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PRODUCT MARKET THREAT AND STOCK PRICE INFORMATIVENESS

Boubker Drissi
University of Rhode Island, bdrissi@gmail.com

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BOUBKER DRISSI

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BOUBKER DRISSI

APPROVED:

Dissertation Committee:

Major Professor Tong Yu

Shaw K. Chen

Jing Jian Xiao

Nasser H. Zawia
DEAN OF THE GRADUATE SCHOOL

UNIVERSITY OF RHODE ISLAND

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ABSTRACT

There are two opposing hypotheses regarding the informative role of stock prices. The first hypothesis argues that the stock market is merely a sideshow where security prices reflect the consequences of managers' decisions for firms' cash flows but do not influence them. In other words, trading in secondary markets has no direct impact on firms' decisions. The second, known as the "active informant hypothesis", states that security prices influence managers' real decisions because some investors trade on private information not available to managers, who therefore rely on stock prices as a source of information. There is recent evidence supporting the latter hypothesis. In order to help elucidate this current debate, this dissertation examines the stock price informativeness of firms facing a product market threat and competition from their peers. I reason that when facing a threat, managers of firms tend to be more inquisitive about their price stock movements and also about the stock price movements of their peers. Indeed, my empirical analyses show that managers of firms facing higher product market threat and competition are more sensitive to the information contained in their stock prices. I also find that firms learn more from their peers' stock price movements as the level threat is greater except when the threat is at its highest level.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

"(An efficient market) has a very desirable feature. In particular, at any point in time market prices of securities provide accurate signals for resource allocation; that is, firms can make production-investment decisions, and consumers can choose among the securities that represent ownership of firms' activities under the presumption that security prices at any time "fully reflect" all available information. A market in which prices fully reflect available information is called efficient." —Eugene Fama and Merton Miller, the Theory of Finance (1972, p 335)

"Our examiners are extremely good at what they do, but any good examiner recognizes that data should come from a variety of different sources, including the signals that come from the market. Therefore, market discipline can be an important adjunct to the supervisory process." —Roger W. Ferguson, Jr., Ex Vice Chairman, Board of Governors of the Federal Reserve System (2005).

"The stock market rally of the past four years shows that capital expenditure is not an essential driver for equities," says Pierre Lapointe, head of global strategy and research at Pavilion Global Markets in Montreal. He also adds "However, history tells us that companies that grow their capital expenditure programs usually do much better than companies that do not."

The contribution of the financial sector to the economy has become increasingly pervasive in the past two decades. Going all the way back to Schumpeter (1911), the financial literature abounds with articles that show that a well-functioning financial system contributes positively to a country's economic growth. To cite a few, King and Levine (1993), Levine and Zervos (1998), and Rajan and Zingales (1997) link capital markets and economic growth and all argue that a more developed financial sector leads to economic growth. Merton and Bodie (1995) argue that the main role of a financial sector is to allocate economic resources in a risky environment. This role has been further subdivided by Levine (2005) into five categories: First to transmit information about possible investments and capital allocation, second to monitor investments and exert corporate control, third to facilitate diversification and management of uncertainty, fourth to mobilize and pool savings, and fifth to facilitate the exchange of goods and services. This dissertation is mainly concerned with the first role of financial markets (its informative role) and in particular how the information in the stock price movements is channeled which in turn reflects the efficiency of the financial markets.

One of the most relevant issues in finance is market efficiency, which is defined as the extent to which market prices are informative about the value of traded assets and whether financial markets have an impact on the overall economy. Some economists argue that the debates over market efficiency would not as be prominent as they are if the stock market did not affect real economic activity. Eugene Fama in his *Foundations of Finance* (1976, p 132) contends

that: “An efficient capital market is a market that is efficient in processing information. In an efficient market, prices “fully reflect available information”.

The issue of market efficiency has become particularly pertinent after the recent financial crisis which began in August 2007 and was triggered by consumer defaults on subprime mortgages and had significant adverse effects on the U.S. financial sector and caused the most dramatic bank failure in U.S. history. Consequently, more research has been devoted to examining the role of financial markets and whether they impact the real economy. In particular, a line of research investigates why managers constantly monitor the performance of their firm’s stock and how firms’ stock prices affect real managerial decisions.

Corporate managers usually make three vital decisions namely, investment decisions, payout decisions, and financing decisions. Managers undertake investments in the sole purpose of ameliorating the future value of the firm. Since we know that share prices are forward looking and incorporate the information pertaining to the expected value of the firm, one would expect that investment and stock prices to be linked. The financial literature abounds with scholar articles that find a positive relationship between a firm’s investment and stock returns. However, there is no absolute consensus that the aforementioned relationship is always positive. Some scholars argue that the link between capital expenditure and stock return often hinges upon the characteristics of the firm in consideration. Some other scholars find that there is a negative relationship between corporate investment and stock market return. In this dissertation we incorporate the

element of threat and one of our goals is to help elucidate this debate and help reach some sort of consensus related to this very vital discussion.

There are two main opposing views regarding the informative role of stock prices. The first view argues that the stock market is merely a sideshow where security prices reflect the consequences of managers' decisions for firms' cash flows but do not influence them. In other words, trading in secondary markets has no direct impact on firms' decisions. The second, known as the "active informant hypothesis", states that security prices influence managers' real decisions because some investors trade on private information not available to managers, who therefore rely on stock prices a source of information.

There is ample evidence that the stock market is not merely a sideshow but rather has an effect on real economic activity which is associated with the informational role of stock prices. In fact, the rationale behind the fact that real decision makers (or managers) learn from the information in the secondary market prices can be divided into three lines of reasoning. The first line of reasoning argues that managers learn from information in their firms' stock prices and utilize this information to make real decisions. The idea was originally introduced by Hayek (1945) who argued that prices are a useful source of information. A financial market is a venue where many speculators with different pieces of information meet to trade, trying to capitalize on their information. Stock prices gather this myriad of pieces of information and present an accurate assessment of firm value which will be used by managers in order to guide their decisions. In other words, stock prices enable managers to utilize those diverse

pieces of information from different traders who have no other means of communicating with managers outside the trading process. But the skeptics might ask how could managers learn from their own stock prices? They are closer to the firm than market traders and are expected to have superior information about the firm. The answer is quite simple: the informativeness of stock prices does not posit that managers have less information than other investors in the capital market, but rather decision makers do not possess perfect information related to their firm. Other investors may have additional information that could be beneficial to them. According to Grossman (1976) and Hellwig (1980), even though an individual investor may be less informed than the manager, the stock market price reflects the information of a collection of investors who on aggregate may be more informed. Furthermore, managerial decisions do not rely on internal information solely related to the firm, but also on information related to the economic environment, the industry outlook, the firm's competitive position competition among other external sources of information. In fact, Allen (1993) contends that financial markets have become more informative as production processes have become more convoluted. The second line of reasoning argues that even if managers do not learn from stock prices, they are interested in market prices because their compensation is often linked to how the stock price of their firm fares. As a result, managers will make real decisions contingent on the extent to which they will impact their firm's stock price which reverts us to the informational role of prices. Finally, the third line of reasoning is often preferred by behaviorist and assumes that managers irrationally rely on the stock price to

form their decisions and often use it as an anchor. They reason that real decision makers look at the price rather than other public signals because the price is often perceived to convey more information (Baker and Wurgler (2012))**.**

There are three distinct hypotheses related to the informative role of financial markets and were introduced by Morck, Shleifer, and Vishny (1990) (MSV hereafter). MSV introduced the "passive informant" hypothesis which argues that the stock market is merely a sideshow and does not play any important role in allocating investment funds. It says that the firm's decision makers know more than the public about the investment opportunities facing the firm. The market might tell the manager what market participants think about the firm's investments, but that does not influence his/her decisions. Their "accurate active informant" hypothesis states that the stock market plays a bigger role and that stock prices affect a firm's investment because they convey to managers information which facilitates their decision making process. It argues that security price influence managers' real decisions because some investors trade on private information not available to managers, who therefore rely on stock prices as a source of information. Their "faulty active informant" argues that managers' decisions about investment are influenced by stock price movements, but managers cannot distinguish between movements reflecting fundamentals and those reflecting market "sentiment". One of this dissertation's goals is to help elucidate this debate and show that the accurate active informant hypothesis is valid.

A recent stream of research argues that managers can learn valuable information about the prospects of their own firm from observing their stock price. This idea originates from Hayek's (1945) intuition that stock prices efficiently aggregate information from various participants and hence help improving the allocation of resources. According to Fresard (2010) "The aggregation of information is permitted by the trading activity of diverse speculators that transmit their private information into market prices via their trades (e.g. Grossman and Stiglitz (1980) or Kyle (1985)).Because these speculators may not have the possibility or willingness to share their information with managers directly, stock prices may incorporate specific information that managers do not possess. As a result, if (some) investors have information about a company's prospects that those running the company ignore, the information embedded in stock prices may help reduce this information asymmetry and improve firms' decisions."

The dissertation makes two main contributions to the finance literature. First, it contributes to the intensive literature that studies the interactions between product market competition and firms' managers' behavior. We show that the greater the threat the more attentive managers are to the information in their own stock market movements. We also find that the greater the competition a firm faces from its rivals the more sensitive managers are to the information contained in their peers' stock price movements except when the level of threat is at its highest level. Second, we contribute to literature supporting the managerial learning hypothesis which states that managers do learn from their stock price

movements and their peer's stock price movements and that the capital markets are not merely a sideshow. Product market threat seems to serve as a catalyst that induces managers to work more efficiently and be more attentive to the information contained in capital markets.

Whether firm managers look at their stock price movements is a matter of paramount importance. In fact, firms live and die by their stock price and the stock price movements are deemed to be of vital importance to the incumbent managers. The most evident reason why managers are concerned about the stock price of their corresponding firms is that they are most of the time shareholder too and have a stake in the company. Very often we find encounter cases where the founder of a public company to own a substantial number of the firm's shares and we also find that the managers' compensation is linked to how their stock and their compensation is under the form of stock options. It has been documented that tying a managers' compensation with the stock price mitigates agency conflicts between managers and shareholders and align their interests. in other words, managers are in a way shareholders of the firm and as a result should pay attention to how the stock price of their firm behaves.

Stocks represent ownership in a company and hence an investor in a firm is affected by how the stock movements of his/her firm. A manager's' goal is to maximize the expected utility or wealth of his/her shareholders and to create value for them and that could be achieved by maximizing the stock prices of the firm. In the short run, managers might not have great control over their firm's stock price, but a continuous poor stock performance could reflect managers' inaptitude to

manage the firm efficiently. In fact, if a firm's stock price repeatedly underperforms the analysts forecast previsions and shareholders' expectations, the latter might consider replacing the incumbent managerial team. In case managers retrench and resist a change instigated by shareholders, a proxy fight could be utilized in order to replace the incumbent management. As a result, managers should always be aware of how their corresponding shareholders perceive their performance and the stock price of their firms is one barometer to achieve that goal. As a consequence, stock prices are used by all market participants since they reflect the well-being of a firm. Traders are always looking for a profit opportunity and analysts are searching for good investments opportunities for their clients and stock prices are one measure to reach that end. Furthermore, creditors also tend to gauge whether firms are sound financially and are able to pay back their debt and one way of verifying that is too look at their stock prices. The link between a firm's stock price and its financial credibility is mainly due to the inherent link between a firm's earnings and its stock price. If a company has strong earnings, it shows stakeholders (creditors included) that the firm can meet its debt obligations which will permit the firms to take advantage of a lower capitalization rate which would maximize its return on investment and also make more projects worth undertaking. Furthermore, a good stock market performance is valuable for a firm in case it's planning to issue more shares. A good performance in the capital market would allow the firm to issue more share at a profitable price.

Another reason why a firm's manager should be concerned with its share price is due to the threat of takeover by other firms. If the stock price of the firm decreases significantly, other firms might consider turning around that firm by a means of a takeover. Many takeovers result in replacing the existing management. To that end, the acquiring company will be able to pay the firm's shareholders a higher premium when stock prices are already low and hence that would maximize the chances of a takeover. Therefore, a strong stock performance could serve as deterrence for potential interested bidders and a poor one would serve as an invitation for potential acquirers.

Furthermore, looking at the takeover from another perspective, a firm with a good stock performance has a better chance in case it decides to take over another firm and the takeover could be financed by issuing additional shares. Doing so would enable the acquiring firm managers to have more assets under their purview. The final reason why share prices might be of interest to managers is due to the fact that managers have a reputation to build and the stock price is one measure of how market participants perceive them. As a consequence, the higher the stock price, and the larger the market value of the company under their purview, and the more prestigious their occupation is.

One of the premises of the efficient market hypothesis is that market participants are rational. A rational individual is supposed to make rational decisions under uncertainty which would maximize his/her utility. Behaviorists question the rationality of investors and managers alike. More studies reckon that

managers may not be always rational and suggest that their financing and investing decisions might suffer from irrationality.

Going all the way back to the seminal paper by Miller and Modigliani and Miller (1958), many scholars have examined the investment decisions by managers and their firms' capital structure. Most of those scholars have assumed that managers are rational. For instance Leland and Pyle (1977), Ross (1977), Myers and Majluf (1984) investigated the phenomenon is signaling by managers in case of information asymmetries assuming managers are rational. Jensen and Meckling (1976), Grossman and Hart (1982), Jensen (1986), Dewatripoint and Tirole (1991), and Fairchild (2003)) investigated how the capital structure selected by managers could reduce agency conflicts between principals and agents. Their methodology uses a principal0agent model which assumes that the rationality of managers.

Around the beginning of the last decade, more scholars started to reckon that managers' decisions might be affected by behavioral shortcomings. For instance, Shefrin (1999), Heaton (2002), and Hackbarth (2002) have examined the link between managerial irrationality and capital structure. Statman and Caldwell 1987, Shefrin (1999) , and Gervais et al 2003 analyzed how capital budgeting is affected by managers' irrationality. Jensen and Meckling (1976) used a model where a manager could divert company funds for personal. The found that one way of aligning the manager's interest with the one of shareholders is to increase the debt level and reduce external equity.

One of the behavioral biases affecting managers is managerial overconfidence. Kahnemann and Lovallo (1993), Shefrin (1999), Goel and Thakor (2000), Malmandier and Tate (2001), Heaton 2002, and Hackbarth 2004 have all examined the phenomenon of managerial overconfidence. Heaton (2002) finds that agents tend to be overconfident and over-optimistic about matters they believe they can control.

Traditional finance attempts to understand how financial markets function by using models in which agents are assumed to be rational. Rationality hinges on two distinct notions. The first notion is related to whether agents update their "prior" or beliefs correctly when new information arises as it is explained by Bayes' law. The second notion is concerned with whether agents make acceptable choices based on their beliefs. Proponents of behavioral finance rely on the irrationality of financial market participants in order to argue against the efficient market hypothesis. While there is ample research which investigates the irrationality of investors, the question whether managers are rational is still limited.

According to the ex-Chairman of the SEC, Arthur Levitt, "Quality information is the lifeblood of strong, vibrant markets. Without it, investor confidence erodes. Liquidity dries up. Fair and efficient markets simply cease to exist. As the *quantity* of information increases exponentially through the Internet and other technologies, the *quality* of that information must be our signal priority"

The question whether asset prices reflect all relevant information is one of the most paramount topics in finance. Notwithstanding, an attempt to empirically

find a definite answer to that pertinent question is impeded by two major obstacles. First, information in not easily observable and differentiating between relevant and irrelevant information has proved to be not a facile task. Second, quantifying how information is processed by market participants has proved to be a daunting task.

How information is processed in financial markets has been extensively examined in the finance literature. Several papers have investigated the process of trading and how stock prices vary around news releases (Harris and Raviv 1993, Kandel and Pearson 1995, and Blume, Easley, and O'Hara 1994). The gist of all those papers revolves around the fact that price reaction is mainly driven by the amount of unanticipated information.

Little is known about how market participants and in particular how managers react to new information. As mentioned earlier, behaviorists' focus has mainly been geared towards the irrationality of investors and they have overlooked the rationality/irrationality of managers.

It has been established that stock prices carry new information which could be useful to managers. The idea dates back to Hayek (1945) who argued that financial market is a venue where many speculators with different pieces of information meet to trade, trying to capitalize on their information. Stock prices gather this myriad of pieces of information and present an accurate assessment of firm value which will could used by managers in order to guide their decisions and update their prior and beliefs. In other words, stock prices enable managers to

utilize those diverse pieces of information from different traders who have no other means of communicating with managers outside the trading process.

This dissertation attempts to fill the aforementioned gap in behavioral finance research by exploring whether managers update their beliefs by extracting information from the stock price movements of their own firms and the ones corresponding to their peers.

