.

4.2 BACKGROUND

4.2.1 Information Quantity

One explanation for the quantity effect is simply that investors are more confident when they have access to more information. Prior psychology research suggests that such an effect arises because decision makers use quantity of information as a cue for information sufficiency (Gill, Swan, and Silvera 1998), judgment quality (Oskamp 1965; Peterson and Pitz 1988), and, therefore, judgment correctness.

4.2.2 Cognitive Effort

Another explanation for the quantity effect involves the role of cognitive effort as a possible mediator of the quantity-confidence relationship. A great deal of research in cognitive and social psychology has examined the role of cognitive effort in judgment and decision making (Fennema and Kleinmuntz 1995). Cognitive effort has been studied as both a dependent variable (Yates and Kulick 1977) and an independent variable (O'Donnell 1996), as well as a mediating variable (Creyer and Ross 1993). A

number of factors have been examined as determinants of cognitive effort. Incentives (Bonner and Sprinkle 2002), accountability (Kennedy 1993; Messier and Quilliam 1992), and pressure (Ashton 1990) have all been shown to influence cognitive effort. Important for this study, prior research also shows that decision problems of greater complexity (i.e., more alternatives and/or more attributes) are viewed as more effortful (Bettman, Johnson, and Payne 1990). Kahneman (1973) also argues that the difficulty or complexity of a task is a strong determinant of the effort expended.

Research in psychology has also examined the effect of effort on perceived and actual performance. The evidence regarding actual performance is mixed, as the effect depends greatly on the nature of the task; increased effort improves performance in some tasks but not in others (Payne, Bettman, and Johnson 1993). However, individuals generally *perceive* a positive relationship between cognitive effort and judgment accuracy (Yates and Kulick 1977). Therefore, they are generally more confident in judgments and decisions for which they have exerted more effort (Paese and Sniezek 1991; Shaw and Zerr 2003; Sieck and Yates 1997).¹³

4.2.3 Competing Explanations

In the low consistency, low quantity (AB) condition of experiment 1, investors receive two signals whose values directionally conflict in their prediction of security value (i.e., the values are on opposite sides of 50). In the low consistency, high quantity (AABB) condition, investors receive four signals, with two in each direction. Investors in the experiment are likely to perceive their task as more complex, and

¹³ The evidence of an effort-perceived accuracy connection is consistent with the adaptive decision-making framework of Payne, Bettman, and Johnson (1993), in which decision makers trade off effort and accuracy when processing information for a decision. Implicit in this model is the assumption that performance (i.e., judgment accuracy or decision appropriateness) generally increases with effort, and that individuals perceive such a relationship. Evidence of the effort-confidence relationship is also consistent with self-perception theory (Bem 1967), which argues that individuals will infer their own beliefs by observing their own behavior. By this account, an individual who has exerted a relatively high level of effort on a task may thus infer a high level of performance, resulting in a high level of confidence.

therefore requiring more effort, when they receive four conflicting signals than when they receive only two.¹⁴ This perception may cause them to exert more cognitive effort, and to feel increased judgment confidence as a result.

Thus, cognitive effort may mediate the effect of signal quantity on unsophisticated investors' confidence in the low consistency condition. This explanation is distinct from the pure quantity effect I refer to earlier, because increased confidence (when consistency is low) would be driven not by the quantity of information per se, but by the perceived complexity of the task and the subsequent cognitive effort exerted.

In the high consistency condition, investors receive either two (AA) or four (AAAA) signals, the values of which are all directionally consistent. In contrast to the low consistency condition, investors are unlikely to perceive their task as more complex when they receive four consistent signals than when they receive two. Rather, four consistent signals represent a stronger case in favor of one security value over the other, and may actually be perceived as reducing the complexity and required effort necessary to make a judgment (Weiner et al. 1972). Thus, in the high consistency setting, there may exist a *negative* relationship between effort and confidence, wherein investors perceive less complexity and subsequently exert less effort, but are still more confident because the evidence is stronger. At the least, signal quantity is unlikely to *increase* the perceived complexity of, and effort exerted on, the task when all signals are consistent. Thus, while cognitive effort may positively mediate the quantity-confidence relationship in the low consistency condition, it is

¹⁴ One issue that arises from this discussion is the range of task difficulty in which effort and difficulty are expected to be positively related. While Kahneman (1973) argues that task difficulty will be a strong determinant of effort, Weiner et al. (1972) note that the relationship may not hold at extreme levels of difficulty. For extremely easy tasks, effort may be perceived as unnecessary (e.g., the high-consistency settings of my experiment), while for extremely difficult tasks, effort may be perceived as futile. They argue that a strong positive relationship will most likely occur at intermediate levels of task difficulty (i.e., where the probability of success is around 0.5). Since my task involves a binary choice prediction, investors know that the probability of a correct prediction is 0.50 in all cases. Thus, I believe the low-consistency task in my experiment is perceived to have this intermediate level of difficulty.

unlikely to do so in the high consistency condition.

Experiment 2 is designed to test whether effort mediates the effect of quantity on confidence in the low consistency condition. In addition to conducting mediating variables analyses to examine the effect of effort, I conduct and report interaction and simple effects tests that shed additional light on the role of cognitive effort on the quantity-confidence relationship at both high and low levels of signal consistency.

4.3 METHOD

4.3.1 Overview and Design

With only a few exceptions, the method used in experiment 2 is identical to that used in experiment 1. Fifty-two undergraduate accounting students (hereafter “investors”) make ROE predictions and trading decisions for the same 24 firms used in experiment 1. Quantity and consistency are manipulated, and “sophisticated” investors are proxied, all in the same manner as in experiment 1. Thirty-six (16) investors serve as unsophisticated (sophisticated) investors. After the experimental sessions, I conduct a clearinghouse market for each firm, using the reservation prices and share numbers provided by each investor. Trades are executed at market prices, shares are converted to their true values, and trading gains and losses are computed for each participant.

The experiment is administered by computer rather than as a paper and pencil task. This allows me to measure the time each participant takes to evaluate each firm. Time taken per firm serves as the principal measure of effort in the analyses (Bettman, Johnson, and Payne 1990; Bonner and Sprinkle 2002; Hirst 1992). In addition, I solicit self-reports of effort, difficulty, and complexity for each firm from each participant. These assessments provide alternative measures of effort as well as insights into investors’ perceptions of the task.

4.3.2 Procedure

Investors received two envelopes upon entering the computer lab. The first envelope contained written instructions regarding the task, the firms, how money was earned, and how investors differed in the market. These instructions were reviewed verbally by the proctor, and investors were free to ask questions publicly. In the second envelope, investors learned their assigned investor type and the signals they would receive. They then answered comprehension check questions and began evaluating the firms, administered by the computer software.

As in experiment 1, each investor reviewed the signals and provided, for each firm, a prediction about the future ROE of the firm, a reservation price, and the number of shares he or she wanted to trade. In addition, each investor was asked to rate on an 11-point scale the amount of mental effort he or she exerted while evaluating the firm, how difficult to correctly predict he or she thought the firm was, and how complex (where complex was defined as “intricate or involved”) he or she found the evaluation of the firm to be. After answering all the questions for a firm, investors could choose to go back and reevaluate the firm or proceed to the next firm.

After the first 12 firms, investors were informed that the quantity of signals received by unsophisticated (i.e., “Type 1”) investors would change for the remaining 12 firms (i.e., Type 1 investors who were receiving two (four) signals would now receive four (two) signals), and any new signals were defined. The investors again answered comprehension check questions before proceeding to the last 12 firms. After evaluating all the firms, investors answered a series of debriefing questions.

4.4 RESULTS

Table 5, Panel A shows mean values of all the dependent variables for

unsophisticated investors. Confidence, Calibration, and Shares are measured in the same way as in experiment 1. Predtime refers to the average number of seconds investors spent on the first screen of each firm, on which they were first shown the signals for the firm and asked to make their ROE prediction. As this was the first screen on which the signals for each firm were shown, the time spent on this screen represents the best time-based measure of the effort exerted in evaluating the signals.¹⁵ I use Predtime as the principal measure of effort in the analyses. Effort, Complexity, and Difficulty refer to the average values of investors' responses to 11-point Likert-scale assessment questions.

The first firm seen by each investor (which was randomly assigned) served as a practice firm to familiarize investors with the computer interface and with the specific wording of the questions. Therefore, the first firm seen by each investor is deleted for the statistical tests.

¹⁵ For cases where investors, after answering all the questions for a particular firm, took the option of returning to the first screen to reevaluate the information, the Predtime measure sums the time spent on the first screen across the number of times investors saw it.