Some of the traits pertaining to the psyche of investors and which could be applied to managers' behavior are belief perseverance and anchoring. According to Lord, Ross, and Lepper (1979), once people have formed an opinion, they stick to it too tightly and for a long time. Barberis and Thaler (2003) cite that belief perseverance could be explained by the fact that when people once form an opinion, they tend to cling to it for a long time and they become too reticent to search for evidence against their beliefs. They also treat new evidence with skepticism. According to Kahneman and Tversky (1974), when people form estimates, they usually start with an arbitrary value and then adjust as new information comes in. Anchoring states that people "anchor" on the initial value and adjust very slowly to new information.

These psychological traits could be easily translated to managers who might persevere in their beliefs and ignore any new information contained in the stock price of their own firms or their peers. Our analysis will determine whether managers show that kind of behavior toward the flow of new information, in particular, the information contained in stock price movements when the level of competition increases. Barberis et al (1998) discuss how a "conservatism bias"

might lead investors to underreact to information. In certain cases, in violation of Bayes' rule, existing theories suggest that some investors tend to underreact to unexpected news events. The conservatism bias suggests that individuals underestimate new information in updating their expectations and as a consequence prices will tend to slowly adjust to information.

According to Hirshleifer (2003), another psychological behavior that could be applied to managers is the phenomenon of "limited attention" which is a consequence of the large amount of information available out there and the limits to individuals' processing power. Kahneman (1973) cites that attention is a scarce cognitive resource. It has been documented that there is a the cognitive-processing capacity of the human brain has a limit and that the phenomenon is limited attention is due to the substantial amount of information available to agents. The "ostrich effect" documented by Lowenstein and Seppi (2005) states that investors pay more attention to stocks when the market is rising, but ignore the stock prices when the markets are doing poorly.

Kahhneman (1973) argues that attention must be selective and requires effort. Fiske (1995) that individuals encode information by taking external information and representing it internally in a way that is usable. According to Herb Simon "the scarce resource is not information; it is processing capacity to attend to information. Attention is the chief bottleneck in organizational activity, and the bottleneck becomes narrower and narrower as we move to the tops of organizations, where parallel processing capacity become less easy" (Simon 1973, page 270.).

Limited managerial attention has been investigated literature, but from different angles. Geanakoplos and Milgrom (1991) focus on how to allocate different tasks among managers with different ability and the optimal organization structure of a firm. Darrough and Melumad (1995) examine a setting in which a principal motivates a manager with unknown ability to allocate his effort between his own division and other division, and illustrate that sometimes it is optimal to motivate the manager to concentrate on his own. In this dissertation, we will investigate whether managers exhibit "limited attention" pertaining to the information in their stock price movements and the one pertaining to their peers and how the intention of managers changes with a higher level of competition from their peers.

.On the other side of the spectrum, there is the phenomenon of "increased attention" where the agent makes an extra effort in order to serve his interests or the principal's interests. Warner and Watt (1987) examine the relationship between the stock price movements of a firm and the subsequent top management changes. They find an inverse relationship between the two. As a result, managers ought to look at the stock price movements since they reflect whether their job is in jeopardy and that would be even more pronounced when their firm is facing higher threat from competitors.

Another benefit of managers inquiring about their stock price movements and the ones of their peers is the fact that they will be able to reduce any information asymmetry between the informed investors and the less informed ones. Furthermore, it has been documented that when the level of competition is

higher, the degree of exploitation of private information is lower (Holden and Subrahmanyam 1992, 1994; Foster and Viswanathan 1993, 1994, 1996). This occurs because competition leads private information to be incorporated into prices more quickly (i.e., prices become more informative about fundamental value). This effect has two potential implications for the pricing of information asymmetry. First, in a Kyle (1985) type model, competition reduces the need for market makers to price protect because it lowers the extent to which information asymmetry is exploited. Second, in an Easley and O'Hara (2004) type model, competition reduces the risk of information asymmetry to uninformed investors because the collective trades by informed investors lead to greater information being reflected in the equilibrium price. Hence, when facing higher threat, the managers would benefit even further by inquiring about their stock price movements since they contain even more information as competition increases.

CHAPTER 2

Review of Literature

There are many notable differences between the fields of finance and macroeconomics. One of their salient differences is their perspective of the stock market. Finance scholars consider the stock market as the most important market which affects corporate investment decisions, whereas macroeconomists give a minor role to the stock market when it comes to making investment decisions. In fact, it has been established that the stock market is a predictor of the business cycle and provided that the stock market is well-functioning and rational, stock price movements can be deemed as a predictor of the business cycle. According to Henry (2003) "Changes in stock prices reflect both revised expectations about future corporate earnings and changes in the discount rate at which these expected earnings are capitalized". As a result, stock prices seem to possess a forward-looking property which renders the stock market a plausible predictor of the business cycle. If in addition the information contained in stock prices is deemed of high quality, then stock price movements would produce concise and reliable predictions

Notwithstanding the stock market has been recognized as a predictor of the business cycle in theory, macroeconomic forecasters have been reluctant to give importance to its predictions. According to Moore (1983), the stock market

receives rather modest attention compared with other indicators such as interest rate and money supply changes which are frequently showcased for their business cycle predictive ability by macroeconomists. Moore goes on to show that during the period of 1873 to 1975, the stock market had led the business cycle at eighteen of twenty peaks and at seventeen of twenty three troughs.

The contribution of the financial sector to the economy has become increasingly pervasive in the past two decades. Going all the way back to Schumpeter (1911), the financial literature abounds with articles that show that a well-functioning financial system contributes positively to a country's economic growth. To cite a few, King and Levine (1993), Levine and Zervos (1998), and Rajan and Zingales (1997) link capital markets and economic growth and all argue that a more developed financial sector leads to economic growth. Merton and Bodie (1995) argue that the main role of a financial sector is to allocate economic resources in a risky environment. This role has been further subdivided by Levine (2005) into five categories: First to transmit information about possible investments and capital allocation, second to monitor investments and exert corporate control, third to facilitate diversification and management of uncertainty, fourth to mobilize and pool savings, and fifth to facilitate the exchange of goods and services. This dissertation is mainly concerned with the first role of financial markets (its informative role) and in particular how the information in the stock price movements is channeled which in turn reflects the efficiency of the financial markets.

The concept of market efficiency is paramount to financial economics. The term efficiency is utilized to refer to a market in which relevant information is incorporated into the price of financial assets which is also referred to as the informational efficiency of financial markets. The efficient market hypothesis (EMH) was developed independently by Samuelson and Fama in the 1960s and gives us a substantial insight into the process of determining the price of an asset in the marketplace through the interactions of buyers and sellers. EMH has triggered a series of empirical tests and critiques; chief among them comes from behaviorists who show skepticism regarding the human rationality assumption.

Bachelier (1900) in his doctoral Mathematics dissertation at the Sorbonne stated that "past, present and even discounted future events are reflected in market price" and concluded that asset prices fluctuate randomly. Haplessly, Bachelier's insight was overlooked for more than half a century until it was circulated to economists by Paul Samuelson in the late 1950s and then translated to English by Cootner in 1964.

The EMH was originally formulated independently in the 1960s by Eugene Fama and Paul Samuelson. In 1965, Paul Samuelson wrote an article whose article is 'Proof that Properly Anticipated Prices Fluctuate Randomly'. He argues that in a market that is informationally efficient, price changes must be unpredictable if they fully reflect the information and expectations of all market participants. In other words, Samuelson argues that "There is no way of making an expected profit by extrapolating past changes in the future price, by chart or any other esoteric devices of magic or mathematics". Fama (1963; 1965a; 1965b,

1970) introduced in his seminal papers the concept of market efficiency and states that a market in which prices at any time "fully reflect available information is called efficient". His research stems primarily from his interest in the statistical properties of stock prices and the ongoing debate between technical and fundamental analyses. In 1978, Jensen wrote "I believe there is no other proposition in economics which has more solid empirical evidence supporting it than the Efficient Market Hypothesis". Lucas (1978) adds that in markets where all investors have 'rational expectations', prices do fully reflect all available information and marginal-utility weighted prices follow martingales. There were several extensions of the EMH including the consideration of non-traded assets such as human capital, non-homogeneous expectations, asymmetric information, taxes, transactions costs, and various other forms of extensions. However the general ides is the same: investors are rational, markets are efficient when it comes to gathering information, and equilibrium prices reflect all relevant information. (Lo 2007)

A substantial portion of the financial sector's activity transpires in the secondary market. Secondary financial markets play a major role in linking borrowers and savers of capital and serve as a venue where their exchanges take place. The allocation of capital is a primary role of capital markets and the investment policy of firms is a major element of the allocation process. But does the stock market provide information to its participants or is it merely a sideshow? This question has become particularly pertinent after the recent financial crisis. One salient feature of a financial market is that a great part of its activity takes

places in secondary financial markets where instruments are traded among market participants without the firm's involvement. What transpires in the stock markets is daily reported by the press and media and is constantly tracked by managers. Can this be a signal that stock prices inherently contain information of interest to the market participants including firm managers which ultimately might impact the real economic activity? One could answer this question by simply arguing that one way of testing this question is to investigate whether stock prices affect a firm decision maker's actions. Hayek (1945) wrote "We must look at the price system as such a mechanism for communicating information if we want to understand its real function…The most significant fact about this system is the economy of knowledge with which it operates, or how little the individual participants need to know in order to be able to take the right action". He further argues that prices are a useful source of information and that financial market is a venue where many speculators with different pieces of information meet to trade, trying to capitalize on their information. Stock prices gather this myriad of pieces of information and present an accurate assessment of firm value which will be used by managers in order to guide their decisions. In other words, stock prices enable managers to utilize those diverse pieces of information from different traders who have no other means of communicating with managers outside the trading process. Baumol (1965) argues that firm managers will learn from this information and utilize it to guide their decisions which will affect firm cash flows and values. Consequently, the financial market has a real effect on the economy by conveying information from investors to managers. Alchian and Demsetz (1972) and Jensen

and Meckling (1976) argue that stock prices can be utilized as a monitoring tool. They reason that a firm's stock prices movements reflect the managers' decisions. Jensen and Meckling (1976) state that "the existence of a well-organized market in which corporate claims are continuously assessed is perhaps the single most important control mechanism affecting managerial behavior in modem industrial economies". Fama (1976) wrote "if the capital market is to function smoothly in allocating resources, prices of securities must be good indicators of value". Tobin (1969) shows that the stock price of a firm can be utilized by a manager in order to make optimal investment decisions. He relates investment to q, which is the ratio of the market's valuation of capital to the cost of acquiring new capital. An increase in the prospective return on capital or a decrease in the market's discount rate raises q and thereby increases investment. With a simple form of adjustment cost for changing the capital stock, the optimal amount of current investment depends only on the current value of q.

Resorting to the stock prices in order to make corporate decisions hinges on the assumption that the capital markets are efficient. According to Fama and Miller (1972) "An efficient market has a very desirable feature. In particular, at any point in time market prices of securities provide accurate signals for resource allocation; that is, firms can make production-investment decisions, and consumers can choose among the securities that represent ownership of firms' activities under the presumption that security prices at any time "fully reflect" all available information. A market in which prices fully reflect available information is called efficient."

In a capitalist world, prices are used to balance supply and demand for goods and services and price changes serve to redeploy resources in the most efficient way possible. Secondary market prices are often perceived as the most "informationally efficient" prices in the economy (Dow and Gorton (1997). The market is interested in learning about managers' decisions but the manager may also want to glean into stock prices in order to gauge how to market reacts to prospective investments. Stock prices may be used by managers since it conveys information about prospective investment projects and cash flows. In other words, information in stock prices will be utilized by managers in order to make investment decisions since managers will be compensated based on subsequent stock price information. In sum, stock prices indirectly affect managerial investment decisions by imparting two sorts of information: one pertains to investment opportunities and refers to the "prospective" role of stock market prices and the other reflects managers' past decisions and choices and refers to the "retrospective" role of stock market prices. Thus, the capital market has both an informative and monitoring role. Dow and Gorton (1997) further argue that shareholders want managers to learn from the information contained in stock prices and intend to induce them to act this way. Along the same line, Boot and Thakor (1997) and Subrahmanyam and Titman (1999) use the feedback effect to rationalize a firm's choice to issue publicly traded securities, rather than receiving private financing (e.g., from a bank). In these models, public trading allows the firm to infer information from its stock price and use it to improve its real decisions. They show that managers can improve their investment decisions by

observing stock-price movements because stock prices contain information that is aggregated from investors who do not communicate directly with firms. Foucault and Gehrig (2008) extend this reasoning to explain the decision of a firm to cross-list shares in two different markets: Cross-listing enables the firm to obtain more precise information from the stock market and improve the efficiency of its investment decisions.

But one could pose the following question: How could outside investors be more informed than the managers of the firm themselves? According to Grossman (1976) and Hellwig (1980), even though an individual investor may be less informed than the manager, the stock market price reflects the information of a collection of investors who on aggregate may be more informed. Furthermore, managerial decisions do not rely on internal information solely related to the firm, but also on information related to the economic environment, the industry outlook, the firm's competitive position competition among other external sources of information. In fact, Allen (1993) contends that financial markets have become more informative as production processes have become more convoluted. Furthermore, Jegadeesh, Weinstein, and Welch (1993) and Michaely and Shaw (1994) found that outsiders know more than insiders about the value of the firm when it comes to initial public offering (IPO) issuance. Morck, Shleifer, and Vishny (MSV hereafter) (1990) argue that the debates over market efficiency would not be as lively as they are if the stock market did not impact real economic activity. MSV (1990) were the first to formally categorize the possible cases of informativeness of the stock market and its interaction with firms' decision

makers. They introduced four distinct hypotheses related to the informative role of financial markets. The first theory states that the stock market is merely a sideshow and does not play any role in affecting managers' investment decisions. The second theory states that managers rely on the stock market as a source of information when they make investment decisions but that information may or may not be accurate in determining the firm's prospects. The third theory and most probably the most common view of the stock market role states that the stock market affects managers' investment through its influence on the cost of funds and external financing. Finally, the fourth theory states that the stock market affects managers' decisions not because of its informational and financing role but rather due to the fact that managers must adhere to investors' preferences in order to protect their livelihood.

In relation to our empirical analysis, MSV defined the "passive informant" hypothesis which argues that the stock market is merely a sideshow and does not play any important role in allocating investment funds. It says that the firm's decision makers know more than the public about the investment opportunities facing the firm. The market might reflect what market participants think about the firm's investments, but that does not influence managers' decisions. This view portrays the stock market as a sideshow where firm managers do not learn anything from the stock price. The passive informant hypothesis has gained great support since it makes sense to reason that outsiders know less about the firm than insiders. The passive informant hypothesis draws support from the literature on insider trading. Seyhun (1986) shows that insiders make money on trading in their

firms' stock and that they successfully predict their firm's future return which suggests that insiders' knowledge helps them with forecasting their firm's return**.**

Their "accurate active informant" hypothesis states that "the stock market plays a bigger role and that stock prices affect a firm's investment because they convey to managers information which facilitates their decision making process. It argues that security price influence managers' real decisions because some investors trade on private information not available to managers, who therefore rely on stock prices as a source of information. Therefore, according to the active informant hypothesis the stock market is not merely a sideshow but rather plays a greater role in the managerial decision process. MSV further argue that even if the stock market might send inaccurate signal, the information may still be used and so the stock return will influence investment. Their "faulty active informant" argues that managers' decisions about investment are influenced by stock price movements, but managers cannot distinguish between movements reflecting fundamentals and those pertaining to market sentiment."

Corporate managers usually make three vital decisions namely, investment decisions, payout decisions, and financing decisions. Managers undertake investments in the sole purpose of ameliorating the future value of the firm. Since we know that share prices are forward looking and incorporate the information pertaining to the expected value of the firm, one would expect that investment and stock prices to be linked. The financial literature abounds with scholar articles that find a positive relationship between a firm's investment and stock returns. However, there is no absolute consensus that the mentioned relationship is always

positive. Some scholars argue that the link between capital expenditure and stock return often hinge upon the characteristics of the firm in consideration. According to Naran Bhana (2008) "The market responds significantly and positively to capital announcements by focused firms, whereas there is a much weaker response to announcements by diversified companies". Chung, Wright, and Charoenwong (1998) argue that the share price reaction to a company's capital expenditures depends on how that market perceives that specific investment. Some scholars also put forward the argument that stock markets are not always efficient in processing information and may not always reflect the real expected value of the firm. As a result, relying on the stock market prices to make investment decisions might not always be sensible. In fact Bosworth (1975) states that is incomprehensible that managers would base their investment decisions on a very volatile short-lived changes in stock prices. Anderson and Garcia-Feijoo (2002) examine the relationship between capital investment, growth options, and stock returns. They find that stock returns are negatively linked to firm-level investment. More specifically, they find that subsequent monthly returns are significantly lower for firms that have recently accelerated investment spending. On the other hand, there is a vast line of literature which finds that there is appositive relationship between corporate investments and stock market return. McConnell and Muscarella (1985) study the market reaction to capital expenditure decisions by industrial and public utility firms. They find they when firms announce an increase in capital expenditures it's reflected by a positive stock return for industrial firms. They also find that when the firms announce a

decrease in capital expenditure it's reflected by a negative stock return for those firms. Tease (1993) went a step further and decomposed the stock price into speculative and fundamental components and argued that the speculative part does not influence investment decisions. Blanchard, Rhee and Summers (1990) and Chirinko and Schaller (1996) also support the idea that the inefficiencies of the stock market seem not to impact investment.

Titman, Wei, and Xie (2004) argue that stock prices usually respond positively to major corporate investment. However, financing originating from increased investment (issuing equity for instance) leads to a negative stock return (Loughran and Ritter (1995)). They further argue that corporate decisions related to decreased investment (repurchases for instance) usually results in positive stock returns. They also find that firms that increase their investment expenditures they mainly tend to underperform their benchmarks over the following five years**.** Titman, Wei, Xie present an explanation as to why stock returns might react negatively to an increase in investment. They reason that it might be due to the fact the managers usually attempt to justify their investment by embellishing their new business opportunities. However, if the investors do not appreciate those new ventures instigated by the managers, it could be reflected negatively on the stock return. This phenomenon, they argue, could be even more accentuated for managers deemed to be empire builders. In sum, Titman, Wei, and Xie document a negative relationship between capital investment and future stock returns.

Some authors introduced theoretical models relating corporate investment and stock return. For instance, Cochrane (1991, 1996) introduces an asset pricing

model based on aggregate capital investment and shows that it fares as well as the Capital asset pricing model and the Chen, Roll, and Ross (1986) model.

There is also ample evidence that there is a positive relationship between a firm's R&D and stock return (Chan, Martin, and Kensinger 1990; Chan, Lakonishok, and Sougiannis 2001; Chambers, Jennings, and Thompson 2002; Chu 2007; Lin 2007; Li and Liu 2010)). Chan, Martin and Kensinger (1990) found that that there is a positive significant stock market reaction to the announcements of increased R&D expenditures by US firms. Nonetheless, the reaction was found to be negative when it comes to low technology firms, which indicates that the stock market is able to differentiate between good and bad investments and ultimately rewards firms undertaking sensible investments. Li (2011) examines the link between financial constrained firms, R&D investments, and stock returns. He finds that R&D predicts returns only among financially constrained firms. In other words, there is a strong interaction effect between financial constraints, R&D investment, and stock expected returns.

Woolridge and Snow (1990) analyzed the market reaction to different types of investment announcements. They categorized them as joint ventures, R&D, capital expenditure, and product market diversification. They found that there is a positive reaction to each category of investment. They further examined whether the size of the project and its longevity affect that relationship between investment and stock returns. They find that the market does not differentiate between large and small projects, and between long- and short- term projects.

Jennings and Mazzeo (1991) analyze the relation between a firm's stock returns at the announcement of an acquisition and management's subsequent actions. They find that managers' use of market information depends mainly on the private information they possess. Stephens and Weisbach (1998) find that managers rely on their firm's stock performance to determine the number of shares they decide to repurchase. Subrahmanyam and Titman (2001) contend that a company's stock price impacts how the firm is perceived by its customers, suppliers, employees, lenders, and other stakeholders. Moreover, the way the firm is perceived affects their purchase, supply, or investment decisions, which eventually affect the firm's cash flow. Recent studies lend support to this direct feedback from asset prices to asset cash flows.

Accrding to Baker, Stein, and Wurgler (2003) "corporate investment is sensitive to nonfundamental movements in stock prices". They assert that corporate investment and the stock market are positively correlated in both time series and cross-sectional analysis. They reason that the reason behind that positive relation is the fact the stock prices reflect the marginal product. They further specify that that reasoning is mainly based on the relationship between investment and Tobin's Q introduced first by Tobin (1969) and later by Furstenberg (1977). Sunder (2005) provides evidence that financing costs of firms are affected by information spillovers from stock markets and shows that the firms' bank borrowing costs are decreasing in measures of information production in stock markets. In particular, Sunder's paper investigates the value if a firm based on the information spillovers from its publicly traded stock. The concept of

"Information spillover" was first explored by Grossman and Stiglitz (1980) who showed that information produced by informed investors could be communicated to uninformed though stock prices. Along the same line, Allen and Gale (2000) state that stock prices play a significant role in aggregating formation. They contend that when there is uncertainty regarding the optimal action to be taken by firms, financial markets serve as a mechanism for aggregating dispersed beliefs. Aghion, Bolton and Tirole (2000) have examined the interaction between the existence of an informative stock price and the incentives of the initial equity investor to monitor. They found that having an informative stock price improves monitoring incentives. Polk and Sapienza (2009) test how stock market mispricing might influence individual firms' investment decisions. They find that a firm's investment decision is related to the market mis-valuation of the firm. More specifically, they find that a typical change in their mispricing proxy triggers about a two percent change in the company's investment. They further show that the greater the degree of asymmetric information between firms and investors, the more sensitive the firm's investment decisions are sensitive to the stock market mispricing.

Dye and Srydar (2002) state that capital market participants in aggregate may have information pertaining to the firm unknown to the managers of the firm. They examine whether managers utilize the capital market's information in order to make or alter their managerial strategies. They show that managers are able to extract information from the stock market by first making a new strategy available to the public and then observe the market reaction to the announcement of that

strategy. They further show that stock market prices can be used to direct managers' decisions. They further reason that information flows from the stock market to firms because first of all prices in stock markets, like all prices, impact resource allocation decisions. Second, stock market participants are experts in valuation and their success hinges on their accuracy to estimate firms' future decisions. Thus, they conclude that capital markets should therefore possess information not available to managers.

Burton and Seale (2005) delineate the use of market data to monitor insured institutions' risk. They quote Roger W. Ferguson, Jr., Vice Chairman, Board of Governors of the Federal Reserve System who said "*Our examiners are extremely good at what they do, but any good examiner recognizes that data should come from a variety of different sources, including the signals that come from the market. Therefore, market discipline can be an important adjunct to the supervisory process*".

Luo (2005) analyzes 200 mergers and acquisitions (M&As) in the US in the 1990s and finds that merging firms appear to learn from the market during the M&A process by observing how the market reacts to the merger announcement. His study shows that the information contained in stock prices enhances managers' information sets and affects their forward-looking disclosures. It also supports the fact that information flows between firms and capital markets.

Chen, Goldstein & Jiang (2007) state that "two measures of the amount of private information in stock price—price nonsynchronicity and probability of

informed trading (PIN)—have a strong positive effect on the sensitivity of corporate investment to stock price. Moreover, the effect is robust to the inclusion of controls for managerial information and for other information-related variables. The results suggest that firm managers learn from the private information in stock price about their own firms' fundamentals and incorporate this information in the corporate investment decisions". We relate our findings to an alternative explanation for the investment-to-price sensitivity, namely that it is generated by capital constraints, and show that both the learning channel and the alternative channel contribute to this sensitivity.

Behaviorists link competition and behavioral consequences. Going all the way back to Triplett (1898) who documented a link between competition and task performance and that rivalry is a powerful psychological phenomenon with substantial behavioral consequences Kilduff, Elfenbein, and Staw (2010) state that "they believe that rivalry may have a range of important consequences for the attitudes, decisions, and behaviors of competitors. A number of studies have linked competition to enhanced motivation (Mulvey and Ribbens (1999) and Tauer and Harackiewicz (2004)) and task performance (Erev et al. (1993), Brown et al. (1998), and Tauer amd Harackiewicz (2004))".

The way decision makers perceive their market environment (their competitors) and the firm's prospective delineate their corporate strategy which in turn affects the performance of the firm and the market in which it operates. The relations between the firm and its market environment lie at the intersection

between the field of industrial organization which is a branch of economics and the field of organizational behavior and administration. (Caves)

Going all the way back to Smith (1776) who stated that "Monoply is a great enemy to good management", scholars such as Alchian (1950) and Stigler (1958) have argued that competition in the product market is a powerful mechanism ensuring that management does not waste corporate resources.

There is a growing literature which examines the relationship between product market competition, managerial incentives alignment, and efficiency. Caves and Barton (1990) and Caves (1992) find that above a certain level of industry concentration, technical efficiency is reduced. Nickell, Nicolitsas and Dryden (1997) observe that UK firms that face more competition also face higher levels of productivity growth. Raith (2003) shows that stronger competition implies better alignment of manager's incentives. Fabrizio et al. (2010) find that the utilities deregulation in the U.S. has made utilities firms more productive.

Economists argue that managers of firms in competitive industries have strong incentives to reduce slack and maximize profits (Giroud and Mueller (2010)). The empirical literature concludes that competition induces better corporate governance which in turn aligns managers' and shareholders' interests. In fact, the "quiet life" hypothesis which was originally formulated by Sir John Hick in 1935 argues that managers in non-competitive industries tend to enjoy a quiet life which can lead to managerial slack, while managers in competitive industries are constantly under pressure and are prone to improve efficiency. As

Sir John Hicks put it "the best of all monopoly profits is a quiet life". Hart (1983) shows that competition mitigates managerial slack. Holmstrom (1982) and Nalebuff and Stiglitz (1983) demonstrate that an increase in the number of competitors may provide additional information that can be used to mitigate moral hazard. Schmidt (1997) shows that competition increases the probability that a firm with high costs becomes unprofitable and must be liquidated, which induces managers to work hard in order to keep their jobs and avoid the likelihood of liquidation. Allen and Gale (2000) argue that product market competition provides corporate managers with incentives to behave efficiently because competition forces out incompetent managers. They go even further and contend that product market competition may be a more effective corporate governance mechanism than either the market for corporate control or monitoring by institutions. Bertrand and Mullainathan (2003) and Giroud and Mueller (2010) find evidence supporting the predictions of the "quiet life" hypothesis, namely that managers in concentrated industries avoid difficult tasks such as firing employees, negotiating with employees over salaries, or negotiating with suppliers over prices of inputs. Chhaochharia, Grinstein, Grullon, Michaely (2012) attain results that reinforce the "quiet life" hypothesis in that managers in concentrated industries decrease slack more than managers in non-concentrated industries.

It has been documented that the efficiency of corporate investments is influenced by problems of asymmetric information and agency. By inquiring about their own stock price movements and the one of their peers, managers

might mitigate the asymmetric information and hence improve their investment efficiency. Stein in his 2009 JF presidential address states there might be a link between competition and the financial market efficiency. In fact, there is a growing literature which examines the relationship between product market competition, managerial incentives alignment, and efficiency. Caves and Barton (1990) and Caves (1992) find that above a certain level of industry concentration, technical efficiency is reduced. Nickell, Nicolitsas and Dryden (1997) observe that UK firms that face more competition also face higher levels of productivity growth. Raith (2003) shows that stronger competition implies better alignment of manager's incentives. Fabrizio et al. (2010) find that the utilities deregulation in the U.S. has made utilities firms more productive. Shleifer and Vishny (1997) note that "product market competition is probably the most powerful force towards economic efficiency in the world". Schmidt (1997) shows that competition increases the probability that a firm with high costs becomes unprofitable and must be liquidated, which induces managers to work hard in order to keep their jobs and avoid the likelihood of liquidation. Hart (1983) shows that competition mitigates managerial slack. Holmstrom (1982) and Nalebuff and Stiglitz (1983) demonstrate that an increase in the number of competitors may provide additional information that can be used to mitigate moral hazard. Allen and Gale (2000) argue that product market competition provides corporate managers with incentives to behave efficiently because competition forces out incompetent managers.

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Griffith (2001) shows that product market competition results in a better productivity, especially among those firms in which managers have conflicts of interest. Giroud and mueller (2012) investigate the interaction between product market competition and firms' payout policy. They find that firms in more competitive industries pay more dividends than firms in less competitive industries. Their empirical findings reinforce the idea that product market competition pushes managers to pay out excess cash and therefore induces managers to behave in a more efficient manner. Bloom, Propper, Seiler, and Van Reenan (2010) investigate the relationship of competition on management quality, and find that competition in an effective way of improving management.

Stoughton, Wong, Li (2013) provide a series of empirical tests in order to investigate the relationship between competition and investment efficiency. Their findings lend support to the notion that shows that investment is more efficient in concentrated industries.

Dougal, Parsons, and Titman (2012) show that a company's investment is highly sensitive to the investments of other companies located nearby. They further show that even after controlling for its own Q and cash flows, a company's investment is strongly related to the Q and cash flows of nearby firms operating outside its industry. The authors state that "these time-varying regional effects are large and indicate that local agglomeration economies are important determinants of firm investment and growth". In sum, Dougal et al. (2012) find that investment expenditures depend on the geographic location of the firm and its proximity to peer firms and even firms operating in different industries. Fracassi (2011) investigates the relationship between a firm managers' professional network and its corresponding managerial decisions. He states that "Social network theory suggests that individual's preferences and decisions are affected by the actions of others". He finds that the more social connections two firms have in common, the more similar is their level of investment. Gilbert and Lieberman (1987) show that firm's take preemptive actions in order to counter the competitions from rivals and maintain market share. Their analysis further indicates that investment reduces the likelihood that competitors will increase their market share.

Predation risk is defined as the risk a firm faces from the actions of its rivals. It has been shown that predation risk in the product market can affect a firm's financial decisions significantly. Froot, Scharfstein, and Stein (1993) argue that predation risk is linked to the interaction of a company's investment opportunities with that of its competitors. Several recent papers study how product market competition affects a firm's financial policy. Recent empirical studies find that higher predatory threats lead to higher level of cash holdings, lower dividend payments, and more hedging Haushalter, Klasa, Maxwell (2007) investigate whether a firm facing higher competition (or a predation risk) from its rivals faces a risk of incurring losses in market share and whether the firm manages that specific risk. They find that the firm's investment opportunities are dependent on the level of competition it faces from its peers. Thus, they show that predation risk in an important factor which affects a firm's investment choices. Hoberg, Phillips, and Prabhala (2013) were able to come up with a new measure coined "fluidity" which reflects the similarity between a firm's product characteristics and the product market threat it faces from its rivals. They investigate the relationship between product market threats and a firm's payout policy and cash holdings. They find that the higher fluidity or the threat a firm faces, the lower the likelihood that a firm pays dividends and repurchase shares. They also find that the product market threat is accompanied by a firm's increase in cash holding. Leary and Roberts (2010) show that firms do not make financing decisions in isolation. They argue that firms makes financing decisions mainly in response to the financing decisions of competitors. They further find that smaller

and less successful firms tend to change their financing decisions in response to larger and more successful rivals. Fresard and Foucault (2012) show that there is a link between a firm's investment and the stock price of its peers. More specifically, they document that a firm's investment is positively related to the stock prices of peer firms that sell related products. They provide evidence that this connection arises because managers can learn information from observing the stock price of their peers. In Sum, their results prove that financial markets affect firm's managerial decisions by imparting important to the decision makers by conveying information contained in the stock market price movements of their peers. Fresard and Valta (2013) examine the effect of trade globalization and competition on U.S. firms' investments. The find that when firms face more competition they tend to pursue more conservative investment choices. More specifically, those firms tend to reduce capital and R&D expenditures and increase their cash holding. Ferreira, Ferreira, and Raposo (2008) investigate the relationship between board structure and price informativeness. They find a negative relationship between price informativeness and board independence. They use the probability of informed trading (PIN) as a measure of stock price informativeness. Their results reinforce the idea that stock price information and board monitoring can substitute each other.

According to Fresard (2010), "several studies document that corporate decisions are materially affected by the informational content of security prices. In particular, Durnev, Morck and Yeung (2004) show that firms invest more efficiently when their stock price incorporates a larger amount of private

information. Chen, Goldstein, and Jiang (2007) report that corporate investment is more sensitive to stock price when prices are more informative. They interpret this result as evidence that managers extract valuable information from observing their stock price, and use this information when deciding on corporate investment". In this paper, we push the logic a step further and include the element of threat in order to categorize firms in terms of the level of threat they face from their peers.

Going all the way back to Triplett (1898), many scholars have documented a link between competition and task performance and that rivalry is a powerful psychological phenomenon with substantial behavioral consequences. Kilduff, Elfenbein, and Staw (2010) state that "they believe that rivalry may have a range of important consequences for the attitudes, decisions, and behaviors of competitors. A number of studies have linked competition to enhanced motivation (Mulvey and Ribbens (1999) and Tauer and Harackiewicz (2004)) and task performance (Erev et al. (1993), Brown et al. (1998), and Tauer amd Harackiewicz (2004))". Product market competition makes managers work more efficiently. Hart (1983) shows that competition mitigates managerial slack. Holmstrom (1982) and Nalebuff and Stiglitz (1983) demonstrate that an increase in the number of competitors may provide additional information that can be used to mitigate moral hazard. Allen and Gale (2000) argue that product market competition provides corporate managers with incentives to behave efficiently because competition forces out incompetent manager.