TABLE 5.
Experiment 2: Effects of quantity, consistency, and effort on unsophisticated investors' judgments

Panel A: Descriptive Statistics

Low-Quantity

	Low Consistency (AB)		High Consistency (AA)	<i>Average</i>
Confidence	0.685		0.773	0.731
Calibration	-0.127		-0.039	-0.081
Shares	4.786		5.537	5.180
Predtime	17.847		15.016	16.363
Effort	5.301		4.602	4.935
Complexity	5.347		4.560	4.935
Difficulty	5.837		4.977	5.386

High-Quantity

	Low Consistency (AABB)	Intermediate Consistency (ABBB) (AAAB)		High Consistency (AAAA)	<i>Average</i>
Confidence	0.710	0.747	0.685	0.796	0.742
Calibration	-0.119	-0.198	-0.041	-0.060	-0.099
Shares	5.037	5.235	4.882	6.188	5.442
Predtime	25.140	17.189	21.763	14.608	19.643
Effort	5.559	4.897	5.397	4.694	5.125
Complexity	5.632	5.265	5.588	4.734	5.255
Difficulty	5.875	5.603	5.868	4.861	5.478

TABLE 5 (Continued)*Panel B: Effects of quantity and consistency on confidence*

Dependent Measure	Effect	F	p-value (one-tailed)
Confidence	Quantity	5.80	0.011
	Consistency	85.17	0.000
	Quantity × Consistency	0.00	0.500

Panel C: Effects of quantity and consistency on Predtime

Dependent Measure	Effect	F	p-value (one-tailed)
Predtime	Quantity	4.33	0.023
	Consistency	17.65	0.000
	Quantity × Consistency	5.45	0.013

Panel D: Effects of quantity, consistency, and Predtime on confidence

Dependent Measure	Effect	F	p-value (one-tailed)
Confidence	Quantity	4.29	0.023
	Predtime	12.19	0.001
	Quantity × Predtime	0.08	0.387
	Consistency	61.59	0.000
	Quantity × Consistency	0.04	0.425
	Predtime × Consistency	4.02	0.023
	Quantity × Predtime × Consistency	0.00	0.487

TABLE 5 (Continued)*Panel E: Simple and interactive effects in the low consistency condition*

Consistency	Dependent Measure	Effect	F	p-value (one-tailed)	
Low Consistency	Confidence	Quantity	3.27	0.038	
	Predtime	Quantity	7.90	0.004	
	Confidence	Predtime	1.32	0.125	
	Confidence		Quantity	2.92	0.048
			Predtime	2.09	0.075
			Quantity × Predtime	0.13	0.360

Panel F: Simple and interactive effects in the high consistency condition

Consistency	Dependent Measure	Effect	F	p-value (one-tailed)	
High Consistency	Confidence	Quantity	3.56	0.033	
	Predtime	Quantity	0.04	0.419	
	Confidence	Predtime	8.53	0.002	
	Confidence		Quantity	2.29	0.070
			Predtime	7.12	0.004
			Quantity × Predtime	0.03	0.428

4.4.1 Effects of quantity and consistency on confidence

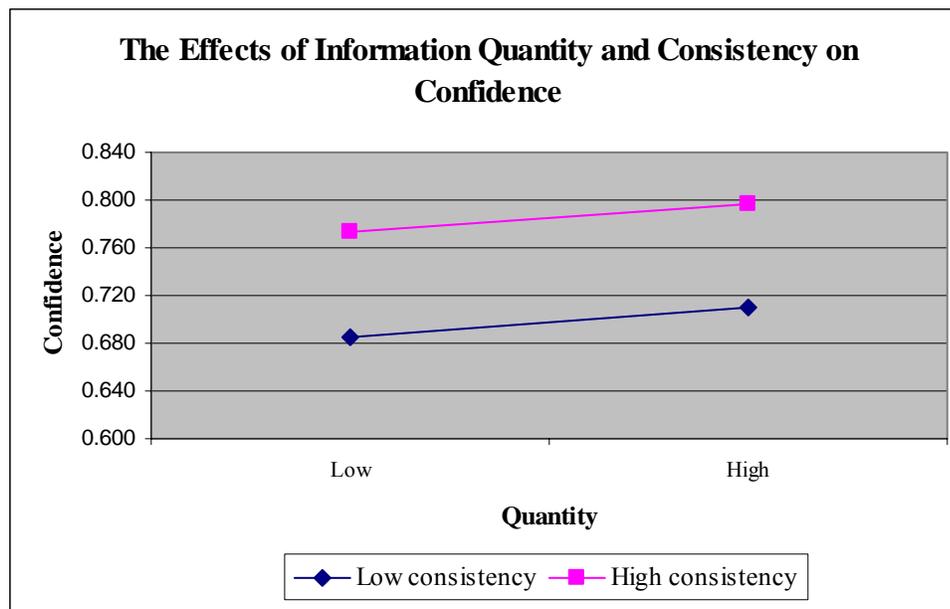
I first conduct a repeated measures, fixed effects analysis to determine if the principal results of experiment 1 (i.e., main effects of quantity and consistency on confidence) are replicated in experiment 2. Panel B of Table 2 shows the results, which are also shown graphically in Figure 3, Panel A. As in experiment 1, unsophisticated investors' confidence is higher when signal quantity ($F = 5.80$; one-tailed $p = 0.011$) and consistency ($F = 85.17$; $p = 0.000$) are higher, and the interaction term is not significant ($F = 0.00$; $p = 0.50$). Thus, the principal result of experiment 1 is replicated in experiment 2.¹⁶ Replication indicates that changes in experimental protocol between experiments 1 and 2 did not drive away the effects that experiment 2 is designed to address.

4.4.2 Effects of quantity and consistency on Preptime

I also conduct a similar analysis with Preptime as the dependent variable to assess the overall effects of quantity and consistency on effort. Panel C of Table 2 shows the results, which are also shown graphically in Figure 3, Panel B. The main effects of quantity ($F = 4.33$; $p = 0.023$) and consistency ($F = 17.65$; $p = 0.000$) are significant, as well as the interaction ($F = 5.45$; $p = 0.013$). Simple effects tests (shown in Panels E and F of Table 5) show that the effect of quantity on Preptime is significant (and positive) in the low consistency condition, but not in the high consistency condition.

¹⁶ Additional analyses (not shown) reveal that the other results from Experiment 1 were also replicated in Experiment 2. Specifically, shares traded were also higher when signal quantity and consistency are higher. Calibration and wealth are lower when signal consistency is lower, and are lower with a greater quantity of signals in the high consistency condition, but not in the low consistency condition.

Panel A: Effects of quantity and consistency on confidence



Panel B: Effects of quantity and consistency on Preditime

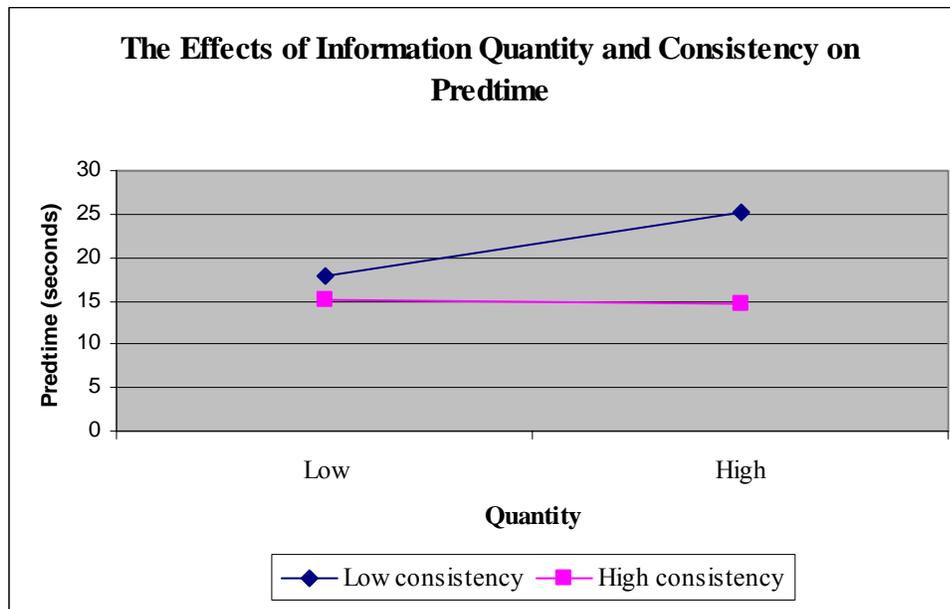
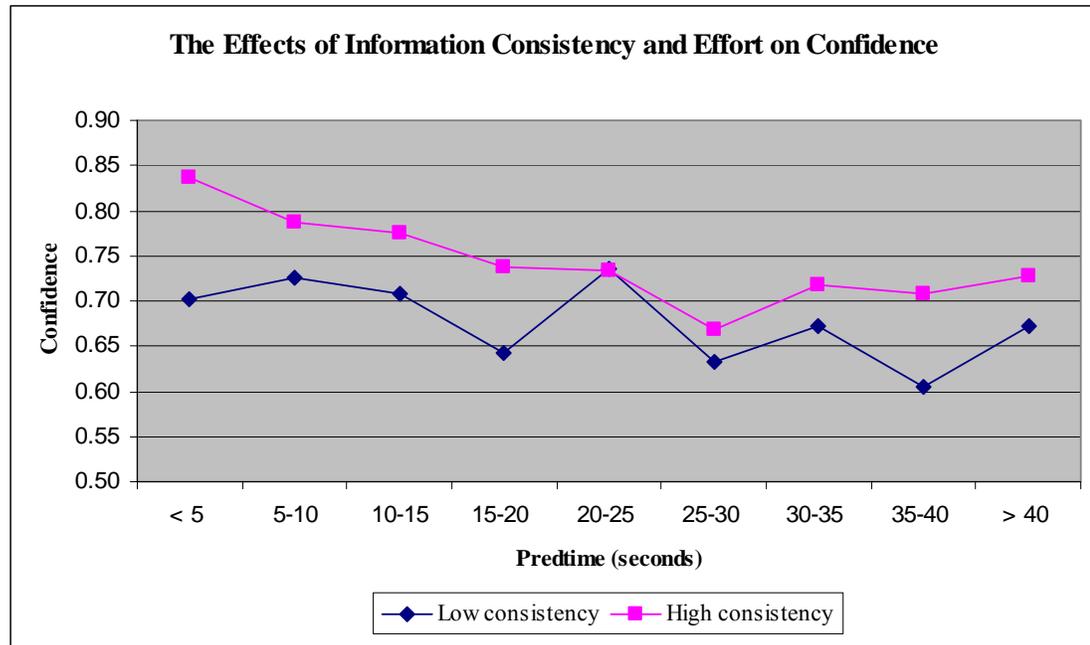


FIGURE 3.
Experiment 2: Unsophisticated investors' confidence and effort

FIGURE 3 (Continued)*Panel C: Effects of consistency and Preptime on confidence*

Thus, consistent with the theory presented earlier, signal quantity increases effort when information is inconsistent, but not when it is consistent.