We rationalize that managers of a firm facing a higher product market threat from its peers should learn even more from their corresponding firm's stock price movement s compared with less threatened firms. The logic is quite simple: a manager of a firm facing a threat recognizes that his/her company is facing a fierce competition and is desperately looking for information from investors in order to mitigate the threat. One way of mitigating the threat is by looking for additional information pertaining to his/her firm in order to make more sensible managerial decisions. Given the fact the competition induces managers to work more efficiently; it will be reflected n managers gleaning further over their stock price movements. According to Atkins (2012), "competition in the equity markets is analogous to competition over sales in the product markets (Holden and Subrahmanyam 1992). In product markets, firms with monopoly power over product sales extract rents from consumers; more competition between firms over product sales reduces this exploitation (Samuelson and Nordhaus 2009). In equity markets, informed traders with monopoly power over private information extract rents by trading against less informed traders (e.g., liquidity traders). More competition between informed traders over private information reduces market inefficiency".

The logic used in the first hypothesis could be extended to the case where a manager of a firm learns from the stock price movements of its peers. Hoberg, Phillips, and Prabhala (2013) were able to come up with a new measure coined "fluidity" which reflects the similarity between a firm's product characteristics and the product market threat it faces from its rivals. They investigate the

relationship between product market threats and a firm's payout policy and cash holdings. They find that the higher fluidity or the threat a firm faces, the lower the likelihood that a firm pays dividends and repurchase shares. They also find that the product market threat is accompanied by a firm's increase in cash holding. They argue that firms makes financing decisions mainly in response to the financing decisions of competitors. They further find that smaller and less successful firms tend to change their financing decisions in response to larger and more successful rivals. In Sum, their results prove that financial markets affect firm's managerial decisions by imparting important to the decision makers by conveying information contained in the stock market price movements of their peers. Foucault and Fresard (2012) show that there is a link between a firm's investment and the stock price of its peers. More specifically, they document that a firm's investment is positively related to the stock prices of peer firms that sell related products. They provide evidence that this connection arises because managers can learn information from observing the stock price of their peers. We postulate that the link found by Foucault and Fresard (2012) should be more pronounced for a firm facing a threat from its peers. In particular, we rationalize that a manager of a threatened firm should learn even further from the stock price of his/her peers' stock price movements in order to address the threat faced by his/her firm. Leary and Roberts (2010) find that smaller and less successful firms are more likely to adjust their capital structures and financial policies in response to the actions of their larger, more successful peers.

CHAPTER 3

Hypotheses Development

Empirically, several studies document that corporate decisions are materially affected by the informational content of security prices. In particular, Durnev, Morck and Yeung (2004) show that firms invest more efficiently when their stock price incorporates a larger amount of private information. Chen, Goldstein, and Jiang (2007) report that corporate investment is more sensitive to stock price when prices are more informative. They interpret this result as evidence that managers extract valuable information from observing their stock price, and use this information when deciding on corporate investment. In this paper, we push the logic a step further and include the element of threat in order to categorize firms in terms of the level of threat they face from their peers.

Going all the way back to Triplett (1898), many scholars have documented a link between competition and task performance and that rivalry is a powerful psychological phenomenon with substantial behavioral consequences. Kilduff, Elfenbein, and Staw (2010) state that they "believe that rivalry may have a range of important consequences for the attitudes, decisions, and behaviors of competitors". They also add that " a number of studies have linked competition to enhanced motivation (Mulvey and Ribbens (1999) and Tauer and Harackiewicz (2004)) and task performance (Erev et al. (1993), Brown et al. (1998), and Tauer amd Harackiewicz (2004))". Product market competition makes managers work

more efficiently. Hart (1983) shows that competition mitigates managerial slack. Holmstrom (1982) and Nalebuff and Stiglitz (1983) demonstrate that an increase in the number of competitors may provide additional information that can be used to mitigate moral hazard. Allen and Gale (2000) argue that product market competition provides corporate managers with incentives to behave efficiently because competition forces out incompetent manager.

We rationalize that managers of a firm facing a higher product market threat from its peers should learn even more from their corresponding firm's stock price movement s compared with less threatened firms. The logic is quite simple: a manager of a firm facing a threat recognizes that his/her company is facing a fierce competition and is desperately looking for information from investors in order to mitigate the threat. One way of mitigating the threat is by looking for additional information pertaining to his/her firm in order to make more sensible managerial decisions. Given the fact the competition induces managers to work more efficiently; it will be reflected n managers gleaning further over their stock price movements. This logic leads us to the following hypothesis:

Hypothesis 1: Managers of firms facing a higher threat from their peers are more sensitive to the information in their stock price movements compared to less threatened firms.

The logic used in the first hypothesis could be extended to the case where a manager of a firm learns from the stock price movements of its peers. Hoberg, Phillips, and Prabhala (2013) were able to come up with a new measure coined

"fluidity" which reflects the similarity between a firm's product characteristics and the product market threat it faces from its rivals. They investigate the relationship between product market threats and a firm's payout policy and cash holdings. They find that the higher fluidity or the threat a firm faces, the lower the likelihood that a firm pays dividends and repurchase shares. They also find that the product market threat is accompanied by a firm's increase in cash holding. They argue that firms makes financing decisions mainly in response to the financing decisions of competitors. They further find that smaller and less successful firms tend to change their financing decisions in response to larger and more successful rivals. In Sum, their results prove that financial markets affect firm's managerial decisions by imparting important to the decision makers by conveying information contained in the stock market price movements of their peers. Foucault and Fresard (2012) show that there is a link between a firm's investment and the stock price of its peers. More specifically, they document that a firm's investment is positively related to the stock prices of peer firms that sell related products. They provide evidence that this connection arises because managers can learn information from observing the stock price of their peers. We postulate that the link found by Foucault and Fresard (2012) should be more pronounced for a firm facing a threat from its peers. In particular, we rationalize that a manager of a threatened firm should learn even further from the stock price of his/her peers' stock price movements in order to address the threat faced by his/her firm. Hence, the following hypothesis:

Hypothesis 2: Managers of firms facing a higher threat from their peers are more sensitive to the information contained in their peers' stock price compared to less threatened firms

CHAPTER 4

DATA

Text-based Network Industry Classification (TNIC) Data

To define a firm's peers, I use the new Text-based Network Industry Classification (TNIC) developed by Hoberg and Phillips (2010). According to the authors, "this classification is based on text-based analysis of product descriptions from firms'10-K statements filed yearly with the Securities and Exchange Commission (SEC). They define as peers all the firms that belong to the same TNIC industry in a given year. Their data covers the 1997 to 2008 period. Hoberg and Phillips (2010)'s TNIC industries have three important features. First, unlike industries based on the Standard Industry Classification (SIC) or the North American Industry Classification System (NAICS), they are dynamic as they change over time as firms' products evolve. In particular, when a firm modifies its product range, innovate, or enter a new product market, the set of peer firms change accordingly. Second, TNIC industries are based on the products that firms supply to the market, rather than its production processes as, for instance, is the case for NAICS. Third, unlike SIC and NAICS industries, TNIC industries do not require relations between firms to be transitive. In fact, as industry members are defined relative to each firm in the product space, each firm has its own distinct set of similar firms. This provides a richer definition of similarity and product market relatedness."

Final Sample

I obtain Investments and accounting data from the annual Compustat industrial files. This data constitutes a sample that covers the period 1996-2008. I exclude firm-year observations for which total assets are missing. Stock price and return information are from CRSP. After merging the CRSP with the Compustat data and after deleting the top and bottom 1% of the regression variables, the sample comprises 29,860 firm-years observations. Table 2 describes our samples. Panel A presents the TNIC sample from Hoberg and Philips (2012), the Threat sample from Hoberg, Philips, and Prabhala (2013), COMPUSTAT sample , Adjusted probability of informed trading APIN sample from Duarte and Young (2007), and our Final Sample which is obtained by merging all the data sample mentioned previously. Panel B presents the descriptive statistics of the main variable of our final sample used in our analysis which include the Threat, Q (defined as market value of equity plus book value of assets minus book value of divided by book value of assets), APIN (the adjusted probability of informed trading), and investment INV (defined as Capital expenditure plus R&D scaled by beginning-of-year assets).

Table 2 presents the descriptive statistics of our sample. Panel A presents the samples utilized in order to reach our final sample. We start with the text-based network industry classifications (TNIC) sample used in Hoberg and Philips (2012) which was obtained by using web crawling and text parsing algorithms and therefore by constructing a database of word business descriptions from 10-K annual listings on the SEC Edgar website from 1996 to 2008. The sample gives us

a dynamic list of a firm's peers during a each year. The TNIC sample is constituted of 99,592 firm year observations. The Threat sample is obtained from Hoberg, Phillips, and Prabhala (2013) and introduces a measure of the product market threat faced by firms covering the period 1996-2008. The Threat sample is comprised of 65,535 firm year observations. We merged the two samples by PERMNO in order to get our preliminary sample. The COMPUSTAT sample covers all the firms contained in our preliminary sample which are covered by COMPUSTAT. The APIN sample is obtained from Duarte and Young (2007) and presents the adjusted probability of informed trading better captures the informational component of probability of informed trading (PIN). The APIN sample is comprised of 48,294 firm year observations. Finally, our sample is obtained by merging the COMPUSTAT sample with the APIN sample and is comprised of 44,716 firm year observations. Panel B presents the descriptive statistics of the main variable of our final sample used in our analysis which include the Threat, Q (defined as market value of equity plus book value of assets minus book value of divided by book value of assets), APIN (the adjusted probability of informed trading), and investment INV (defined as Capital expenditure plus R&D scaled by beginning-of-year assets). Then average threat is 6.9516 with a standard deviation of 3.395 and a maximum of 27.262. Q ratio has a mean of 1.9513 with a standard deviation of 1.504 and a maximum value of 59.126. The adjusted PIN (APIN) has a mean of 0.1393, a standard deviation of 0.068, and a maximum value of 0.698. Finally, investment (INV) has a mean of

0.0626 billion dollars, a standard deviation of 0.196 billion, and a maximum value of 6.065 billion.

CHAPTER 5

METHODOLOGY

Herfindahl-Index

Testing our hypothesis requires a proxy for the degree of competition. In order to measure the level of threat a firm is facing, we use the widely accepted measure of competitiveness, the Herfindahl-Hirschman index, which is according to Wikipedia is "better known as the Herfindahl index, named after economists Orris C. Herfindahl and Albert O. Hirschman. The HHI is a statistical measure of concentration which measures the size of firms in relation to the industry. In other words, the HHI accounts for the number of firms in a market, as well as concentration, by incorporating the relative size (that is, market share) of all firms in a market. Following Wikipedia, it is calculated by squaring the market shares of all firms in a market and then summing the squares, as follows:

$$H = \sum_{i=1}^{N} s_i^2 \qquad (1)$$

Where s_i is the market share of firm i in the market, and N is the number of firms. There is also a normalised Herfindahl index. Whereas the Herfindahl index ranges from 1/N to one, the normalized Herfindahl index ranges from 0 to 1. It is computed as:

$$H^* = \frac{(H - 1/N)}{1 - 1/N} \qquad (2)$$

where again, N is the number of firms in the market, and H is the usual Herfindahl Index, as above."

Bayes' prior

According to F. J. Anscombe, J.R.S.S., 25 (1962) "There are several paradigms for approaching statistical inference, but the two dominant ones are frequentist (sometimes called classical or traditional) and Bayesian. The overview in the previous chapter covered mainly classical approaches. According to the Bayesian paradigm, the unobservable parameters in a statistical model are treated as random. When no data are available, a prior distribution is used to quantify our knowledge about the parameter. When data are available, we can update our prior knowledge using the conditional distribution of parameters, given the data. The transition from the prior to the posterior is possible via the Bayes theorem.

The central piece of Bayes' rule describes how rational agents update their beliefs after receiving new information. Suppose that before the experiment our prior distribution describing θ is π(θ). The data are coming from the assumed model (likelihood) which depends on the parameter and is denoted by $f(x|\ \theta)$*:* Bayes theorem updates the prior π(θ) to the posterior by accounting for the data *x*,

$$\pi\ (\theta \mid x) = \frac{f(x|\theta)\pi(\theta)}{m(x)} \qquad (3)$$

where $m(x)$ is a normalizing constant, $m(x) = \int f(x|\theta)\pi(\theta)\,\mathrm{d}\,\theta$

Once the data *x* are knows, θ is the only unknown quantity and the posterior distribution π(θ |x) completely describes the uncertainty. There are two key advantages of Bayesian paradigm: (i) once the uncertainty is expressed via the probability distribution and the statistical inference can be automated, it follows a conceptually simple recipe, and (ii) available prior information is coherently incorporated into the statistical model"

Measure of informed trading (R^2)

In order to test our first hypotheses, I divide our sample into quintiles based on the herfindahl index measure. To examine whether a firm's managers are sensitive to the stock informativeness in its stock, I follow Chen, Goldstein, Jiang (2007) and perform the following equation for each fluidity group:

$$I_{i,t} = \alpha_i + \eta_i + \beta_1 Q_{i,t-1} + \beta_2 INFO_{i,t-1} Q_{i,t-1} + \gamma CONTROL + \varepsilon_{i,t} \quad (4)$$

Where $I_{i,t}$ is firm's i investment in year t, α_i and $\eta_i$represent year and firm-fixed effects. $Q_{i,t-1}$ is the (normalized) price in our analysis and is measured by firm´s Q. It is calculated as the market value of equity (price times shares outstanding from CRSP) plus book value of assets minus the book value of equity (Item 6– Item 60), scaled by book assets, all measured at the end of year

t - 1. $INFO_{i,t-1}$ is a measure of the private information in stock price and is obtained by following Roll (1988) as

$$INFO_{i,t-1} = 1 - {R_{i,t}}^2 \quad (5)$$

Where ${R_{i,t}}^2$ are estimated each year from the following regression:

$$r_{i.j.t} = \alpha_i + \beta_{i,m} r_{m,t} + \beta_{i.j} r_{j,t} + \varepsilon_{i,t} \quad (6)$$

Where $r_{i.j.t}$ is the weekly return of firm i in industry j at time t, $r_{m,t}$ is the market return at time t, and $r_{j,t}$ is the return of industry j at time t.

The rationale for using firm-specific return variation is based on a large body of literature, both empirical and theoretical. French and Roll (1986) and Roll (1988) were the first to show that a significant portion of stock return variation is not explained by market movements. On this ground, Roll (1988) argues that firm-specific return variation has to be correlated with private information. Indeed, stock prices move with the arrival of new information, which gets impounded into prices in two ways. The first one occurs through a revaluation of prices following the release of public information, e.g. news on macroeconomic conditions or earnings announcements. The second is through the trading activity of investors who possess private information.

In order to test our first hypotheses using the threat measure, I divide the provided by university of Maryland website and which gives us into quintiles based on the measure of fluidity. To examine whether a firm's managers are sensitive to the stock informativeness in its stock, I follow Chen, Goldstein, Jiang (2007) and perform the following equation for each fluidity group:

$$I_{i,t} = \alpha_i + \eta_i + \beta_1 Q_{i,t-1} + \beta_2 INFO_{i,t-1} Q_{i,t-1} + \gamma CONTROL + \varepsilon_{i,t} \quad (7)$$

Where $I_{i,t}$ is firm's i investment in year t, α_i and $\eta_i$represent year and firm-fixed effects. $Q_{i,t-1}$ is the (normalized) price in our analysis and is measured by firm´s Q. It is calculated as the market value of equity (price times shares outstanding

from CRSP) plus book value of assets minus the book value of equity (Item 6– Item 60), scaled by book assets, all measured at the end of year t - 1. $INFO_{i,t-1}$ is a measure of the private information in stock price and is obtained by following Roll (1988) as

$$INFO_{i,t-1} = 1 - {R_{i,t}}^2 \quad (8)$$

Where ${R_{i,t}}^2$ are estimated each year from the following regression:

$$r_{i.j.t} = \alpha_i + \beta_{i,m} r_{m,t} + \beta_{i.j} r_{j,t} + \varepsilon_{i,t} \quad (9)$$

Where $r_{i.j.t}$ is the weekly return of firm i in industry j at time t, $r_{m,t}$ is the market return at time t, and $r_{j,t}$ is the return of industry j at time t.

The rationale for using firm-specific return variation is based on a large body of literature, both empirical and theoretical. French and Roll (1986) and Roll (1988) were the first to show that a significant portion of stock return variation is not explained by market movements. On this ground, Roll (1988) argues that firm-specific return variation has to be correlated with private information. Indeed, stock prices move with the arrival of new information, which gets impounded into prices in two ways. The first one occurs through a revaluation of prices following the release of public information, e.g. news on macroeconomic conditions or earnings announcements. The second is through the trading activity of investors who possess private information.

Probability of Informed Trading

We also use the PIN measure developed by Easley, Kiefer, and O.Hara (1996) as another proxy for the likelihood of informed trading in a stock. It is used in a context related to ours by Chen, Goldstein, and Jiang (2007) and Bakke and Whited (2010). In our tests, we use an adjusted measure of PIN, developed by Duarte and Young (2007), which better captures the informational component of PIN.

Our regression in equation (1) includes the following control variables: 1/ASSETSi,t-1, CFi,t, INFOit-1 ,and INFOit-1.CFi,t. We include 1/ASSETSi,t-1 because both the dependent variable Iit and the regressor Qi,t-1 are scaled by last-year book assets (ASSETSi,t-1), which could introduce spurious correlation. Cash flow CFi,t is included both separately and in interaction with INFOit_1 to accommodate the well-documented effect of cash flow on investment [e.g., Fazzari, Hubbard, and Petersen (1988)]. We measure CFit as the sum of net income before extraordinary items (Item 18), depreciation and amortization expenses (Item 14), and R&D expenses (Item 46), scaled by beginning-of-year book assets.

In order to test our second hypothesis, I use the sample provided by Hoberg and Phillips (2010) to identify a firm's peers and then divide the sample into quintiles following the same method used in testing the first hypothesis. I follow Foucault and Fresard (2012) and test empirically the following equation:

$$I_{i.t} = \alpha_i + \delta_t + \beta Q_{i,t-1} + \eta Q_{-i,t-1} + \gamma \boldsymbol{X}_{i,t-1} + \varphi \boldsymbol{X}_{-i,t-1} + \varepsilon_{i,t}\,, \qquad (10)$$

where the subscripts i and t represent respectively firm I and and the year, while the subscript -i represents a (equally-weighted) portfolio of peer firms based on

the TNIC industries). The dependent variable $I_{i.t}$ is a measure of corporate investment in year t, which in the baseline specification, is the ratio of capital expenditure in that year scaled by lagged fixed assets (property, plant and equipment). The variable, $Q_{i,t-1}$, is the normalized stock price of firm i in year t-1. The variable, $Q_{-i,t-1}$, is the (average) normalized stock price of firm I's peers, computed as the average Q across all the firms included in the same TNIC industry as firm i in year t - 1, except firm i. $\boldsymbol{X}_{i,t-1}$ and $\boldsymbol{X}_{-i,t-1}$ are the control variables for firm i and its peers respectively and comprise cash flow and size of the firm and its peers.

As in the regression in equation (1), we follow other papers Durnev, Morck, and Yeung (2004) and Chen, Goldstein, and Jiang (2007) in order to measure the informativeness of a firm stock price with a measure of firm-specific return variation (or price non-synchronicity).To test the model's predictions, we need to measure the effect of on the co-variation between investment and stock prices, while holding constant the information pertaining to the firm's peers (and vice versa).

Heckman Correction

In order to investigate whether our regressions suffer from a sample selection bias, we use the Heckman correction which, according to Wikipedia, "consists of a two-step statistical approach and offers a means of correcting for non-randomly selected samples. Heckman discussed bias from using nonrandom selected samples to estimate behavioral relationships as a specification error. He

suggests a two-stage estimation method to correct the bias. Heckman's correction involves a normality assumption, provides a test for sample selection bias and formula for bias corrected model.

In the first stage, we formulate a model, based on economic theory, for the probability of working." According to Wikipedia," the canonical specification for this relationship is a probit regression of the form

$$\text{Prob}(D = 1|Z) = \Phi(Z\gamma), \tag{11}$$

where D indicates employment ($D = 1$ if the respondent is employed and $D = 0$ otherwise), Z is a vector of explanatory variables, γ is a vector of unknown parameters, and Φ is the cumulative distribution function of the standard normal distribution. Estimation of the model yields results that can be used to predict this employment probability for each individual.

In the second stage, the researcher corrects for self-selection by incorporating a transformation of these predicted individual probabilities as an additional explanatory variable. The wage equation may be specified,

$$w^* = X\beta + u \tag{12}$$

where w^* denotes an underlying wage offer, which is not observed if the respondent does not work. The conditional expectation of wages given the person works is then

$$E[w|X, D = 1] = X\beta + E[u|X, D = 1]. \quad (13)$$

Under the assumption that the error terms are jointly normal, we have

$$E[w|X, D = 1] = X\beta + \rho\sigma_u\lambda(Z\gamma), \quad (14)$$

where ρ is the correlation between unobserved determinants of propensity to work $\varepsilon$and unobserved determinants of wage offers *u*, σ_u is the standard deviation of u, and $\lambda$is the inverse Mills ratio evaluated at $Z\gamma$. This equation demonstrates Heckman's insight that sample selection can be viewed as a form of omitted-variables bias, as conditional on both *X* and on λit is as if the sample is randomly selected. The wage equation can be estimated by replacing $\gamma$with Probit estimates from the first stage, constructing the λterm, and including it as an additional explanatory variable in linear regression estimation of the wage equation. Since $\sigma_u > 0$, the coefficient on λcan only be zero if $\rho = 0$, so testing the null that the coefficient on $\lambda$is zero is equivalent to testing for sample selectivity."

Product Market Threat

Following Hoberg and Fresard In order to test our first hypotheses, I divide the sample provided by Hoberg and Phillips (2012)'s into quintiles based on the measure of fluidity. To examine whether a firm's managers are sensitive to the stock informativeness in its stock, I follow Chen, Goldstein, Jiang (2007) and perform the following equation for each fluidity group:

$$I_{i,t} = \alpha_i + \eta_i + \beta_1 Q_{i,t-1} + \beta_2 PIN_{i,t-1}Q_{i,t-1} + \gamma CONTROL + \varepsilon_{i,t} \quad (15)$$

Where $I_{i,t}$ is firm's i investment in year t, α_i and $\eta_i$represent year and firm-fixed effects. $Q_{i,t-1}$ is the (normalized) price in our analysis and is measured by firm´s Q. It is calculated as the market value of equity (price times shares outstanding from CRSP) plus book value of assets minus the book value of equity (Item 6– Item 60), scaled by book assets, all measured at the end of year t - 1.

We use the adjusted probability of informed trading APIN developed by Duarte and Young (2007) as a proxy for the likelihood of informed trading in a stock. It is used in a context related to ours by Chen, Goldstein, and Jiang (2007), Bakke and Whited (2010), and Fresard and Foucault (2012).(Please see Appendix 1 for more details)

Our regression in equation (1) includes the following control variables: 1/ASSETSi,t-1, CFi,t, INFOit-1 ,and INFOit-1.CFi,t. We include 1/ASSETSi,t-1 because both the dependent variable Iit and the regressor Qi,t-1 are scaled by last-year book assets (ASSETSi,t-1), which could introduce spurious correlation. Cash flow CFi,t is included both separately and in interaction with INFOit_1 to accommodate the well-documented effect of cash flow on investment [e.g., Fazzari, Hubbard, and Petersen (1988)]. We measure CFit as the sum of net income before extraordinary items (Item 18), depreciation and amortization expenses (Item 14), and R&D expenses (Item 46), scaled by beginning-of-year book assets.

In order to test our second hypothesis, I use the sample provided by Hoberg and Phillips (2010) to identify a firm's peers and then divide the sample

into quintiles following the same method used in testing the first hypothesis. I follow Foucault and Fresard (2012) and test empirically the following equation:

$$I_{i.t} = \alpha_i + \delta_t + \eta Q_{-i,t-1} + \mu PIN_{-i,t-1} + \beta PIN_{-i,t-1} Q_{-i,t-1} + \varphi \boldsymbol{X}_{i,t-1} + \varepsilon_{i,t}, \quad (16)$$

where the subscripts i and t represent respectively firm i and and the year, while the subscript -i represents a (equally-weighted) portfolio of peer firms based on the TNIC industries). The dependent variable $I_{i.t}$ is a measure of corporate investment in year t, which in the baseline specification, is the ratio of capital expenditure in that year scaled by lagged fixed assets (property, plant and equipment). The variable, $Q_{-i,t-1}$, is the normalized stock price of firm i's peers, computed as the average Q across all the firms included in the same TNIC industry as firm i in year t - 1, except firm i. $\boldsymbol{X}_{i,t-1}$ is the control variable for firm i and comprise cash flow and size of the firm. $PIN_{-i,t-1}$ is the probability of informed trading of firm i's peer firms.

As in the regression in equation (1), we follow other papers Durnev, Morck, and Yeung (2004) and Chen, Goldstein, and Jiang (2007) in order to measure the informativeness of a firm stock price with a measure of firm-specific return variation (or price non-synchronicity).To test the model's predictions, we need to measure the effect of on the co-variation between investment and stock prices, while holding constant the informationpertaining to the firm's peers (and vice versa).

Fluidity Measure

The notion that rival threats are important, perhaps even more so than static measures of market share, is consistent with theories of contestable markets in industrial organization (Baumol, Panzar, and Willig (1982)). In order to gauge the level of threat faced by a firm, I utilize a measure introduced by Philips, Hoberg, and Prabhala (2013) coined "Fluidity". According to the authors, "they use computational linguistics to analyze over 42,000 individual firm business descriptions from firm 10-Ks to construct new measures of the structure and evolution of the product space occupied by firms. These measures include product fluidity, a new measure of the competitive threats faced by a firm in its product market, which captures changes in rival firms' products relative to the firm. More specifically, fluidity captures how rivals are changing the product words that overlap with firm i's vocabulary. Fluidity focuses on product space dynamics and changes in products. Specifically, let J_t denote a scalar equal to the number of all unique words used in the product descriptions of all firms in year t. Let W_{it} denote an ordered Boolean vector of length J_t identifying which of the J_t words are used by firm i in year t. Element j of W_{it} equals 1 if firm i uses word j in its product description and is zero otherwise. They normalize W_{it} to unit length and define the result is $N_{i,t}$.

To capture the changes in the overall usage of a given word j in year t, they define the aggregate vector $D_{t-1,t}$ as:

$$D_{t-1,t} = \left| \sum_j (W_{j,t} - W_{j,t-1}) \right| \quad (17)$$

So a firm's product market fluidity is simply the dot product between its own word vector $N_{i,t}$ and normalized $D_{t-1,t}$:

$$Product\ Market\ Fluidity_i = < N_{i,t} \ . \ \frac{D_{t-1,t}}{|D_{t-1,t}|} > \quad (18)$$

Intuitively, fluidity is a "cosine" similarity between a firm's own word usage $N_{i,t}$ vector and the aggregate change vector $D_{t-1,t}$. Quantitatively, the dot product in Eq. (2) measures the cosine of the angle between the two vectors. Because the dot product is based on non-negative vectors, fluidity is thus the cosine between vectors in the first quadrant. Thus fluidity lies in the interval [0; 1]. Fluidity is greater when a firm's words overlap more with $D_{t-1,t}$, the vector that reflects rival actions. Thus it is larger when there is a greater competitive threat."

Probability of Informed Trading (PIN)

Accrding to Fresard (2010) "The probability of information-based trading (*PIN*) was developed by Easley, Kiefer and O'Hara (1996). This measure is based on the estimation of a structural microstructure model, where trades may come from "noise traders" or "informed traders". Je also add that "it has been shown empirically that *PIN* is a valid measure of price informativeness. Vega (2006) reports that stock with high *PIN* have smaller reactions following an earnings announcement, which is in line with the idea that these stocks incorporate more private information."

Chen, Goldstein and Jiang (2007) and Bakke and Whited (2008) document a positive association between PIN and the sensitivity of investment to stock. In this dissertation, we use an adjusted measure of PIN (APIN), developed by Duarte and Young (2007), which better captures the informational component of PIN.

CHAPTER 6

FINDINGS

As a prelude to our empirical findings, let's first make some important observations regarding the time series of the Standard and Poors (S&P) and the U.S. gross fixed investment. Figure 1 presents the log of the Standard and Poors index levels from 1995-2012. Figure 2 presents the log of aggregate investments during the same period. Aggregate investment is defined as the total business spending on fixed assets, such as factories, machinery, equipment, dwellings, and inventories of raw materials, which provide the basis for future production. The two graphs reflect episodes of a strong association between the stock market and investment. In fact, the two graphs look almost similar which reflects the strong relationship between investments and the stock market. We can see that during the Dot-com bubble, which reached its climax in 2000, the S&P index dropped significantly and the aggregate investments followed the same pattern. During the latest subprime mortgage crisis in 2007-2008 the same scenario transpired.

Table 3 presents the descriptive statistics of our sample based on the level of competition. In panel A, we present the statistics for all the firms constituting our sample. We divide our sample into quintiles based on the level of competition faced by a firm following the Herfindahl measure of competition. Panels B through F present statistics for firms in quintile 1 (firms facing the lowest level of competition) through quintile 5 (firms facing the highest level of competition)

respectively. The sample period is from 1996 to 2008. One salient observation is that as the level of competition increases from quintile one to quintile five, capital expenditure (a key component of a firm's investment) increases as well. Capital expenditure increases from 251.317 to 445.643 as we move from the firms facing the lowest competition sample to the firms facing the highest competition one. These results reflect the fact that there is a positive relationship between a firm's investment and the level of competition it's facing from its competitors and hence reinforce our first hypothesis which states that Managers of firms facing a higher level of competition from their peers are more sensitive to the information in their stock price movements compared to firm facing a lower level of competition.

Table 4 presents the descriptive statistics of our sample based on the level of threat. In panel A, we present the statistics for all the firms constituting our sample. We divide our sample into quintiles based on the level of threat faced by a firm following Hoberg, Philips, and Praphala (2013) measure of threat. Panels B through F present statistics for firms in quintile 1 (least threatened firms) through quintile 5 (most threatened firms) respectively. The sample period is from 1996 to 2008. One salient observation is that as the product market threat increase from quintile one to quintile five, capital expenditure (a key component of a firm's investment) increases as well. Capital expenditure increases from 57.07 to 66.08 as we move from the least threatened firms' sample to the most threatened one. Also, Q increases steadily from 1.97 to 2.42 as we move from the first to the fifth quintile. This proves that the stock price sensitivity is related to the threat faced by a firm. These results reflect the fact that there is a positive relationship

between a firm's investment and the threat it's facing from its competitors and hence reinforce our first hypothesis which states that Managers of firms facing a higher threat from their peers are more sensitive to the information in their stock price movements compared to less threatened firms.

Table 5 presents the Pearson's correlation between the level of competition a firm is facing and its capital expenditure. We can see that the correlation becomes stronger as we move from the sample of firms facing the highest level of competition to the sample of firms facing the highest level of competition from its peers. The correlation between capital expenditure and a firm's threat is equal to 0.007257 and increases to 0.18593 for firms facing the highest level of competition. These results also reinforce our first hypothesis and suggest that the correlation between competition and capital investment becomes stronger as the level of competition a firm is facing goes up.

Table 6 presents the Pearson's correlation between the level of private information of a firm and its capital expenditure. We can see that the correlation becomes stronger as we move from the sample of firms having the least level of private information to the sample of firms having the highest level of private information. The correlation between capital expenditure and a firm's level of private of information is equal to -0.011 for firms having the lowest level of private information and increases to 0.001 for firms having the highest level of private information. Again, these results reinforce our first hypothesis and suggest that the correlation between threat and investment becomes stronger as the level of private information increases..

Table 7 presents the Pearson's correlation between a firm's threat and its capital expenditure. We can see that the correlation becomes stronger as we move from the sample of firms facing the least threat to the sample of firms facing the greatest threat from its peers. The correlation between capital expenditure and a firm's threat is equal to -0.04471 and is not statistically significant while it's statistically significant and equal to 0.02410 for most threatened firms. These results also reinforce our first hypothesis and suggest that the correlation between threat and investment becomes stronger as threat increases

Table 8 presents the regression described in equation (3) and controls for the industry and year effects. Regression (1) regresses a firm's investment (defined as capital expenditure plus research and development expenses scaled by lagged total assets) on Q (defined as the market value of equity plus book value of assets minus book value of equity scaled by book value of assets), probability of informed trading (PIN), and the interaction of the probability of the information of information trading (PIN) and Q which is represented as PIN*Q. The coefficient of 7.34 pertaining to PIN*Q, which is statistically and economically significant, reinforces the idea that managers do learn from the information contained in their firm's stock price movement when making investment decisions, concurs with previous empirical findings, and lends support to the active informant hypothesis . Regression (2) regresses a firm's investment on Q, the probability of informed trading (PIN), the interaction of the probability of the information of information trading and Q (PIN*Q), the value-weighted market

adjusted firm return for next three years (RET), cash flow (CF), and inverse of lagged asset (Inv_Asset). This regression reiterated the results obtained in the regression (1) even after we controlled for return, cash flow, and size. The coefficient of 1.65 is both statistically and economically significant and concurs with our first regression results. We could also add that the R-square increases from 43% in the first regression to 47% in the second regression which further validates the explanatory power of the added control variables.