4.4.3 Mediation analysis in the overall dataset

Before examining the mediating role of effort in the separate consistency conditions, I conduct the analysis using the overall dataset. Panel D of Table 5 shows the main and interactive effects of quantity, consistency, and Preptime on confidence. While the main effect of Preptime is significant ($F = 12.19$; $p = 0.001$), the main effect of quantity, though smaller, remains significant ($F = 4.29$; $p = 0.023$), indicating that effort does not completely mediate the effect of quantity on confidence in the overall dataset (a fully mediating role would be shown if the effect of quantity on confidence were reduced or eliminated when effort is added to the analysis). The table also

reveals a significant Predtime \times Consistency interaction ($F = 4.02$; $p = 0.023$). This interaction is shown graphically in Panel C of Figure 3, which shows, contrary to the literature cited earlier, a negative trend in confidence as Predtime increases. Consistent with the graph, simple effects tests (shown in Panels E and F of Table 5) show that the effect of Predtime on confidence is significantly negative in the high consistency condition, but is not significant in the low consistency condition.¹⁷

4.4.4 Mediation analysis in the high and low consistency conditions

The theory presented earlier suggests that while effort may mediate the effect of quantity on confidence in the low consistency condition, it is unlikely to do so in the high consistency condition. Therefore, I conduct mediation analysis separately for each consistency condition. Specifically, I examine the two links of the mediation relationship—the link between quantity and effort, and the subsequent link between effort and confidence—at both high and low levels of consistency.

The results for the low consistency condition are shown in Panel E of Table 5. Quantity significantly affects Predtime ($F = 7.90$; $p = 0.004$), supporting the first link of the mediation relationship. However, the effect of Predtime on confidence is not significant ($F = 1.32$; $p = 0.125$), failing to support the second link of the mediation relationship. Not surprisingly, then, the effect of quantity on confidence remains significant ($F = 2.92$; $p = 0.048$) when Predtime is added to the analysis.

The results for the high consistency condition are shown in Panel F of Table 5. As mentioned earlier, the effect of quantity on Predtime is not significant ($F = 0.04$; $p = 0.419$), failing to support the first link of the mediation relationship. Thus, Predtime could not mediate the effect of quantity on confidence in the high

¹⁷ This result is supported by Pearson correlation statistics, which show a Predtime-confidence correlation that is not significantly different from zero in the low consistency condition ($r = -0.080$; $p = 0.147$), but is significantly negative in the high consistency condition ($r = -0.206$; $p = 0.001$).

consistency condition (as expected), as the variables fail to meet a premise for mediation analysis (i.e., that the independent variable significantly affect the proposed mediating variable).

In summary, the mediation relationship breaks down in the low consistency condition due to an insignificant Pretime-confidence relationship (the second link), while the mediation relationship breaks down in the high consistency condition due to an insignificant quantity-Pretime relationship (the first link). I find no evidence that effort mediates the effect of signal quantity on unsophisticated investors' judgment confidence.¹⁸

4.5 DISCUSSION

The results of experiment 2 show that while an increase in signal quantity increases both effort and confidence in the low consistency condition, effort and confidence are not positively related. Therefore, cognitive effort does not mediate the positive effect of quantity on confidence when information is directionally inconsistent.

Previous research that shows a positive relationship between task effort and confidence has held the task itself constant, and assessed the relationship either by soliciting effort ratings as a measured independent variable (see Yates and Kulick 1977) or by manipulating incentives to affect the effort exerted by subjects (see Shaw and Zerr 2003). In contrast, effort is manipulated in this study by directly altering characteristics of the task (namely, complexity). The negative relationship between effort and confidence that I find in this study therefore suggests that the relationship

¹⁸ When investors' ratings of effort or complexity are used as the effort measure, the conclusions regarding mediation are similar, with the results differing in the following ways: while Pretime is insignificantly negatively correlated with confidence in the low consistency condition, Effort and Complexity are both significantly negatively correlated with confidence. Thus, regardless of quantity, confidence is inversely related to these measures of perceived effort in the low consistency condition. These results indicate that the lack of mediation is not due to investors' perceptions of effort differing from the effort revealed by the time-based effort proxy.

between effort and confidence may be positive only when the task is held constant (i.e., the harder one works, the better one's perceived performance, *all else equal*). When effort increases due to changes in the task itself, the relationship between effort and confidence appears to be negative.¹⁹

The pattern of results also suggests that the process by which the quantity of information affects judgment confidence differs depending on the consistency of the information. When information is consistent, increasing signal quantity leads to increased confidence in a straightforward manner. Specifically, investors appear to perceive their accuracy by the strength of the case for one security value over another. Thus, when a consistent information set becomes larger, their confidence is increased. The results regarding effort suggest that, if anything, effort is reduced when consistent information is increased, yet confidence is increased because of the relatively low effort required to reach a judgment.

When information is inconsistent, increasing signal quantity increases both cognitive effort and confidence, yet effort and confidence are unrelated. Investors' confidence in this condition appears to be less negatively affected by effort, possibly due to the greater complexity of the task. In other words, investors exert more effort when signal quantity increases, but because the task is more complex, they may feel the additional effort necessary to achieve some confidence in their response. Thus, the complexity of the task in the low consistency condition may offset the negative effects of effort on confidence.

The failure of cognitive effort to mediate the quantity-confidence relationship supports the argument that the relationship represents a pure "quantity effect," in which judgment confidence is increased directly by the fact that judgments are made

¹⁹ This result is consistent with research that shows a negative relationship between task difficulty and confidence (Lichtenstein and Fischhoff 1977). In this study, Difficulty and Confidence were negatively correlated ($r = -0.31$, $p = 0.001$), while Difficulty and Pretime were positively correlated ($r = 0.183$,

using a greater quantity of information, even if that information is inconsistent. This is consistent with the simpler psychological theory that the quantity of information drives the richness of an individual's mental representation of a target, and thus directly affects the confidence he or she feels in judgments about that target (Gill, Swann, and Silvera 1998; Oskamp 1965). The results presented here suggest that this effect occurs even when the information is directionally inconsistent.

$p = 0.001$). Thus, when increased effort is induced by an increase in task difficulty, the effort-confidence relationship appears to be negative.

CHAPTER 5. CONCLUSION

This dissertation examines a financial reporting environment in which the quantity of information increases, but its overall quality does not. Managers in such a setting are likely to disclose low-quality information that is consistent in its implications. The results show that unsophisticated investors are more confident and more aggressive when information quantity and consistency are greater, holding information quality constant. Unsophisticated investors transfer more wealth to sophisticated investors when they have more low-quality information, and their wealth is higher (lower) when their information is consistent and directionally accurate (inaccurate).

The goal of many recent calls for increased disclosure is to improve the judgments and decisions of unsophisticated investors (SEC 2000). However, my results suggest that investors who lack knowledge of information quality may actually suffer reduced welfare as a result of increased disclosure, because the higher information quantity and consistency that is likely under increased disclosure encourages higher confidence and more aggressive trading. Investors who fall prey to these effects may benefit from relying on summary information provided by information intermediaries such as financial analysts, rather than on the voluminous disclosure coming directly from firms (Elliott, Hodge, and Jackson 2005; SIA 2001).

Unsophisticated investors relied heavily on information quantity when assessing confidence. While predicted by the relevant psychology literature, this reliance was at times unambiguously irrational; e.g., when investors responded to a higher quantity of conflicting information by providing more extreme reservation prices. The results of experiment 2 suggest that this effect is direct, and not mediated by the effort exerted by investors. This result has implications for our understanding of

the factors that affect confidence. Prior research in behavioral finance suggests that an investor will be more confident about assessments “with which he has greater personal involvement” (Daniel, Hirshleifer, and Subrahmanyam 1998, p. 1841), indicating a possible role for effort in determining confidence. While such a role may exist, the results of experiment 2 suggest that confidence can be affected more directly by changes in the quantity of information.

Unsophisticated investors also relied heavily on directional agreement of signals when making their predictions—their confidence was significantly higher as signal consistency increased. This result differs from the results of Peterson and Pitz (1987), who find that the effect of information quantity on confidence is not influenced by consistency. Features of the task in this study (e.g., difficulty in interpreting signals and assessing diagnosticity, binary prediction) may have made the consistency of the signals a salient feature to which unsophisticated investors attended and on which they relied. This reliance suggests that unsophisticated investors may be particularly vulnerable to manipulation in fraud settings in which managers disclose information that paints a consistent but nondiagnostic picture of the firm.

Using a simulated, single-period market offers advantages and disadvantages for examining welfare effects. This approach allows me to collect twenty-four observations from each investor, without observing the correlated behavior that would occur over multiple rounds of interaction and feedback, and also allows me to focus on the more immediate effects of changes in the information environment on unsophisticated investors. In this sense, the experiment is consistent with the judgment and decision making literature, which tends to examine one-time judgments and behavior. Also, a common criticism of experimental markets is that evidence of irrational trading by disadvantaged investors may be attributable to the fact that there is little else for them to do while waiting for trading rounds to end. The single-period

market eliminates this explanation because investors work at their own pace, moving immediately to another firm when finished with the previous one. However, the single-period market has the disadvantage of not allowing investors to learn from the feedback that would be available in a setting with repeated interaction, and may therefore not reflect market conditions that could obtain over time. Multi-period markets also facilitate noise reduction as investors grow accustomed to market interactions. Examining whether these effects persist in multi-period markets thus offers a useful direction for future research.

Other limitations of this dissertation present additional opportunities for future research. First, in the experiments, unsophisticated investors receive more information in the high-quantity condition, but they also receive the same quantity of information that sophisticated investors receive. I therefore am unable to determine whether the increases in confidence and aggressiveness arise due to the increase in absolute information quantity, relative information quantity, or both. Given that Reg FD purportedly increases both absolute and relative information quantity, assessing their separate effects is not the main focus of this study. Intuitively, however, the increase in unsophisticated investors' confidence would be likely to arise from the increase in absolute information (because more information suggests more accurate predictions), while the increase in aggressiveness would be likely to arise from the increase in relative information (because information equivalence suggests knowledge equivalence on a "level informational playing field"). Future research could examine this prediction.