Table 9 performs the same regression as the one performed in Table 8 but uses the adjusted probability of informed trading as a measure of private information in a firm. Table 9 presents the regression described in equation (3) and controls for the industry and year effects. Regression (1) regresses a firm's investment (defined as capital expenditure plus research and development expenses scaled by lagged total assets) on Q (defined as the market value of equity plus book value of assets minus book value of equity scaled by book value of assets), the adjusted probability of informed trading (APIN), and the interaction of the adjusted probability of the information of information trading (APIN) and Q which is represented as APIN*Q. The coefficient of 4.08 pertaining to APIN*Q, which is statistically and economically significant, reinforces the idea that managers do learn from the information contained in their firm's stock price movement when making investment decisions, concurs with previous empirical findings, and lends support to the active informant hypothesis . Regression (2) regresses a firm's investment on Q, the adjusted probability of informed trading (APIN), the interaction of the adjusted probability of the information of

information trading and Q (APIN*Q), the value-weighted market adjusted firm return for next three years (RET), cash flow (CF), and inverse of lagged asset (Inv_Asset). This regression reiterated the results obtained in the regression (1) even after we controlled for return, cash flow, and size. The coefficient of 2.7319 is both statistically and economically significant and concurs with our first regression results. We could also add that the R-square increases from 29% in the first regression to 33% in the second regression which also further validates the explanatory power of the added control variables.

Table 10 performs the same regression as the one performed in Table 8 but uses the Roll's measure as a measure of private information in a firm. Table 10 presents the regression described in equation (3) and controls for the industry and year effects. Regression (1) regresses a firm's investment (defined as capital expenditure plus research and development expenses scaled by lagged total assets) on Q (defined as the market value of equity plus book value of assets minus book value of equity scaled by book value of assets), the level of private information (INFO), and the interaction of the level of informed trading (INFO) and Q which is represented as INFO*Q. The coefficient of 2.02 pertaining to INFO*Q, which is statistically and economically significant, also reinforces the idea that managers do learn from the information contained in their firm's stock price movement when making investment decisions, concurs with previous empirical findings, and lends support to the active informant hypothesis . Regression (2) regresses a firm's investment on Q, the level of informed trading (info), the interaction of the level of informed trading and Q (INFO*Q), the

value-weighted market adjusted firm return for next three years (RET), cash flow (CF), and inverse of lagged asset (Inv_Asset). This regression reiterated the results obtained in the regression (1) even after we controlled for return, cash flow, and size. The coefficient of 2.29 is both statistically and economically significant and concurs with our first regression results. In the same vein as in tables 9 and 9, we could also add that the R-square increases from 34% in the first regression to 43% in the second regression which also further validates the explanatory power of the added control variables.

Table 11 investigates the firms' investment sensitivity to the information in their own stock price inside information and its link to the level of competition measured by the Herfindahl index. We divide our sample into quintiles based on the Herfindahl index measure, where quintile one presents the firms facing the highest level of competition sample and quintile five presents firms facing the highest level of competition sample respectively. Regressions (1) and (2) implement the regression described in equation (3) for the least threatened firms' sample. Regressions (3) and (4) implement the regression described in equation (3) for the most threatened firms' sample. The coefficient pertaining to the interaction of a firm's investment to the private information contained in the stock price movements (PIN*Q) increases from a negative value of -8.98 to 6.226 when we move from the sample of firms facing the highest level of competition in regression (1) to the sample of firms facing the highest level of competition in regression.(3). These results certainly support our first hypothesis and show that firm managers are more sensitive to their stock price movements as the level of

competition from peers increases. Once we control for return, cash flow, and size in regression (2) and (4) our results still lead to the same conclusion. The coefficient related the (PIN*Q) increases from -4.10 to 18.14 when we move from firms facing the lowest level of competition to firms facing the highest level of competition.

Table 12 investigates the firms' investment sensitivity to the information in their own stock price inside information and its link to the product market threat. We divide our sample into quintiles based on Hoberg and Philips, Prabhala (2013) measure of threat, where quintile one presents the least threatened firms sample and quintile five presents the most threatened firms sample respectively. Regressions (1) and (2) implement the regression described in equation (3) for the least threatened firms' sample. Regressions (3) and (4) implement the regression described in equation (3) for the most threatened firms' sample. The coefficient pertaining to the interaction of a firm's investment to the private information contained in the stock price movements (PIN*Q) increases from 2.51 to 6.23 when we move from the least threatened firms in regression (1) to the most threatened firms in regression (3). These results clearly support our first hypothesis and show that firm managers are more sensitive to their stock price movements as the threat from their rivals is greater. Once we control for return, cash flow, and size in regression (2) and (4) our results still lead to the same conclusion. The coefficient related the (PIN*Q) increases from 1.64 to 3.91 when we move from the least threatened firms to most threatened firms.

Table 13 investigates the Firms' Investment sensitivity to peers' stock price movements using the Herfindahl index as a measure of the level of competition. It also presents the regression of firm's investment I on the firm's Q ((Q_Firm) and its peers' Q (Q_peer). control for the year effect and the industry effect. We divide our sample into quintiles based on the level of competition measure by the Herfindahl index. We perform the regression for all quintiles, where quintile one presents firms facing the lowest level of competition and quintile five presents firms facing the highest level of competition. In the first quintile, the coefficient related to the price of the firm (Q_Firm) has a value of 2.72 and the one pertaining to the peer firms (Q_Peer) has a value of 0.25. As we move from the first quintile (most competition) to the fifth quintile (most competition), the coefficient related to Q_Firm increase of 1.08916 from the first quintile to the values of 3.45, 6.73, and 7.65 for third, fourth, and fifth quintiles respectively. All those values are economically and statistically significant. We can see that there is a significant increase in the level of attention a firm's managers pay to movement in its stock price as the level of competition goes up.

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Table 14 investigates the Firms' Investment sensitivity to peers' stock price movements and its relationship with the product market threat. It presents the regression of firm's investment I on the firm's Q ((Q_Firm) and its peers' Q (Q_peer) . We control for the year effect and the industry effect. We divide our sample into quintiles based on Hoberg, Philips, and Prabhala (2013) measure of threat. We perform the regression for all quintiles, where quintile one presents the

least threatened firms sample and quintile five presents the most threatened firms sample respectively. In the first quintile, the coefficient related to the price of the firm (Q_Firm) has a value of 1.08916 and the one pertaining to the peer firms (Q_Peer) has a value of 0.095559. As we move from the first quintile (least threatened firms) to the fifth quintile (most threatened firms), the coefficient related to Q_Firm increase of 1.08916 from the first quintile to the values of 1.10915, 2.41347, 5.65501, and 4.62822 for the second, third, fourth, and fifth quintile respectively. All those values are economically and statistically significant. We can see that there is a significant increase in the level of attention a firm's managers pay to movement in its stock price as the level of threat increases. The coefficients related to Q_Peer give us an insight about how managers react to the movements in their peers' stock prices. We can see that the coefficient increases from 0.09559 for the least threatened firms to 0.12269, 0.13477, and 0.14295 for the second, third, and fourth quintiles respectively. When the level of threat reaches its highest level in quintile five, the coefficient drops to negative value -0.08644 which seems to indicate that when facing a very high level of competition, firm managers tend to cease to look at the stock price movements of their peers and retrench.

Table 15 investigates firms' Investment sensitivity to peers' stock price inside information for all the firms in our sample. It presents the regression described in equation (4) by regressing of firm's investment I (defined as capital expenditure plus research and development expenses scaled by lagged total assets) on its cash flow (CF_Firm) and the inverse of its lagged asset

(Inv_Asset_Firm), its peers' Q (defined as the market value of equity plus book value of assets minus book value of equity scaled by book value of assets), and its peers' probability of informed trading (PIN). The values of 1.20 and 1.57 related to the regressor PIN*Q in regression (1) and (2) respectively are both statistically and economically significant and suggest that firm managers do indeed learn from the inside information in their peers' stock price movements. Table divides the sample into quintiles based on the level of threat faced by the firm and performs the same regressions. We can see that in regression (1) the coefficient related to PIN*Q moves from -0.46081 and -0.66202 in the first quintile and the second quintile where the level of competition is small to 2.98666 and 5.95565 in the third and fourth quintiles where the level of competition is greater. We also can see that when the level of threat is at its highest level (fifth quintile) the coefficient drops to 1.1855 which indicates that managers tend to retrench when the level of threat is very high. The same results hold when we control for a firm's size and cash flow.

Table 16 investigates firms' Investment sensitivity to peers' stock price inside information for all the firms in our sample. It presents the regression described in equation (4) by regressing of firm's investment I (defined as capital expenditure plus research and development expenses scaled by lagged total assets) on its cash flow (CF_Firm) and the inverse of its lagged asset (Inv_Asset_Firm), its peers' Q (defined as the market value of equity plus book value of assets minus book value of equity scaled by book value of assets), and its peers' adjusted probability of informed trading (APIN). The values of 3.16 and

1.73 related to the regressor APIN*Q in regression (1) and (2) respectively are both statistically and economically significant and suggest that firm managers do indeed learn from the inside information in their peers' stock price movements.

Table 17 examines firms' Investment sensitivity to peers' stock price inside information for all the firms in our sample. It presents the regression described in equation (4) by regressing of firm's investment i (defined as capital expenditure plus research and development expenses scaled by lagged total assets) on its cash flow (CF_Firm) and the inverse of its lagged asset (Inv_Asset_Firm), its peers' Q (defined as the market value of equity plus book value of assets minus book value of equity scaled by book value of assets), and its peers' probability of informed trading (PIN). The values of 3.84 and 3.25 related to the regressor PIN*Q in regression (1) and (2) respectively are both statistically and economically significant and suggest that firm managers do indeed learn from the inside information in their peers' stock price movements.

Table 18 divides the sample into quintiles based on the level of competition faced by the firm and performs the same regressions. We can see that in regression (1) the coefficient related to PIN*Q moves from -0.89 and 0.39 in the first quintile and the second quintile where the level of competition is small to 0.99 and 2.64 in the third and fourth quintiles where the level of competition is greater. We also can see that when the level of threat is at its highest level (fifth quintile) the coefficient drops to 1.49 which indicates that managers tend to retrench when the level of threat is very high. However, when we control for the

firm's size and cash flow, our regression results do not give up any signs of retrenchment.

Table 19 divides the sample into quintiles based on the level of threat faced by the firm and performs the same regressions. We can see that in regression (1) the coefficient related to PIN*Q moves from -0.46081 and -0.66202 in the first quintile and the second quintile where the level of competition is small to 2.98666 and 5.95565 in the third and fourth quintiles where the level of competition is greater. We also can see that when the level of threat is at its highest level (fifth quintile) the coefficient drops to 1.1855 which indicates that managers tend to retrench when the level of threat is very high. The same results hold when we control for a firm's size and cash flow.

In order to verify whether our analysis has a sample bias problem, we use the Heckman measure as an additional robustness check to see whether sample bias exists. Our results show that there is no sample bias issue and our regressions yield the same results.

CHAPTER 7

CONCLUSION

This dissertation contributes to the literature that studies the interaction between product market competition and firm's financial policies. The empirical findings lend support to the "active informant hypothesis" and confirm that firms do learn from their stock price movements and their learning gets accentuated when the level of threat from competitors is higher. The empirical results also confirm that firms do learn from the stock price movements and their learning increases as the threat from peers is higher expect when the firm is facing the greatest level of threat. This dissertation also reinforces the hypothesis which contends that competition and rivalry induce firm managers to work more efficiently. We proved that when facing a greater competition, firm managers are more attentive to the information in their stock price movements and the ones of their peers. We are tempted to explain behind the fact that at the highest level of threat firms cease to learn from the stock price movement of their peers by a phenomenon of retrenchment. I believe that this particular finding could lead to further research pertaining to the psychology of managers when facing very high competition levels and would lead up to a deeper insight about firm managers reaction to competition. My hope is that this study inspires future work on better understanding the mechanisms driving the strong interdependencies among financial policies.

Table 1: Variable definitions

The table provides the definitions of the main variables used in the analysis.

Variable	Definition
CAPEXRD	Calculated as capital expenditure plus R&D scaled by beginning-of-year assets (%)
CAPEX	The capital expenditure scaled by beginning-of-year assets (%)
R&D	Research and development expenses
Q	Computed as market value of equity plus book value of assets minus book value of equity divided by book value of assets
INFO	Measure of private information following Roll (1988)
Herfindahl	Four-digit SIC industry concentration ratios gathered in the Census of Manufacturers
PIN	Probability of informed trading in a stock measure by
APIN	Adjusted probability of informed trading in a stock measure by Duarte and Young (2007)
CF	Net income before extraordinary item plus depreciation and amortization expenses plus R&D expense, divided by lagged assets
RET	Value-weighted market return adjusted firm return for next three years
ASSET	Total book value of assets in billions of dollars
INV_AST	Inverse of total assets
Fluidity	Firm's competition threat measure by Hoberg, Philips, and Prabhala (2013)
INV	Capital expenditure plus R&D scaled by beginning-of-year assets

Table 2: Sample descriptive statistics

This table shows the number of firm year observations for each datasets and the summary statistics of the main variables. Panel A presents the TNIC sample from Hoberg and Philips (2012), the Threat sample from Hoberg, Philips, and Prabhala (2013), COMPUSTAT sample, probability of informed trading PIN sample from Duarte and Young (2007), and our final sample which is obtained by merging all the data sample mentioned previously. Panel B provides the descriptive statistics of variables including Threat, Q, PIN, and INV. The definitions of the variables are provided in Table 1.

Panel A: Sample

Sample	Number of Firm Year Observations
TNIC Sample	99,592
Threat Sample	65,535
COMPUSTAT	55,787
PIN Sample	48,294
Final Sample	44,716

Panel B: Descriptive Statistics

Variable	Min	P5	P25	Mean	Median	P75	P95	Max	Std Dev.
INFO	0	0.22	0.44	0.62	0.63	0.81	0.95	0.99	0.23
Herfindahl					0.227	0.452	1.00	1.00	0.264
Threat	0.035 0.33	0.067 2.44	0.135 4.58	0.339 6.95	6.40	9.22	13.79	27.26	3.40
Q	0.06	0.67	0.96	1.95	1.41	1.74	3.73	59.13	1.50
PIN	0	0.07	0.10	0.16	0.14	0.19	0.37	0.87	0.09
APIN	0	0.07	0.09	0.14	0.12	0.16	0.28	0.70	0.07
INV	0	0	0.01	0.06	0.04	0.07	0.20	6.07	0.20

Table 3: Descriptive statistics across quintiles using Herfindahl measure

This table shows the statistics of the main variables for all firms and across quintiles based on the level of competition using the Herfindahl index. Panel A reports the mean, median and standard deviation of variables including Herfindahl, ASSET, CAPEX, Q, and CF for all firms. Then we divide the sample into quintiles based on the Herfindahl measure and report the mean, median, and standard deviation of the variables in each quintile in Panel B through Panel F. Q1 represents the group firms facing the least competition while Q5 is the group of firms facing the most competition. The definitions of the variables are provided in Table 1. The sample period is from 1996 to 2008.

	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.
	Panel A: All Firms			Panel B: Q1		
Herfindahl	0.339	0.272	0.264	0.792	0.799	0.174
ASSET	1975.811	1961.287	9042.272	3279.839	1669.370	1638.274
CAPEX	375.664	65.000	1071.07	251.317	37.898	870.042
Q	1.645	1.253	1.533	1.588	1.224	1.473
CF	0.068	0.074	0.328	0.056	0.079	0.601
	Panel C: Q2			Panel D: Q3		
Herfindahl	0.403	0.398	0.056	0.257	0.272	0.036
ASSET	1098.098	149.797	4218.484	1981.566	182.391	7418.197
CAPEX	280.102	49.081	774.040	472.475	82.191	1361.380
Q	1.689	1.349	1.659	1.592	1.241	1.708
CF	0.079	0.091	0.212	0.058	0.076	0.287
	Panel E: Q4			Panel F: Q5		
Herfindahl	0.155	0.146	0.023	0.082	0.077	0.028
ASSET	1957.636	226.1	5608.998	1561.014	276.203	5685.281

CAPEX	426.823	40.655	1383.60	445.643	145.710	757.236
Q	1.879	1.308	1.729	1.488	1.203	0.919
CF	0.066	0.062	0.166	0.082	0.066	0.141

Table 4: Descriptive statistics across quintiles using Threat measure

This table shows the statistics of the main variables for all firms and across quintiles based on the level of threat. Panel A reports the mean, median and standard deviation of variables including Threat, ASSET, CAPEX, Q, and CF for all firms. Then we divide the sample into quintiles based on the level of threat (Threat) and report the mean, median, and standard deviation of the variables in each quintile in Panel B through Panel F. Q1 represents the group of the least threatened firms while Q5 is the group of the most threatened firms. The definitions of the variables are provided in Table 1. The sample period is from 1996 to 2008.