Cognitive effort was not found to fully mediate the effect of information quantity on judgment confidence in the low consistency condition. Another possible explanation for this result relates to confirmation bias. Research in psychology finds that individuals tend to focus on evidence that confirms a preferred position and

discount evidence that disconfirms that position (Fischhoff and Beyth-Marom 1983; Klayman and Ha 1987). Under this explanation, investors select a “preferred” signal, one to which they ascribe more weight when making judgments. In the AB condition, that signal stands alone in suggesting a security value. However, in the AABB condition, that signal is joined directionally by another, strengthening the investor’s confidence that the security takes the suggested value, and therefore increasing the extremity of their reservation prices. Future research could examine this possibility.

Another avenue for future research involves the role of information load in affecting judgment confidence. A great deal of research in psychology and other areas has examined the effects of information load on task performance, generally finding that performance decreases as information load increases beyond some threshold of information processing capacity (Paredes 2003). However, the effects of information load on judgment confidence are less clear, and have not been studied as extensively. Such effects are beyond the scope of the studies reported here, which use relatively low quantities of information (two vs. four signals) specifically to avoid information overload effects. In many settings (such as that used in this study), however, judgment confidence can be as important in determining overall performance as judgment accuracy. The effect of information load on confidence is therefore an interesting direction for future research.

This dissertation also offers directions for archival research on the effects of Reg FD. The effect of information quantity on unsophisticated investors’ trading aggressiveness suggests that the largest pre- vs. post-FD difference in small trade volume should be observed for those firms that show the largest post-FD increase in the amount of public information they disclose. Also, my results suggest that unsophisticated investors may be worse off financially if the post-FD increase in quantity has not been matched by an increase in quality. An archival analysis of

individual investor trade data could shed light on whether the welfare of unsophisticated investors is impaired in the post-FD environment, and whether it exhibits the effects found in this study.

Finally, the role of effort in determining confidence appears to be an interesting area for researchers interested in the trading behaviors of different investor types. In contrast to literature showing a positive effort-confidence relationship, effort in my experiments had a negative impact on investors' confidence. As mentioned earlier, this negative relation appears to emerge when effort is affected by actual changes in the task (as opposed to other changes, such as incentives). Future studies could expand this research by examining how effort and confidence affect market-level variables such as price and volatility, as well as whether and how the relations among information quantity, effort, and confidence change over time and across levels of investor sophistication and experience.

APPENDIX 1.

Consent forms for experiments 1 and 2

This appendix contains the consent forms used in experiments 1 and 2. Experiment 1 was conducted at Brigham Young University, and experiment 2 was conducted at the University of Illinois at Urbana-Champaign. Differences between the two consent forms reflect the different requirements of each university's human subjects committee.

[CAPITALIZED, ITALICIZED COMMENTS IN SQUARE PARENTHESES ARE FOR CLARIFICATION PURPOSES ONLY AND DID NOT APPEAR ON THE PAGES READ BY INVESTORS.]

[EXPERIMENT 1 CONSENT FORM, PAGE 1 OF 1]

Consent to be a Research Subject

Introduction

This research study is being conducted by Steven Smith of Cornell University. You were selected to participate because you are a member of the Marriott School community with previous coursework in Financial Accounting.

Procedures

If you agree to participate in this study, each participant will review varying amounts of accounting information for a number of firms, make predictions about future performance, and make security trading decisions. We expect this session to last about 1 ½ hours.

Risks and Benefits

We do not anticipate any risks to you from participating in this study, other than those you encounter in day-to-day life. We expect you to benefit directly by learning more about financial markets. We also expect other indirect benefits, because the results will enhance regulators' and investors' understanding of how to regulate and behave in financial markets. Your decision whether or not to participate will not affect your current or future relations with the University or any members of the University community.

Confidentiality

All information provided will remain confidential and will only be reported as group data with no identifying information. All data will be kept in password-protected files and only those directly involved with the research will have access to them. After the research is completed, any personal information will be destroyed.

Compensation

You will receive a minimum of \$5 for completing the task. You will also receive cash payments based on your performance at the security trading task. We expect the average payment to be about \$20.

Participation

Participation in this research study is voluntary. You have the right to withdraw at anytime or refuse to participate entirely without jeopardy to your class status, grade or standing with the university.

Questions about the Research

If you have questions regarding this study, you may contact Steven Smith at (607) 255-2671, sds25@cornell.edu or Jeff Wilks at (801) 422-1728, jeff_wilks@byu.edu.

Questions about your Rights as Research Participants

If you have questions you do not feel comfortable asking the researcher, you may contact Dr. Shane Schulthies, IRB Chair, 422-5490, 120B RB, shane_schulthies@byu.edu.

I have read, understood, and received a copy of the above consent and desire of my own free will and volition to participate in this study.

Signature: _____ Date: _____

[EXPERIMENT 2 CONSENT FORM, PAGE 1 OF 1]

Consent to be a Research Participant

Introduction

This research study is being conducted by Professor Steven Smith of the University of Illinois. You were selected to participate because you are enrolled in an accounting program at UIUC. If you agree to participate in this study, you will review accounting information for a number of firms, make predictions about future performance, and make security trading decisions. We expect this session to last about 1½ hours.

Risks and Benefits

We do not anticipate any risks to you from participating in this study, other than those you encounter in day-to-day life. We expect you to benefit directly by learning more about financial markets. We also expect other indirect benefits, because the results will enhance regulators' and investors' understanding of how to regulate and behave in financial markets. Your decision whether or not to participate will not affect your current or future standing with the University or any members of the University community.

Confidentiality

All information provided will remain confidential and will only be reported as group data with no identifying information. All data will be kept in password-protected files and only those directly involved with the research will have access to them. After the research is completed, any personal information will be destroyed.

Compensation

You will receive a minimum of \$5 for completing the task. You will also receive cash payments based on your performance at the security trading task. We expect the average payment to be in the range of \$18 to \$20.

Participation

Participation in this research study is voluntary. You have the right to withdraw at anytime or refuse to participate entirely without jeopardy to your class status, grade or standing with the university. However, if you do leave before completing the task, you will not be eligible for compensation.

Questions about the Research

If you have questions regarding this study, you may contact Professor Steven Smith by phone at (217) 265-6770, or by email at smithsd@uiuc.edu.

Questions about your Rights as a Research Participant

Questions about your rights as a research participant should be directed to the UIUC Institutional Review Board by phone at 333-2670, or by email at irb@uiuc.edu.

I have read, understood, and received a copy of the above consent and desire of my own free will and volition to participate in this study.

Please print name: _____

Signature: _____ Date: _____

This research is approved by the Institutional Review Board until **November 4, 2005**.

APPENDIX 2.

Experimental materials: Envelope 1

This appendix shows the materials investors received in Envelope 1 of both experiments. These materials were identical across all conditions and experiments.

[CAPITALIZED, ITALICIZED COMMENTS IN SQUARE PARENTHESES ARE FOR CLARIFICATION PURPOSES ONLY AND DID NOT APPEAR ON THE PAGES READ BY INVESTORS.]

[EXPERIMENT MATERIALS: ENVELOPE 1, PAGE 1 OF 3]

FINANCIAL ACCOUNTING RESEARCH STUDY

During this session, you will do the following:

1. Review accounting information for a firm for a certain year.
2. Predict whether that firm's Return on Equity (ROE = Income/Average Stockholders' Equity) in the next year will be above or below the median ROE of all public firms.
3. Indicate a price (called a "cutoff price") below which you would be willing to buy securities of the firm, and above which you would be willing to sell securities of the firm.
4. Indicate the number of shares you would like to trade (buy/sell). The trading decisions of all investors in this session will be analyzed to determine a market price for the firm, and buy and sell transactions will be executed at that price. Your payment for this session will be determined by your trading decisions.

You will complete these 4 steps for 24 separate firms.

We will now explain the 4 steps in more detail.

1. The Firms and the Information

The firms come from a database of all public firms during the years 1998 through 2002. Any firm-year in which ROE was not positive was eliminated. We also eliminated all firms for which the necessary accounting information was missing. The 24 firms you will evaluate are a representative sample of the database. You will receive accounting information for each firm to assist you in making predictions about that firm's future ROE.

For each firm, you will receive a list of accounting information items for a given year (called the "current" year). The list will include *percentile values* of certain annual financial statement accounts and ratios. For example, if the firm's Change in Gross Margin Ratio is greater than 34% of all other firms in the current year, then the value for that measure is 34.

2. Predicting Above- or Below-Median ROE

After reviewing the information, you will be asked to predict whether that firm's ROE in the next year (called "future ROE") will be above or below the median ROE of all firms in the next year (called "median ROE"). Because you are predicting whether a firm's future ROE will be greater or less than the *median* ROE of all firms in that year, about half of the firms will be above and half will be below.

[EXPERIMENT MATERIALS: ENVELOPE 1, PAGE 1 OF 3]

If you received no information at all and had to guess about each firm, you would be correct about 50% of the time. The information items provided can be used to help you increase your prediction accuracy.

3. Your Cutoff Price

After making your prediction, you will be asked to make buy and sell decisions for securities of each firm. For each firm, shares are worth \$1 each if the firm's future ROE is above median ROE, and \$0 if future ROE is below median ROE. The amount is referred to as the security's "true value". For each security, the decisions of all the investors will establish a "market price," and trades (buys and sells) will be executed at that market price.

Your first decision for each security is your "cutoff price," which is the price at which you are indifferent between buying and selling shares. If the market price is below your cutoff price, you will buy shares of the security; if the market price is above your cutoff price, you will sell shares of the security. Therefore, you should set your cutoff price equal to what you believe is the probability that the firm's future ROE will be above median ROE. For example, if you believe the probability that a firm's future ROE will exceed median ROE is 75%, you should set your cutoff price at \$0.75, because you would expect to make money by buying shares at market prices below \$0.75 and selling shares at market prices above \$0.75. All market prices will be between \$0 and \$1.

4. Number of Shares to Trade

Your second decision for each security is the number of shares (between 0 and 10) you are willing to buy when market prices are below your cutoff price or sell when prices are above your cutoff price. For example, if your cutoff price is \$0.75 and you indicate "8" as your number of shares, you are indicating that you are willing to buy 8 shares at market prices less than \$0.75 and sell 8 shares at market prices greater than \$0.75. Note that indicating a greater number of shares means you can win more money if your prediction is right, but that you can lose more money if your prediction is wrong.

Trading and the Market Price

The cutoff prices and share numbers of all the investors in this session will be collected and entered into a computer. The computer will use the information to compute a "market-clearing price," which is the price at which supply equals demand (i.e., the price at which the number of shares offered by sellers equals the number of shares wanted by buyers) for each security. All buy and sell transactions will be executed at this market price. If there is a range of market-clearing prices, the midpoint of that range is used as the market price.

There is only one trading session for each security. Therefore, after entering your cutoff price and share number for a security, you will immediately move on to the next firm. The determination of the market price and the execution of buys and sells will be conducted after the session. You will not learn the true values of the securities during the session.

[EXPERIMENT MATERIALS: ENVELOPE 1, PAGE 1 OF 3]

How to Make Money

After the session is completed, a record of all transactions will be made, and the cash and share balances of each investor will be determined for each security. All shares of each security will be converted into their true cash values (\$0 or \$1), and trading gains and losses for each participant will be computed. You earn money every time you buy a share for less than its true value or sell a share for more than its true value. You lose money every time you buy a share for more than its true value or sell a share for less than its true value. So, if you bought securities at a market clearing price of \$0.55, you made \$0.45 if the true value of the securities was \$1, but lost \$0.55 if the true value of the securities was \$0. If you sold securities at a market clearing price of \$0.55, you made \$0.55 if the true value of the securities was \$0, but lost \$0.45 if the true value of the securities was \$1.

Remember that trades are executed at the market-clearing price, not at your cutoff price. For example, if your cutoff price is \$0.75 and the market clearing price is \$0.55, your “buy” transactions will be executed at \$0.55.

Your winnings in laboratory dollars will be converted to U.S. dollars. You will be paid a flat rate, adjusted to reflect your gains or losses. We anticipate an average payment of \$15 per participant. Each participant is guaranteed to earn at least \$5 for completing the session.

The Investors

There are two types of investors in this session. “Type 1” investors receive 2 items of accounting information for each firm; “Type 2” investors receive those same two items of information plus 2 additional items (a total of 4) for each firm. In addition, at the beginning of the session, Type 2 investors will receive some guidance about the explanatory power of all investors’ information. Type 1 investors do not receive any guidance. Investor type is assigned randomly; you will learn which type you have been assigned in the next envelope.

In this session, 2/3 of the investors are Type 1 investors and 1/3 of the investors are Type 2 investors.

**PLEASE REFRAIN FROM TALKING OR COMMUNICATING WITH OTHERS
DURING THIS SESSION.**

**PLEASE CONTINUE ON TO THE NEXT ENVELOPE. YOU MAY REFER TO THE
MATERIAL IN THIS ENVELOPE AT ANY TIME.**

APPENDIX 3.

Experimental materials: Envelope 2

This appendix shows the materials investors received in Envelope 2 of both experiments. In this envelope, investors received information about their assigned type (“Type1”, referring to unsophisticated investors, or “Type 2”, referring to sophisticated investors) and the information signals they would receive for each firm.

The quantity of signals received by unsophisticated investors was manipulated within subjects at either two (low quantity) or four (high quantity), and this manipulation was counterbalanced in both experiments. This appendix shows the Envelope 2 information received by unsophisticated investors who began the experiment in the low quantity condition.

[CAPITALIZED, ITALICIZED COMMENTS IN SQUARE PARENTHESES ARE FOR CLARIFICATION PURPOSES ONLY AND DID NOT APPEAR ON THE PAGES READ BY INVESTORS.]

[EXPERIMENTAL MATERIALS: ENVELOPE 2 (UNSOPHISTICATED INVESTORS), PAGE 1 OF 1]

YOU HAVE BEEN ASSIGNED THE ROLE OF A TYPE 1 INVESTOR IN THIS SESSION.

TYPE 1 INVESTOR INFORMATION

The information items for each firm are that firm's *percentile values*. "Percentile values" means that the numbers represent where the actual values of the information item lie relative to the values of all other firms in the most recent fiscal year, on a scale from 0 to 99. For example, if a firm's percentage change in Gross Margin Ratio was higher than the percentage change of 42% of all other firms in the most recent fiscal year, the value for that measure will be 42.

You will receive the following two items of accounting information for each firm:

1. The current year's ratio of Cash from Operations (CFO) to Long-term Debt (CFO / Average Long-term Debt).
 2. The percentage change in Gross Margin Ratio ((Net Sales – COGS) / Net Sales) during the current year.
-

[EXPERIMENTAL MATERIALS: ENVELOPE 2 (SOPHISTICATED INVESTORS), PAGE 1 OF 1]

YOU HAVE BEEN ASSIGNED THE ROLE OF A TYPE 2 INVESTOR IN THIS SESSION.

TYPE 2 INVESTOR INFORMATION

The information items for each firm are that firm's *percentile values*. "Percentile values" means that the numbers represent where the actual values of the information item lie relative to the values of all other firms in the most recent fiscal year, on a scale from 0 to 99. For example, if a firm's percentage change in Gross Margin Ratio was higher than the percentage change of 42% of all other firms in the most recent fiscal year, the value for that measure will be 42.

You will receive the following four items of accounting information for each firm:

1. The current year's ratio of Cash from Operations (CFO) to Long-term Debt (CFO / Average Long-term Debt).
 2. The percentage change in Gross Margin Ratio ((Net Sales – COGS) / Net Sales) during the current year.
 3. The current year's Inventory Turnover Ratio (COGS / Average Inventory).
 4. The percentage change in Working Capital (Current Assets – Current Liabilities) during the current year.
-

APPENDIX 4.

Experimental materials: “Sophisticated” investors’ guidance

This appendix shows the guidance received by sophisticated (i.e., “Type 2”) investors. Sophisticated investors received information (in Envelope 2) about the diagnosticity (i.e., quality) of their signals, as well as that of the signals received by unsophisticated investors.

The guidance differed depending on whether sophisticated investors would be initially trading with unsophisticated investors in the low or high quantity conditions. This appendix shows the guidance received by sophisticated investors who initially traded with unsophisticated investors in the low quantity condition.

[CAPITALIZED, ITALICIZED COMMENTS IN SQUARE PARENTHESES ARE FOR CLARIFICATION PURPOSES ONLY AND DID NOT APPEAR ON THE PAGES READ BY INVESTORS.]

GUIDANCE (TYPE 2 INVESTORS ONLY)

Type 1 investors receive only items 1 and 2 from the list on the previous page (CFO to LT Debt Ratio and percentage change in Gross Margin Ratio). They do not receive the Inventory Turnover Ratio and percentage change in Working Capital information items. They also do not know what information items Type 2 investors receive.

Some information items are more helpful than others for making your prediction. The following tables indicate the usefulness of the information items Type 1 and Type 2 investors receive.

Usefulness of Type 2 Investors' Information

Accounting measure	Correlation with prediction variable	Percentage of correct prediction when using the measure perfectly
CFO to LT Debt Ratio	0.439	72%
Percentage Change in Gross Margin Ratio	0.087	59%
Inventory Turnover Ratio	0.080	59%
Percentage Change in Working Capital	0.060	59%
Entire information set (all 4 items)	0.454	72%

Usefulness of Type 1 Investors' Information

Accounting measure	Correlation with prediction variable	Percentage of correct prediction when using the measure perfectly
CFO to LT Debt Ratio	0.439	72%
Percentage Change in Gross Margin Ratio	0.087	59%
Entire information set	0.450	72%

The second column of each table gives the *correlation* between each item and the prediction variable (whether future ROE will be above or below average ROE). Positive correlation indicates that as the accounting information item increases, so does expected ROE. Negative correlation indicates that as the accounting information item increases, expected ROE decreases. Values close to 1 or -1 indicate very high correlation between two variables, while values near 0 indicate little or no correlation.

The third column gives the percent of correct predictions you can expect to achieve if you use the information item perfectly. The closer an item's percentage is to 50%, the less likely it is to provide meaningful information about the prediction variable.

At the bottom of each table, the correlation and percentage correct are given for the total information set.

REMEMBER: Type 1 investors do not receive any guidance regarding their information or yours. This means that they do not know the specific usefulness of each information item. As a result, they are probably more likely to consider each item to be equally important.

APPENDIX 5.

Experimental materials: Comprehension check questions

This appendix shows the comprehension check questions investors were asked after reading the instructions and learning their assigned investor type but before proceeding to evaluate the individual firms. In addition to being asked the same questions unsophisticated investors were asked, sophisticated investors were asked a few more questions related to the guidance they had received.

Investors in experiment 1 received these questions on paper. Because there was no way to check their accuracy before allowing them to proceed, the answers to the questions were provided on the following page, and investors were encouraged to make sure their answers were correct before proceeding. Investors in experiment 2 received the questions on computer; therefore, the program was able to check each investor's accuracy. Investors in experiment 2 were not allowed to proceed until they had provided the correct answer to each question.

This appendix shows the comprehension check questions for unsophisticated and sophisticated investors in experiment 1.

[CAPITALIZED, ITALICIZED COMMENTS IN SQUARE PARENTHESES ARE FOR CLARIFICATION PURPOSES ONLY AND DID NOT APPEAR ON THE PAGES READ BY INVESTORS.]

[EXPERIMENTAL MATERIALS: COMPREHENSION CHECK QUESTIONS (UNSOPHISTICATED INVESTORS) (PAGE 1 OF 2)]

COMPREHENSION CHECK

It is important that you understand these instructions before beginning. Please answer the following questions to demonstrate your understanding. The questions are very simple, if you understand the instructions. Please make sure your answers are correct. You may refer back to find the answers, and there is an answer key on the next page.