	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.
	Panel A: All Firms			Panel B: Q1		
Threat	6.95	6.40	3.39	2.92	3.05	0.76
ASSET	1533.05	233.50	3077	1378.96	233.66	2787.89
CAPEX	57.59	7.04	117.52	57.06	8.58	113.04
Q	1.95	1.41	1.39	1.62	1.29	1.01
CF	-0.01	0.06	0.22	0.06	0.08	0.14
	Panel C: Q2			Panel D: Q3		
Threat	4.80	4.80	0.46	6.41	6.40	0.50
ASSET	1287.41	225.68	2728.76	1353.89	202.34	2840.20
CAPEX	52.94	8.45	107.88	52.05	7.08	108.23
Q	1.74	1.34	1.16	1.91	1.41	1.33
CF	0.04	0.07	0.18	0.01	0.06	0.20
	Panel E: Q4			Panel F: Q5		
Threat	8.38	8.33	0.68	12.24	11.64	2.22
ASSET	1642.24	225.43	3239.17	2002.73	293.32	3639.20
CAPEX	59.13	6.29	121.86	66.80	5.22	133.97

Q	2.07	1.49	1.47	2.42	1.67	1.73
CF	-0.02	0.05	0.23	-0.10	0.01	0.29

Table 5: Correlation between the competition faced by a firm and its capital expenditure using the Herfindahl measure

This table shows the Pearson's correlation between the competition faced by a firm (measured by the Herfindahl index) and its capital expenditure. We divide the sample into quintiles based on the level of competition faced by a firm. Q1 represents the group of firms facing the least competition while Q5 is the group firms facing the most competition. The definitions of the variables are provided in Table 1. The sample period is from 1996 to 2008.

Quintile	Corr (Herfindahl, CAPEX)	p-value
Q1 (Lowest Comp.)	0.07257	<0.001
Q2	-0.03894	<0.001
Q3	0.01701	0.0014
Q4	0.12338	<0.001
Q5 (Highest Comp.)	0.18593	<0.001

Table 6: Correlation between a firm's threat and its capital expenditure using the Fluidity measure

This table shows the Pearson's correlation between a firm's threat and its capital expenditure. We divide the sample into quintiles based on the level of threat. Q1 represents the group of the least threatened firms while Q5 is the group of the most threatened firms. The definitions of the variables are provided in Table 1. The sample period is from 1996 to 2008.

Quintile	Corr (Threat, CAPEX)	p-value
Q1 (Lowest Threat)	-0.045	<0.001
Q2	-0.002	0.822
Q3	0.012	0.249
Q4	0.004	0.704
Q5 (Highest Threat)	0.024	0.020

Table 7: Correlation between a firm's threat and its capital expenditure using the Information Measure

This table shows the Pearson's correlation between a firm's level of private information and its capital expenditure. We divide the sample into quintiles based on the level of information. Q1 represents the group of firms with the lowest level of private information while Q5 is the group of firms with the highest level of private information threatened firms. The definitions of the variables are provided in Table 1. The sample period is from 1996 to 2008.

Quintile	Corr (Info, CAPEX)	p-value
Q1 (Lowest INFO)	-0.011	<0.039
Q2	-0.02	<0.001
Q3	0.012	0.026
Q4	0.052	<0.001
Q5 (Highest Threat)	0.001	0.016

Table 8: Firms' investment sensitivity to stock price inside information using PIN measure

This table shows the results of the baseline regressions. The dependent variable is CAPEXRD. The independent variables include Q, PIN, the interaction between PIN and Q, the interaction between PIN and CF, CF, RET, and INV_AST. The definitions of the variables are provided in Table 1. We control for the year effect and the industry effect. The intercept coefficients are not shown here. ***, **, ** indicate a two-tailed test significance level of less than 1%, 5%, and 10% respectively. The sample period is from 1996 to 2008.

	(1)	(2)
Q	2.54***	1.27***
	(61.62)	(29.43)
PIN	-4.97***	-13.39***
	(-12.97)	(-31.31)
PIN*Q	7.34***	1.65***
	(38.37)	(45.26)
PIN*CF		17.53***
		(22.30)
CF		2.83***
		(9.22)
RET		-0.22*
		(-2.12)
INV_AST		0.059***
		(75.99)
Year effect	Yes	Yes
Industry effect	Yes	Yes
Adjusted R^2	0.43	0.47

Table 9: Firms' investment sensitivity to stock price inside information using Adjusted PIN measure

This table shows the results of the baseline regressions. The dependent variable is CAPEXRD. The independent variables include Q, APIN, the interaction between PIN and Q, the interaction between PIN and CF, CF, RET, and INV_AST. The definitions of the variables are provided in Table 1. We control for the year effect and the industry effect. The intercept coefficients are not shown here. ***, **, ** indicate a two-tailed test significance level of less than 1%, 5%, and 10% respectively. The sample period is from 1996 to 2008.

	(1)	(2)
Q	0.61***	0.42***
	(5.06)	(3.29)
APIN	-4.94***	-4.72***
	(-3.36)	(-3.23)
APIN*Q	4.08***	2.73***
	(4.33)	(2.80)
PIN*CF		38.25*
		(1.79)
CF		32.27***
		(8.62)
RET		-0.44
		(-1.07)
INV_AST		0.03***
		(4.07)
Year effect	Yes	Yes
Industry effect	Yes	Yes
Adjusted R^2	0.29	0.33

Table 10: Firms' investment sensitivity to stock price inside information using Roll's private information measure

This table shows the results of the baseline regressions. The dependent variable is CAPEXRD. The independent variables include Q, PIN, the interaction between INFO and Q, the interaction between INFO and CF, CF, RET, and INV_AST. The definitions of the variables are provided in Table 1. We control for the year effect and the industry effect. The intercept coefficients are not shown here. ***, **, ** indicate a two-tailed test significance level of less than 1%, 5%, and 10% respectively. The sample period is from 1996 to 2008.

	(1)	(2)
Q	0.94***	-0.28***
	(21.73)	(-6.57)
INFO	-3.01***	-3.11***
	(-18.50)	(-19.50)
INFO*Q	2.02***	2.29***
	(30.85)	(35.08)
INFO*CF		24.85***
		(15.53)
CF		34.96***
		(30.74)
RET		-0.52***
		(-3.52)
INV_AST		0.10***
		(15.99)
Year effect	Yes	Yes
Industry effect	Yes	Yes
Adjusted R^2	0.34	0.43

Table 11: Firms' investment sensitivity to own stock price inside information and product market competition using Herfindahl measure and PIN measure

This table shows the results of the regressions in two extreme groups: the firms facing high competition and firms facing least competition. We divide the sample into quintiles based on the level of faced competition (Q1-Q5). The firms facing the most competition are in Q1 while the firms facing the most competition are in Q5. The dependent variable is CAPEXRD. The independent variables include Q, PIN, the interaction between PIN and Q, the interaction between PIN and CF, CF, RET, and INV_AST. The definitions of the variables are provided in Table 1. We control for the year effect and the industry effect. The intercept coefficients are not shown here. ***, **, ** indicate a two-tailed test significance level of less than 1%, 5%, and 10% respectively. The sample period is from 1996 to 2008.

	Least Competition		Highest Competition	
	(1)	(2)	(3)	(4)
Q	4.77***	3.59***	-2.53***	-1.88***
	(97.52)	(62.16)	(-11.97)	(-11.52)
PIN	15.74**	-0.26	-71.28***	-38.57***
	(35.87)	(-0.50)	(-38.23)	(-28.49)
PIN*Q	-8.98***	-4.10	55.73***	18.14***
	(-46.20)	(-13.51)	(53.68)	(21.67)
PIN*CF		60.98*		-39.85***
		(41.97)		(-6.98)
CF		23.86***		24.36***
		(39.13)		(19.36)
RET		0.76		0.34
		(0.86)		(-0.89)
INV_AST		0.06		0.46***
		(29.18)		(162.79)
Year effect	Yes	Yes	Yes	Yes
Industry effect	Yes	Yes	Yes	Yes

Adjusted R^2	0.52	0.58	0.42	0.70

Table 12: Firms' investment sensitivity to own stock price inside information and product market competition using Threat measure and PIN measure

This table shows the results of the regressions in two extreme groups: the less threatened firms and the most threatened firms. We divide the sample into quintiles based on the level of threat (Q1-Q5). The less threatened firms are in Q1 while the most threatened firms are in Q5. The dependent variable is CAPEXRD. The independent variables include Q, PIN, the interaction between PIN and Q, the interaction between PIN and CF, CF, RET, and INV_AST. The definitions of the variables are provided in Table 1. We control for the year effect and the industry effect. The intercept coefficients are not shown here. ***, **, ** indicate a two-tailed test significance level of less than 1%, 5%, and 10% respectively. The sample period is from 1996 to 2008.

	Less Threatened Firms		Most Threatened Firms	
	(1)	(2)	(3)	(4)
Q	0.77***	0.27	-0.30	-0.24
	(4.55)	(1.46)	(-0.77)	(-0.50)
PIN	-3.91**	-1.10	-20.07***	-17.70***
	(-2.21)	(-0.62)	(-3.04)	(-2.70)
PIN*Q	2.51*	1.64	6.23**	3.91
	(1.98)	(-0.62)	(2.11)	(1.23)
PIN*CF		-52.82*		-161.60
		(-1.80)		(-1.64)
CF		51.92***		44.67***
		(8.65)		(3.11)
RET		0.43		-2.55*
		(0.66)		(-1.92)
INV_AST		-0.01		0.11***
		(-0.64)		(3.78)
Year effect	Yes	Yes	Yes	Yes
Industry effect	Yes	Yes	Yes	Yes

Adjusted R^2	0.29	0.33	0.41	0.43

Table 13: Firms' investment sensitivity to peers' stock price movements using Herfindahl measure

This table shows the results of the regressions of a firm's investment on its peers' stock price movements across quintiles. We divide the sample into quintiles based on the level of threat (Q1-Q5). The less threatened firms are in Q1 while the most threatened firms are in Q5. The dependent variable is CAPEXRD. The independent variables include the firm's Q (Q_Firm), and its peers' Q (Q_peer). The definitions of the variables are provided in Table 1. We control for the year effect and the industry effect. The intercept coefficients are not shown here. ***, **, ** indicate a two-tailed test significance level of less than 1%, 5%, and 10% respectively. The sample period is from 1996 to 2008.

	Q1 (Least Comp.)	Q2	Q3	Q4	Q5 (Highest Comp.)
	(1)	(2)	(3)	(4)	(5)
Q_Firm	2.72***	2.34***	3.45***	6.73***	7.65***
	(109.75)	(115.64)	(138.16)	(143.41)	(78.04)
Q_Peer	0.25***	0.15***	0.09***	0.01	0.03***
	(10.55)	(9.72)	(6.27)	(0.49)	(0.69)
Year effect	Yes	Yes	Yes	Yes	Yes
Industry effect	Yes	Yes	Yes	Yes	Yes
Adjusted R	0.49	0.54	0.58	0.51	0.37

Table 14: Firms' investment sensitivity to peers' stock price movements using Threat measure

This table shows the results of the regressions of a firm's investment on its peers' stock price movements across quintiles. We divide the sample into quintiles based on the level of threat (Q1-Q5). The less threatened firms are in Q1 while the most threatened firms are in Q5. The dependent variable is CAPEXRD. The independent variables include the firm's Q (Q_Firm), and its peers' Q (Q_peer). The definitions of the variables are provided in Table 1. We control for the year effect and the industry effect. The intercept coefficients are not shown here. ***, **, ** indicate a two-tailed test significance level of less than 1%, 5%, and 10% respectively. The sample period is from 1996 to 2008.

	Q1 (Least Threatened Firms)	Q2	Q3	Q4	Q5 (Most Threatened Firms)
	(1)	(2)	(3)	(4)	(5)
Q_Firm	1.09***	1.11***	2.41***	5.66***	4.63***
	(73.11)	(46.85)	(99.68)	(17.83)	(13.11)
Q_Peer	0.10***	0.12***	0.13***	0.14***	-0.09***
	(5.88)	(8.72)	(9.49)	(5.51)	(-3.57)
Year effect	Yes	Yes	Yes	Yes	Yes
Industry effect	Yes	Yes	Yes	Yes	Yes
Adjusted R	0.42	0.34	0.47	0.48	0.42

Table 15: Firms' Investment sensitivity to peers' stock price inside information using Herfindahl measure and PIN measure

This table shows the results of the regressions of a firm's investment sensitivity to peers' stock price inside information. The dependent variable is CAPEXRD. The independent variables include its peers' Q (Q_Peer), its peers' PIN (PIN_Peer), the interaction between PIN_Peer and Q_Peer, the firm's CF (CF_Firm), and the firm's inverse of the assets (INV_AST_Firm). The definitions of the variables are provided in Table 1. We control for the year effect and the industry effect. The intercept coefficients are not shown here. ***, **, ** indicate a two-tailed test significance level of less than 1%, 5%, and 10% respectively. The sample period is from 1996 to 2008.

	(1)	(2)
Q_Peer	0.38***	0.71***
	(8.62)	(12.08)
PIN_Peer	0.96	0.74*
	(0.38)	(1.64)
PIN_Peer*Q_Peer	1.20*	1.57**
	(1.00)	(2.17)
CF_Firm		1.13**
		(2.29)
INV_AST_Firm		0.16***
		(82.97)
Year effect	Yes	Yes
Industry effect	Yes	Yes
Adjusted R^2	0.56	0.43

Table 16: Firms' Investment sensitivity to peers' stock price inside information using Herfindahl measure and APIN measure

This table shows the results of the regressions of a firm's investment sensitivity to peers' stock price inside information. The dependent variable is CAPEXRD. The independent variables include its peers' Q (Q_Peer), its peers' PIN (PIN_Peer), the interaction between PIN_Peer and Q_Peer, the firm's CF (CF_Firm), and the firm's inverse of the assets (INV_AST_Firm). The definitions of the variables are provided in Table 1. We control for the year effect and the industry effect. The intercept coefficients are not shown here. ***, **, ** indicate a two-tailed test significance level of less than 1%, 5%, and 10% respectively. The sample period is from 1996 to 2008.

	(1)	(2)
Q_Peer	0.03*	0.85***
	(1.02)	(14.54)
APIN_Peer	-3.07***	-2.29***
	(-6.76)	(-3.79)
APIN_Peer*Q_Peer	3.16***	1.73***
	(14.93)	(4.85)
CF_Firm		0.13**
		(2.29)
INV_AST_Firm		0.16***
		(82.89)
Year effect	Yes	Yes
Industry effect	Yes	Yes
Adjusted R^2	0.25	0.43

Table 17: Firms' Investment sensitivity to peers' stock price inside information using fluidity measure and PIN measure

This table shows the results of the regressions of a firm's investment sensitivity to peers' stock price inside information. The dependent variable is CAPEXRD. The independent variables include its peers' Q (Q_Peer), its peers' PIN (PIN_Peer), the interaction between PIN_Peer and Q_Peer, the firm's CF (CF_Firm), and the firm's inverse of the assets (INV_AST_Firm). The definitions of the variables are provided in Table 1. We control for the year effect and the industry effect. The intercept coefficients are not shown here. ***, **, ** indicate a two-tailed test significance level of less than 1%, 5%, and 10% respectively. The sample period is from 1996 to 2008.

	(1)	(2)
Q_Peer	0.13***	0.17*
	(4.80)	(1.86)
PIN_Peer	-2.99***	-2.58***
	(-7.80)	(-6.87)
PIN_Peer*Q_Peer	3.84***	3.25***
	(20.01)	(17.29)
CF_Firm		9.06***
		(119.90)
INV_AST_Firm		-0.01***
		(-6.00)
Year effect	Yes	Yes
Industry effect	Yes	Yes
Adjusted R^2	0.23	0.26

Table 18: Firms' investment sensitivity to peers' stock price inside information and product market competition using Herfindahl index and PIN measure

This table shows the results of the regressions across quintiles. We divide the sample into quintiles based on the level of threat (Q1-Q5). The less threatened firms are in Q1 while the most threatened firms are in Q5. The dependent variable is CAPEXRD. The independent variables include its peers' Q (Q_Peer), its peers' PIN (PIN_Peer), the interaction between PIN_Peer and Q_Peer, the firm's CF (CF_Firm), and the firm's inverse of the assets (INV_AST_Firm). The definitions of the variables are provided in Table 1. We control for the year effect and the industry effect. The intercept coefficients are not shown here. ***, **, ** indicate a two-tailed test significance level of less than 1%, 5%, and 10% respectively. The sample period is from 1996 to 2008.