1. True or False: You will be predicting whether a firm's future Return on Equity (ROE) will be above or below the median ROE for all firms in a given year.

 2. In this session, are you a Type 1 investor or a Type 2 investor?

 3. How many information items will you receive for each firm?

 4. How many information items will the *other type of investor* receive for each firm?

 5. True or False: The information items you will receive represent the *actual raw values* of the financial statement accounts and ratios for each firm.

 6. True or False: Type 2 investors receive guidance about the explanatory power of all investors' information. _____
 7. True of False: Type 1 investors receive guidance about the explanatory power of their own information, but not about the information of Type 2 investors.

-

[EXPERIMENTAL MATERIALS: COMPREHENSION CHECK QUESTIONS (UNSOPHISTICATED INVESTORS) (PAGE 2 OF 2)]

Comprehension Check Answer Key

1. True
2. Type 1 investor
3. 2 items
4. 4 items
5. False – they represent percentile values.
6. True
7. False – Type 1 investors do not receive guidance about the explanatory power of any investor's information.

YOU MAY NOW OPEN THE NEXT ENVELOPE AND BEGIN WORKING ON THE SECURITIES. YOU MAY REFER TO THE MATERIAL IN THIS ENVELOPE AT ANY TIME.

PLEASE WORK THROUGH THE SECURITIES IN THE ORDER THEY ARE PRESENTED. ALSO, ONCE YOU HAVE ANSWERED ALL THE QUESTIONS FOR A SECURITY, PLEASE DO NOT GO BACK TO IT.

[EXPERIMENTAL MATERIALS: COMPREHENSION CHECK QUESTIONS (SOPHISTICATED INVESTORS) (PAGE 1 OF 2)]

COMPREHENSION CHECK

It is important that you understand these instructions before beginning. Please answer the following questions to demonstrate your understanding. The questions are very simple, if you understand the instructions. Please make sure your answers are correct. You may refer back to find the answers, and there is an answer key on the next page.

1. True or False: You will be predicting whether a firm's future Return on Equity (ROE) will be above or below the median ROE for all firms in a given year.

 2. In this session, are you a Type 1 investor or a Type 2 investor?

 3. How many information items will you receive for each firm?

 4. How many information items will the *other type of investor* receive for each firm?

 5. True or False: The information items you will receive represent the *actual raw values* of the financial statement accounts and ratios for each firm.

 6. True or False: Type 2 investors receive guidance about the explanatory power of all investors' information. _____
 7. True of False: Type 1 investors receive guidance about the explanatory power of their own information, but not about the information of Type 2 investors.

 8. Which information item is the most useful for predicting whether future ROE will be above or below median ROE? _____
 9. For the information you receive, how much predictive power (in %) do the other three information items add to the one information item that is the most useful?

-

[EXPERIMENTAL MATERIALS: COMPREHENSION CHECK QUESTIONS (SOPHISTICATED INVESTORS) (PAGE 2 OF 2)]

Comprehension Check Answer Key

1. True
2. Type 2 investor
3. 4 items
4. 2 items
5. False – they represent percentile values.
6. True
7. False – Type 1 investors do not receive guidance about the explanatory power of any investor’s information.
8. CFO to LT Debt Ratio
9. 0%.

YOU MAY NOW OPEN THE NEXT ENVELOPE AND BEGIN WORKING ON THE SECURITIES. YOU MAY REFER TO THE MATERIAL IN THIS ENVELOPE AT ANY TIME.

PLEASE WORK THROUGH THE SECURITIES IN THE ORDER THEY ARE PRESENTED. ALSO, ONCE YOU HAVE ANSWERED ALL THE QUESTIONS FOR A SECURITY, PLEASE DO NOT GO BACK TO IT.

APPENDIX 6.

Experiment 1: Firm pages

This appendix shows the first firm page seen by investors in experiment 1, which was administered as a paper-and-pencil task. Unsophisticated investors received either two or four signals per firm, manipulated within subjects. Sophisticated investors received four signals per firm for all firms. This appendix shows the first firm page seen by unsophisticated investors who received *two* signals per firm for the first set of firms, and the corresponding first page seen by sophisticated investors.

[CAPITALIZED, ITALICIZED COMMENTS IN SQUARE PARENTHESES ARE FOR CLARIFICATION PURPOSES ONLY AND DID NOT APPEAR ON THE PAGES READ BY INVESTORS.]

[EXPERIMENT 1: FIRM PAGES (UNSOPHISTICATED INVESTORS) (PAGE 1 OF 1)]

FIRM 1

You are given the following accounting information items for the current year for this firm. Remember, these are percentile values (i.e., the percentage of firms with lower values for these measures):

CFO to LT Debt Ratio:	24
Percentage Change in Gross Margin Ratio:	66

REQUIRED

- 1. Prediction and Cutoff Price:** Please do the following: a) check one of the two boxes to indicate whether you believe the FUTURE ROE of this firm will be above or below the MEDIAN ROE of all public firms; b) indicate your cutoff price, which is the price at which you are indifferent between buying and selling shares of this security. Note: only check one box, and only provide a cutoff price for the alternative you choose.

Check here if you predict **ABOVE**, and mark your cutoff price on the scale below:



-OR-

Check here if you predict **BELOW**, and mark your cutoff price on the scale below:



- 2. Number of Shares:** Check the number of shares that you are willing to buy at market prices below your cutoff price and sell at market prices above your cutoff price (check only one number):

0 **1** **2** **3** **4** **5** **6** **7** **8** **9** **10**
 shares shares

**YOU MAY REFER BACK TO THE INSTRUCTIONS AT ANY TIME, BUT
PLEASE DO NOT GO BACK TO PREVIOUS FIRM PAGES.**

[EXPERIMENT 1: FIRM PAGES (SOPHISTICATED INVESTORS) (PAGE 1 OF 1)]

FIRM 1

You are given the following accounting information items for the current year for this firm. Remember, these are percentile values (i.e., the percentage of firms with lower values for these measures):

CFO to LT Debt Ratio:	24
Percentage Change in Gross Margin Ratio:	66
Inventory Turnover Ratio:	85
Percentage Change in Working Capital:	99

REQUIRED

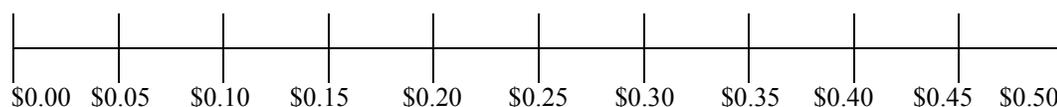
- 1. Prediction and Cutoff Price:** Please do the following: a) check one of the two boxes to indicate whether you believe the FUTURE ROE of this firm will be above or below the MEDIAN ROE of all public firms; b) indicate your cutoff price, which is the price at which you are indifferent between buying and selling shares of this security. Note: only check one box, and only provide a cutoff price for the alternative you choose.

Check here if you predict **ABOVE**, and mark your cutoff price on the scale below:



-OR-

Check here if you predict **BELOW**, and mark your cutoff price on the scale below:



- 2. Number of Shares:** Check the number of shares that you are willing to buy at market prices below your cutoff price and sell at market prices above your cutoff price (check only one number):

0 **1** **2** **3** **4** **5** **6** **7** **8** **9** **10**
 shares shares

YOU MAY REFER BACK TO THE INSTRUCTIONS AT ANY TIME, BUT PLEASE DO NOT GO BACK TO PREVIOUS FIRM PAGES.

APPENDIX 7.

Experiment 2: Firm screens

This appendix shows the sequence of screens that investors saw for each firm they evaluated in experiment 2, which was administered by computer. On the first screen, investors observed the signals and made their ABOVE/BELOW judgment. Based on that judgment, they were then taken to a second screen on which they indicated their reservation price. On the third screen investors indicated the number of shares they wished to trade. The fourth, fifth, and sixth screens elicited investors' assessments of effort, difficulty, and complexity related to the evaluation of each firm. Finally, the seventh screen asked whether they would like to go back and re-evaluate the current firm or proceed to the next firm, where the process was repeated.

This appendix shows the seven screens of the first firm seen by unsophisticated investors who received *four* signals per firm for the first set of firms.

[CAPITALIZED, ITALICIZED COMMENTS IN SQUARE PARENTHESES ARE FOR CLARIFICATION PURPOSES ONLY AND DID NOT APPEAR ON THE PAGES READ BY INVESTORS.]

[EXPERIMENT 2: FIRM SCREENS (PAGE 1 OF 7)]

FIRM 1
INFORMATION AND PREDICTION

You are given the following accounting information items for the current year for this firm. Remember, these are percentile values (i.e., the percentage of firms with lower values for these measures):

CFO to LT Debt Ratio:	27
Percentage Change in Gross Margin Ratio:	7
Inventory Turnover Ratio:	89
Percentage Change in Working Capital:	82

REQUIRED:

1. Please check one of the options below to indicate whether you believe the FUTURE ROE of this firm will be above or below the MEDIAN ROE of all public firms.

Please choose an answer below, and click the 'Continue' button when done

ABOVE

BELOW

[EXPERIMENT 2: FIRM SCREENS (PAGE 3 OF 7)]

FIRM 1
SHARES TO TRADE

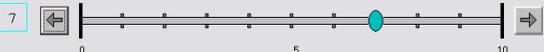
The information items for this firm are shown below.

CFO to LT Debt Ratio:	27
Percentage Change in Gross Margin Ratio:	7
Inventory Turnover Ratio:	89
Percentage Change in Working Capital:	82

REQUIRED:

On the scale below, please indicate the number of shares that you are willing to buy at market prices below your cutoff price and sell at market prices above your cutoff price.

Click on the bar below to indicate your choice, and click the 'Continue' button when done.