	Q1	Q2	Q3	Q4	Q5	Q1	Q2	Q3	Q4	Q5
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Q_Peer	0.97***	0.40***	-0.07*	-0.25***	-0.15	0.71***	0.27***	0.63***	0.022	-0.36*
	(15.04)	(5.64)	(-1.79)	(-2.47)	(-1.07)	(5.55)	(4.58)	(7.67)	(0.27)	(-3.89)
PIN_Peer	1.81***	-0.55	-2.77***	-1.29*	0.06	0.74*	-0.80*	3.85***	-2.10	-2.64***
	(3.63)	(-0.95)	(-4.99)	(-1.18)	(0.05)	(1.64)	(-1.68)	(5.65)	(-2.41)	(-3.23)
PIN_Peer*Q_Peer	-0.89***	0.39*	0.99***	2.64***	1.49**	-0.57**	0.004	0.35***	0.72*	1.28***
	(-3.06)	(1.20)	(10.50)	(5.73)	(2.32)	(-2.17)	(0.02)	(5.09)	(1.97)	(3.13)
CF_Firm						-0.13**	4.85***	-6.18***	-0.28	16.12***
						(-2.29)	(23.87)	(-27.94)	(0.61)	(36.30)
INV_AST_Firm						0.16***	0.14***	0.03	0.22***	0.49***
						(82.97)	(107.8)	(44.97)	(126)	(201.6)

Year effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.31	0.36	0.36	0.19	0.25	0.43	0.56	0.48	0.49	0.69

Table 19: Firms' investment sensitivity to peers' stock price inside information and product market competition using Herfindahl index and APIN measure

This table shows the results of the regressions across quintiles. We divide the sample into quintiles based on the level of competition faced by the firm (Q1-Q5). The firms facing the highest competition are in Q1 while the firms facing the least competition are in Q5. The dependent variable is CAPEXRD. The independent variables include its peers' Q (Q_Peer), its peers' PIN (PIN_Peer), the interaction between APIN_Peer and Q_Peer, the firm's CF (CF_Firm), and the firm's inverse of the assets (INV_AST_Firm). The definitions of the variables are provided in Table 1. We control for the year effect and the industry effect. The intercept coefficients are not shown here. ***, **, ** indicate a two-tailed test significance level of less than 1%, 5%, and 10% respectively. The sample period is from 1996 to 2008.

	Q1	Q2	Q3	Q4	Q5	Q1	Q2	Q3	Q4	Q5
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Q_Peer	1.17***	0.53***	-0.66*	-0.10*	-0.32**	0.85***	0.32***	-0.14**	-0.01	-0.31***
	(18.04)	(11.43)	(-11.28)	(-1.81)	(-2.68)	(14.54)	(8.44)	(-2.66)	(-0.26)	(-4.05)
APIN_Peer	4.00***	0.58	-7.52***	-2.46*	-3.59**	2.29*	-0.19	-1.79**	-2.87	-3.35***
	(6.01)	(0.90)	(-8.50)	(-1.95)	(-2.29)	(3.79)***	(-0.36)	(-2.24)	(-2.86)	(-3.27)
APIN_Peer*Q_Peer	-2.49*	-0.35*	8.37***	3.42***	3.45***	-1.73	-0.42*	3.09***	1.53***	1.54***
	(-6.33)	(-1.01)	(17.80)	(8.05)	(4.48)	(-4.85)	(-1.48)	(7.24)	(4.53)	(3.14)
CF_Firm						-0.13**	4.85***	-6.13***	-0.26	16.11***
						(-2.29)	(23.87)	(-27.74)	(-0.56)	(36.27)
INV_AST_Firm						0.16***	0.14***	0.03***	0.22***	0.49***
						(82.89)	(107.79)	(44.13)	(125.94)	(202.57)

Year effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.31	0.36	0.39	0.19	0.25	0.43	0.56	0.48	0.49	0.69

Table 20: Firms' investment sensitivity to peers' stock price inside information and product market competition using Fluidity measure and PIN measure

This table shows the results of the regressions across quintiles. We divide the sample into quintiles based on the level of threat (Q1-Q5). The less threatened firms are in Q1 while the most threatened firms are in Q5. The dependent variable is CAPEXRD. The independent variables include its peers' Q (Q_Peer), its peers' PIN (PIN_Peer), the interaction between PIN_Peer and Q_Peer, the firm's CF (CF_Firm), and the firm's inverse of the assets (INV_AST_Firm). The definitions of the variables are provided in Table 1. We control for the year effect and the industry effect. The intercept coefficients are not shown here. ***, **, ** indicate a two-tailed test significance level of less than 1%, 5%, and 10% respectively. The sample period is from 1996 to 2008.

	Q1	Q2	Q3	Q4	Q5	Q1	Q2	Q3	Q4	Q5
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Q_Peer	0.31***	0.29***	-0.07*	-0.31***	0.01	0.20***	0.29***	-0.06	-0.11	0.10*
	(8.29)	(8.23)	(-1.79)	(-3.90)	(0.12)	(5.55)	(8.21)	(-1.67)	(-1.46)	(1.83)
PIN_Peer	-0.18	1.06**	-2.77***	-2.90**	0.84	-0.66*	1.05**	-2.74***	-0.99	-1.76***
	(-0.46)	(2.26)	(-4.99)	(-2.35)	(0.79)	(-1.77)	(2.25)	(-4.94)	(-0.86)	(-0.90)
PIN_Peer*Q_Peer	-0.46*	-0.66***	2.99***	5.96***	1.19***	0.04	-0.66***	2.95***	3.62***	-0.11
	(-1.89)	(-2.72)	(10.50)	(9.92)	(2.81)	(0.17)	(-2.72)	(10.37)	(6.46)	(-1.38)
CF_Firm						-9.06***	0.22***	1.19***	21.06***	-17.76***
						(-11.90)	(3.66)	(4.23)	(99.01)	(-78.90)
INV_AST_Firm						0.00	-0.01***	-0.01	-0.01***	-0.01***
						(0.45)	(-3.13)	(-0.91)	(-3.50)	(-6.00)

Year effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.37	0.32	0.39	0.23	0.35	0.40	0.32	0.39	0.33	0.36

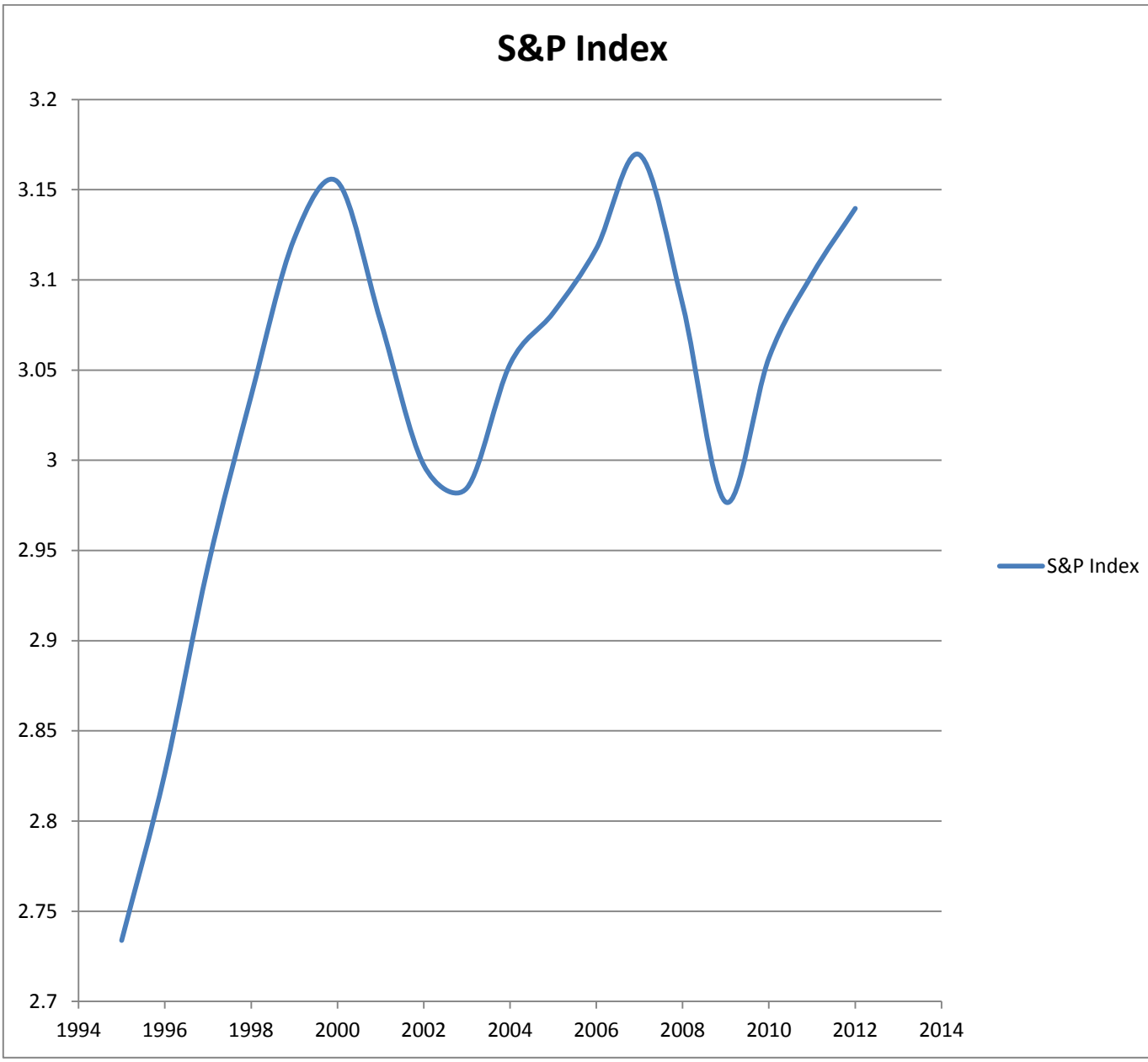

Figure 1: S&P index Time Series

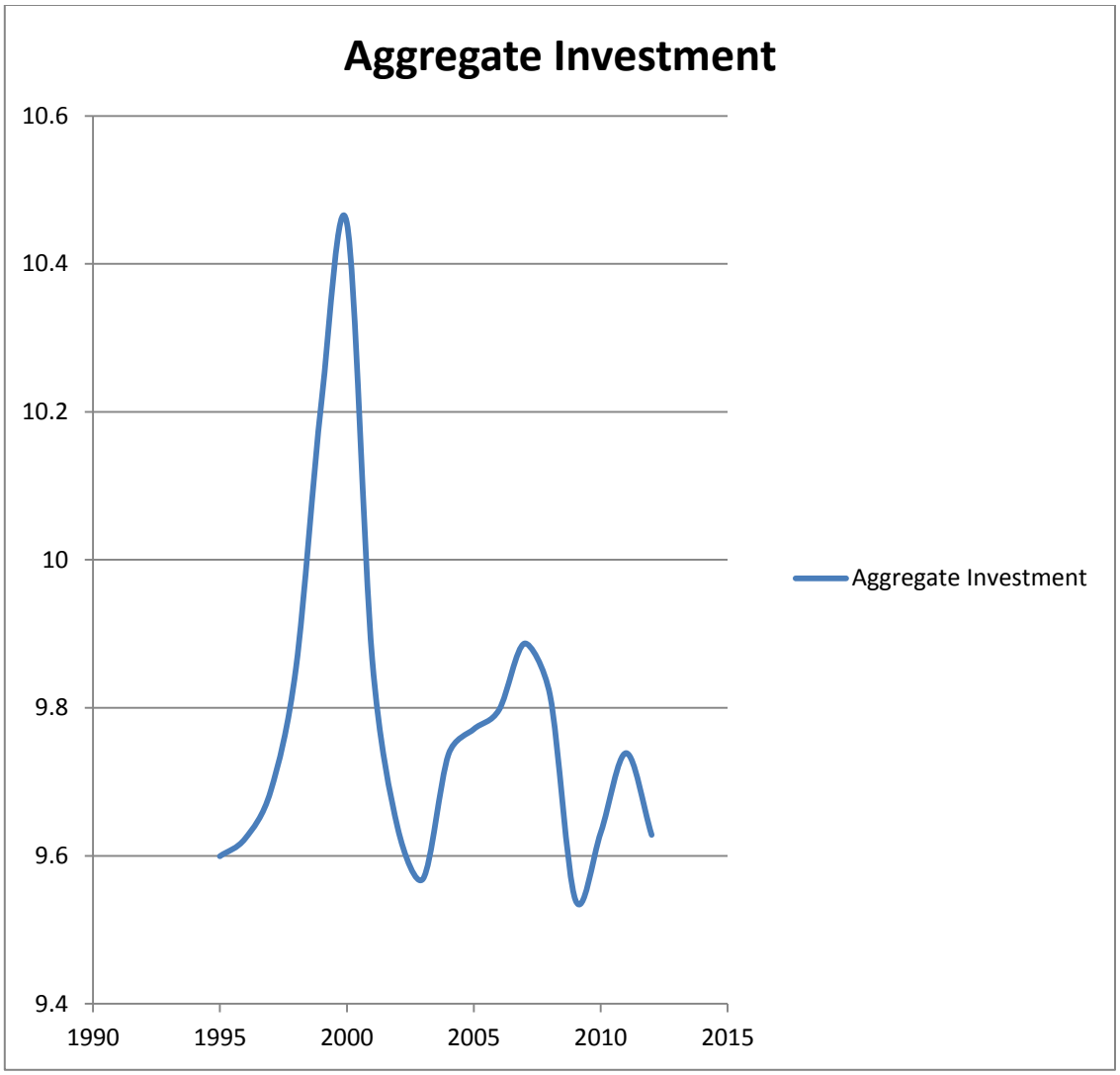

Figure 2: Aggregate Investment Time Series

Appendix 1

Probability of Informed Trading

According to Duarte and Young (2007) "Easley, Kiefer, O'Hara (1996) model is based on the Glosten and Milgrom (1985) and Easley and O'Hara (1987) sequential trade models. The model contains both informed traders who trade for speculative purposes based on private information, and noise traders whose reasons for trading are exogenous. It also posits the existence of an uninformed liquidity provider who sets the bid and ask quotes by observing the flow of buy and sell orders, and assessing the probability that the orders come from informed traders. The bid-ask spread compensates the liquidity provider for the possibility of trading with the informed traders. At the beginning of each day, nature decides whether a private information event will occur. The probability that a private information event will occur on a given day is a. If a private information event occurs on a particular day, informed traders receive a private signal which is positive with probability d. If the signal is positive, buy order flow for that day arrives according to a Poisson distribution with intensity parameter $\mu+\epsilon_b$ and sell order flow arrives according to a Poisson distribution with intensity parameter ϵ_s. The intuition is that on days with positive private information, both informed traders and noise traders arrive in the market as buyers. The total buy order flow for the day therefore consists of arrivals of both noise traders, who arrive at rate ϵ_b, and informed traders who arrive at rate u. On the other hand, only noise traders arrive to sell, so the arrival rate of sell order flow is ϵ_s. If the signal is negative, buy orders consist

only of noise traders with intensity parameter ϵ_b, and sell order flow arrives according to a Poisson distribution with intensity parameter ϵ_s + μ to reflect both the arrivals of noise sellers and of informed sellers. If there is no private signal, only noise traders will arrive in the market, so buy and sell order flow arrives by Poisson distributions with intensity parameters ϵ_s and ϵ_b , respectively.

The PIN is computed as:

$$\text{PIN}= \frac{a\ X\ \mu}{a\ X\ \mu+\epsilon_s+\epsilon_b}$$

The intuition behind the formula for PIN is that the probability of informed trade is the ratio of expected informed order flow to expected total order flow."

Appendix 2

A sample of Least Threatened Firms for 1997 (using threat measure)

AAR CORP
ABC DISPENSING TECHNOLOGIES
ABERCROMBIE & FITCH -CL A
AIR T INC
ALBERTSON'S INC
ALCO STORES INC
ALLOU HEALTHCARE INC
AMERICAN GREETINGS -CL A
AMERICAN STORES CO
AMES DEPT STORES INC
ANGELICA CORP
ANN INC
APOGEE ENTERPRISES INC
ASTRO-MED INC
AVATEX CORP
AZZ INC

` **A Sample of Most Threatened Firms for 1997**

3COM CORP
3DO CO
A D A M INC
ABAXIS INC
ABIOMED INC
ACTERNA CORP
ACTIVE VOICE CORP
ACTIVISION INC
ACXIOM CORP
ADELPHIA COMMUN
ADM TRONICS UNLIMITED INC/DE
ADVANCEPCS
ALKERMES PLC
ALMOST FAMILY INC
AMERICAN WAGERING INC
ANSOFT CORP
APHTON CORP
ARV ASSISTED LIVING INC
ATC HEALTHCARE INC
ATL PRODUCTS INC

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