[EXPERIMENT 2: FIRM SCREENS (PAGE 4 OF 7)]

**FIRM 1
EFFORT ASSESSMENT**

Effort refers to how much mental work was required for you to complete the task.

REQUIRED:

On the scale below, please rate the amount of effort you exerted when evaluating this firm.

Click on the bar below to indicate your choice, and click the 'Continue' button when done.



Low Effort Moderate Effort High Effort

[EXPERIMENT 2: FIRM SCREENS (PAGE 5 OF 7)]

**FIRM 1
DIFFICULTY ASSESSMENT**

Difficulty refers to how hard you perceive the task of making an accurate prediction.

REQUIRED:

On the scale below, please indicate how difficult you found the task of evaluating this firm to be.

Click on the bar below to indicate your choice, and click the 'Continue' button when done.



Not difficult at all Moderately difficult Very difficult

[EXPERIMENT 2: FIRM SCREENS (PAGE 6 OF 7)]

**FIRM 1
COMPLEXITY ASSESSMENT**

Complexity refers to how intricate and involved a task is.

REQUIRED:

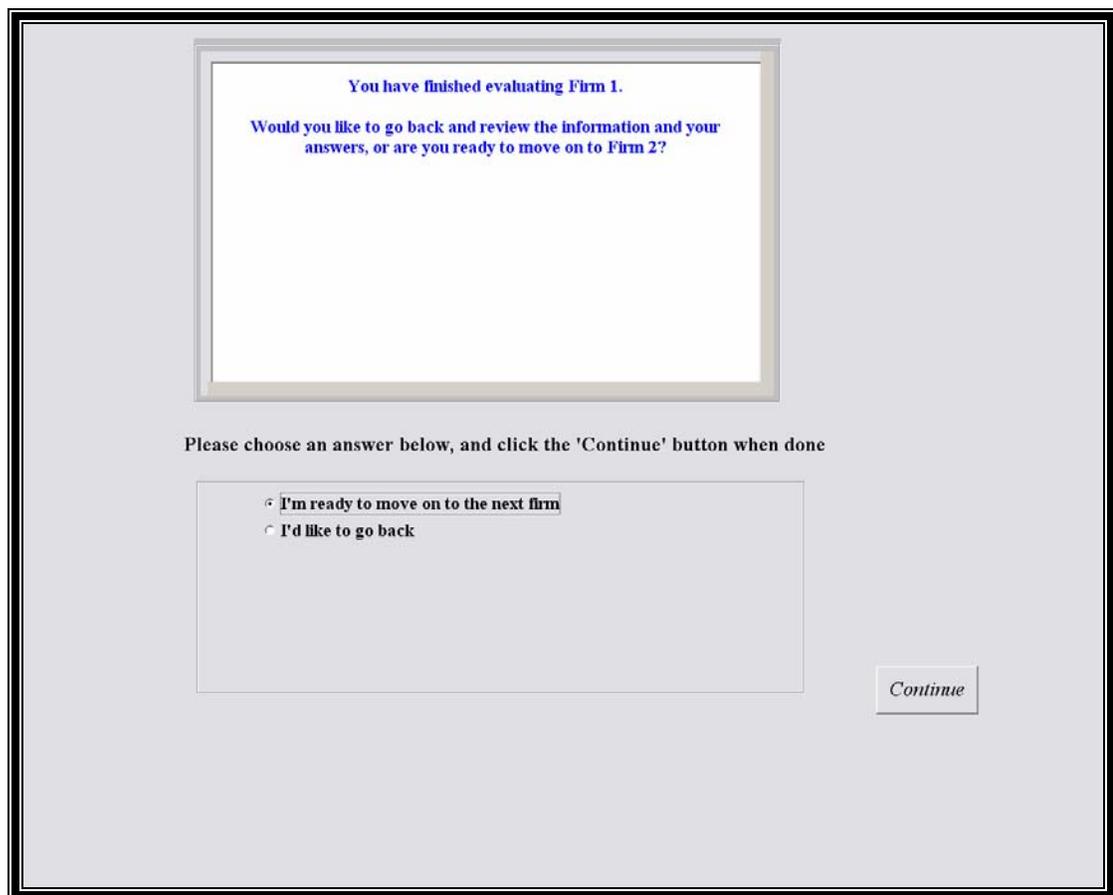
On the scale below, please indicate how complex you found the task of evaluating this firm to be.

Click on the bar below to indicate your choice, and click the 'Continue' button when done.



Not complex at all Moderately complex Very complex

[EXPERIMENT 2: FIRM SCREENS (PAGE 7 OF 7)]



You have finished evaluating Firm 1.

Would you like to go back and review the information and your answers, or are you ready to move on to Firm 2?

Please choose an answer below, and click the 'Continue' button when done

- I'm ready to move on to the next firm
- I'd like to go back

Continue

APPENDIX 8.

Experimental materials: Quantity manipulation

This appendix shows how investors were informed of the quantity manipulation in both experiments. Unsophisticated investors received two (four) signals for each of the first twelve firms they evaluated, followed by four (two) signals for each of the remaining twelve firms. Sophisticated investors received four signals for each of the 24 firms they evaluated. This appendix shows the quantity manipulation for unsophisticated investors who received two signals followed by four signals, as well as the guidance for the corresponding sophisticated investors. Additional comprehension check questions were given, and they are also shown.

[CAPITALIZED, ITALICIZED COMMENTS IN SQUARE PARENTHESES ARE FOR CLARIFICATION PURPOSES ONLY AND DID NOT APPEAR ON THE PAGES READ BY INVESTORS.]

*[EXPERIMENTAL MATERIALS: QUANTITY MANIPULATION (UNSOPHISTICATED INVESTORS)
(PAGE 1 OF 2)]*

IMPORTANT

FOR THE REMAINING 12 FIRMS, TYPE 1 INVESTORS WILL RECEIVE 4 INFORMATION ITEMS INSTEAD OF 2. In addition to receiving the percentile values of a firm's CFO to LT Debt Ratio and Change in Gross Margin Ratio, Type 1 investors will receive the following:

The current year's Inventory Turnover Ratio (COGS / Average Inventory).

The percentage change in Working Capital (Current Assets – Current Liabilities) during the current year.

Type 2 investors will continue to receive the same information they received for the first 12 firms.

Comprehension Check

To ensure your understanding of these instructions, please answer the following questions (please make sure your answers are correct – the answer key is located on the next page).

1. How many information items did Type 1 investors receive for each firm up to this point?

 2. How many information items will Type 1 investors receive for each firm from now on?

 3. Will Type 2 investors' information change for the remaining 12 firms? _____
-

*[EXPERIMENTAL MATERIALS: QUANTITY MANIPULATION (UNSOPHISTICATED INVESTORS)
(PAGE 2 OF 2)]*

Comprehension Check Answer Key

1. 2 items
2. 4 items
3. No

**YOU MAY NOW OPEN THE LAST ENVELOPE AND BEGIN WORKING ON THE
REMAINING 12 SECURITIES.**

[EXPERIMENTAL MATERIALS: QUANTITY MANIPULATION (SOPHISTICATED INVESTORS) (PAGE 1 OF 2)]

IMPORTANT

FOR THE REMAINING 12 FIRMS, TYPE 1 INVESTORS WILL RECEIVE 4 INFORMATION ITEMS INSTEAD OF 2. In addition to receiving the percentile values of a firm's CFO to LT Debt Ratio and Change in Gross Margin Ratio, Type 1 investors will receive the following:

The current year's Inventory Turnover Ratio (COGS / Average Inventory).

The percentage change in Working Capital (Current Assets – Current Liabilities) during the current year.

Type 2 investors will continue to receive the same information they received for the first 12 firms.

GUIDANCE (TYPE 2 INVESTORS ONLY)

Type 1 investors will now receive the same information items that you receive. The following table indicates the usefulness of the information items all investors will receive. **It is the same as the table you received earlier.**

REMEMBER: TYPE 1 INVESTORS DO NOT RECEIVE THIS TABLE.

Accounting measure	Correlation with prediction variable	Percentage of correct prediction when using the measure perfectly
CFO to LT Debt Ratio	0.439	72%
Percentage Change in Gross Margin Ratio	0.087	59%
Inventory Turnover Ratio	0.080	59%
Percentage Change in Working Capital	0.060	59%
Entire information set (all 4 items)	0.454	72%

Comprehension Check

To ensure your understanding of these instructions, please answer the following questions (please make sure your answers are correct – the answer key is located on the next page).

1. How many information items did Type 1 investors receive for each firm up to this point?

 2. How many information items will Type 1 investors receive for each firm from now on?

 3. Will Type 2 investors' information change for the remaining 12 firms? _____
-

[EXPERIMENTAL MATERIALS: QUANTITY MANIPULATION (SOPHISTICATED INVESTORS) (PAGE 2 OF 2)]

Comprehension Check Answer Key

1. 2 items
2. 4 items
3. No

**YOU MAY NOW OPEN THE LAST ENVELOPE AND BEGIN WORKING ON THE
REMAINING 12 SECURITIES.**

APPENDIX 9.

Experimental materials: Debriefing questions

This appendix shows the debriefing questions investors in experiment 1 answered after they evaluated all 24 firms in the experiment. The questions given to unsophisticated (sophisticated investors) are shown first (second).

With only small modifications, the debriefing questions given in experiment 2 were the same as those given in experiment 1. This appendix shows the debriefing questions answered by unsophisticated and sophisticated investors in experiment 1.

[CAPITALIZED, ITALICIZED COMMENTS IN SQUARE PARENTHESES ARE FOR CLARIFICATION PURPOSES ONLY AND DID NOT APPEAR ON THE PAGES READ BY INVESTORS.]

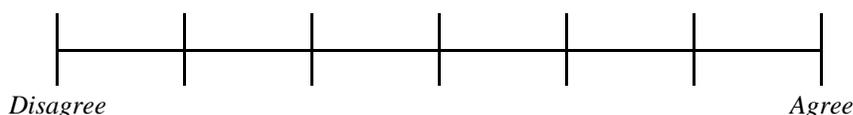
[EXPERIMENT 1: DEBRIEFING QUESTIONS (UNSOPHISTICATED INVESTORS) (PAGE 1 OF 3)]

**YOU HAVE FINISHED THE SESSION.
PLEASE ANSWER THE FOLLOWING QUESTIONS BEFORE RETURNING YOUR
MATERIALS TO THE ADMINISTRATOR. DO NOT GO BACK AND CHANGE ANY
PREVIOUS ANSWERS.**

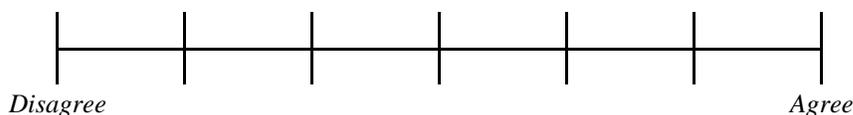
QUESTIONS ABOUT YOUR EXPERIENCE

Please indicate, on the scales given, the extent to which you agree or disagree with the following statements.

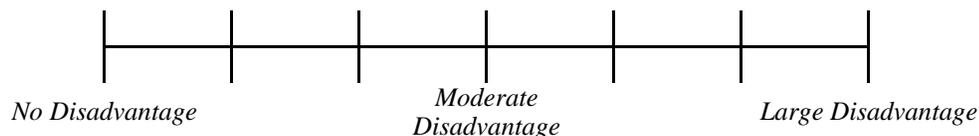
1. I understood the instructions.



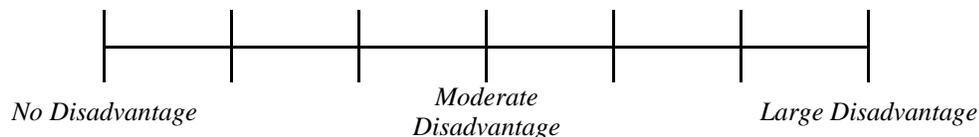
2. I understood the task.



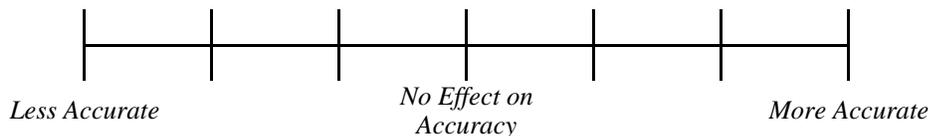
3. How much of a disadvantage did you feel, relative to Type 2 investors, when you received 2 information items for each firm?



4. How much of a disadvantage did you feel, relative to Type 2 investors, when you received 4 information items for each firm?



5. Do you feel that your predictions were more or less accurate when you received 4 information items compared to when you received 2 information items?

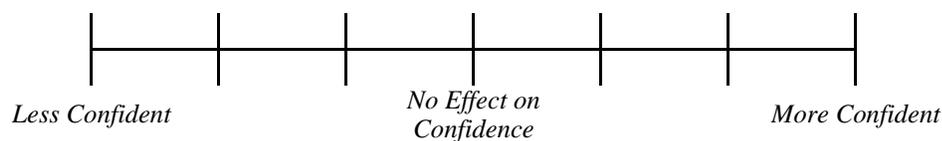


[EXPERIMENT 1: DEBRIEFING QUESTIONS (UNSOPHISTICATED INVESTORS) (PAGE 2 OF 3)]

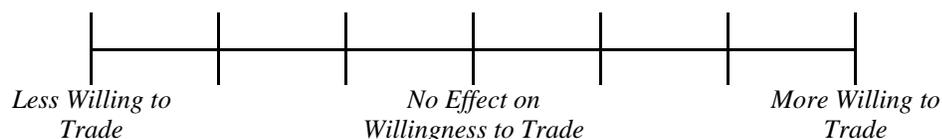
6. Did you feel more or less confident in your predictions when you received 4 information items compared to when you received 2 information items?



7. Did you feel more or less confident in your predictions when the information items were *consistent* (i.e., all or most of the values were either high or low) compared to when the information items were *inconsistent* (i.e., some high and some low)?



8. Did you feel more or less willing to trade shares when you received 4 information items compared to when you received 2 information items?



9. Some of the information items you received were more relevant than others for predicting future ROE. Please rank the 4 information items you received according to your belief about the relevance of each item for predicting future ROE, where 1 = most relevant and 4 = least relevant, or check the last box if you relied on each item equally.

	CFO to LT Debt Ratio
	Percentage Change in Gross Margin Ratio
	Inventory Turnover Ratio
	Percentage Change in Working Capital
	I relied on each information item equally.

[EXPERIMENT 1: DEBRIEFING QUESTIONS (UNSOPHISTICATED INVESTORS) (PAGE 3 OF 3)]

QUESTIONS ABOUT YOU

10. Name of university _____
11. What is your student status?
____ MBA Student (what year? ____)
____ MAcc Student (what year? ____)
12. How many accounting classes have you taken in total? _____
13. Have you taken a course in Financial Statement Analysis? _____
14. What is your age? _____
15. What is your gender? _____

**THANK YOU FOR YOUR PARTICIPATION. YOUR WINNINGS WILL BE
CALCULATED AND YOU WILL RECEIVE AN EMAIL WITHIN THE NEXT FEW
WEEKS INDICATING WHERE TO GO TO PICK UP YOUR PAYMENT.**

**PLEASE RETURN ALL MATERIALS TO THE ENVELOPES FROM WHICH THEY
CAME AND RETURN THEM TO THE ADMINISTRATOR.**

[EXPERIMENT 1: DEBRIEFING QUESTIONS (SOPHISTICATED INVESTORS) (PAGE 1 OF 3)]

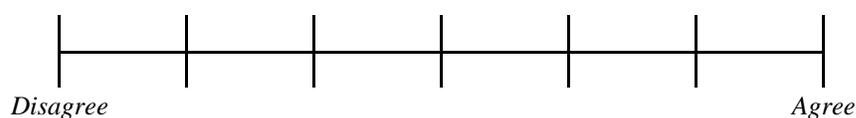
YOU HAVE FINISHED THE SESSION.

PLEASE ANSWER THE FOLLOWING QUESTIONS BEFORE RETURNING YOUR MATERIALS TO THE ADMINISTRATOR. DO NOT GO BACK AND CHANGE ANY PREVIOUS ANSWERS.

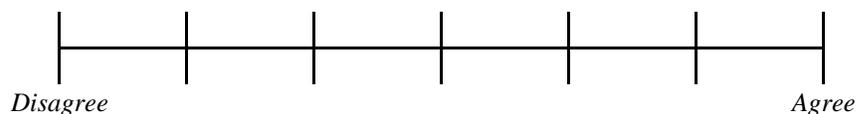
QUESTIONS ABOUT YOUR EXPERIENCE

Please indicate, on the scales given, the extent to which you agree or disagree with the following statements.

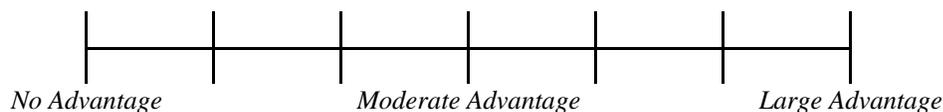
1. I understood the instructions.



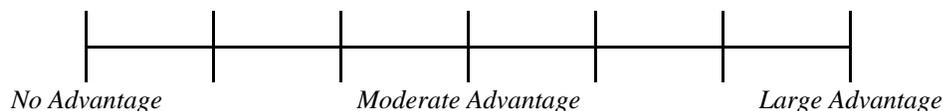
2. I understood the task.



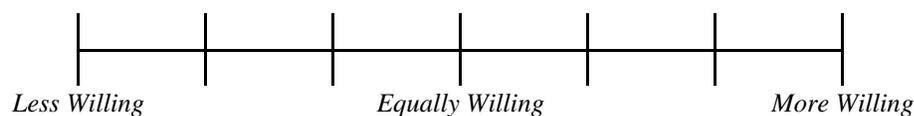
3. How much of an advantage did you feel, relative to Type 1 investors, when you received 4 information items and they received 2 information items?



4. How much of an advantage did you feel, relative to Type 1 investors, when all investors received 4 information items for each firm?



5. Did you feel more or less willing to trade shares when Type 1 investors received 2 information items, compared to when they received the same 4 information items that you received?



[EXPERIMENT 1: DEBRIEFING QUESTIONS (SOPHISTICATED INVESTORS) (PAGE 2 OF 3)]

6. Do you feel that your winnings will be greater or smaller for the firms for which Type 1 investors received 2 information items, compared to your winnings for the firms for which Type 1 investors received the same 4 information items that you received?



7. Which of the 4 information items you received did you rely on the most when making your predictions? (Check one)

	CFO to LT Debt Ratio
	Percentage Change in Gross Margin Ratio
	Inventory Turnover Ratio
	Percentage Change in Working Capital
	I relied on all information items equally

QUESTIONS ABOUT YOU

8. Name of university _____
9. What is your student status?
- ___ MBA Student (what year? ___)
- ___ MAcc Student (what year? ___)
10. How many accounting classes have you taken in total? _____
11. Have you taken a course in Financial Statement Analysis? _____
12. What is your age? _____
13. What is your gender? _____
-

[EXPERIMENT 1: DEBRIEFING QUESTIONS (SOPHISTICATED INVESTORS) (PAGE 3 OF 3)]

**THANK YOU FOR YOUR PARTICIPATION. YOUR WINNINGS WILL BE
CALCULATED AND YOU WILL RECEIVE AN EMAIL WITHIN THE NEXT FEW
WEEKS INDICATING WHERE TO GO TO PICK UP YOUR PAYMENT.**

**PLEASE RETURN ALL MATERIALS TO THE ENVELOPES FROM WHICH THEY
CAME AND RETURN THEM TO THE ADMINISTRATOR.**

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