STOCK MARKET REACTION TO PRODUCT ANNOUNCEMENTS AND ITS IMPLICATION TOWARD MARKET EFFICIENCY

A THESIS

Presented to

The Faculty of the Department of Economics and Business

The Colorado College

In Partial Fulfillment of the Requirements for the Degree

Bachelor of Arts

By

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April/2007

Stock Market Reaction to Product Announcements and Its Implication towards Market Efficiency

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April, 2007

Economics

Abstract

The purpose of this study is to find out if the stock market is efficient or inefficient with regard to product announcements. The Efficient Market Hypothesis (EMH), which states that all available information is "fully" represented in a securities price, has been a widely debated subject within the financial world and has yet to be disproved. This study includes an examination of whether or not stock prices overreact to product announcements creating abnormal returns. Two methods are applied to calculate daily abnormal stock returns and then observed over multiple days to ensure that the full announcement effect was captured. Of the 276 product announcements examined, results indicate that stock prices do overreact to product announcements, thus refuting the widely accepted EMH.

KEYWORDS: (Efficient Market Hypothesis, Product Announcements, Overreaction)

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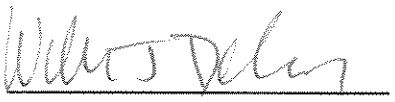

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CHAPTER I

INTRODUCTION

The stock market has become an essential aspect of American society. From corporate America to individual investors, the performance of securities in the stock market can be dependent on the level of one's success. An abundance of companies in numerous industries are constantly trying to gain the competitive edge and increase their value. Investors are constantly checking the market to gain information regarding companies and their performance. A wide range of information is viewed from quarterly announcements to stock analyst's market predictions. Therefore, companies need to choose wisely which information they wish to make public. When a company decides to make an announcement to the public with reference to current or future performance, does the market respond efficiently? More specifically, this paper will study whether the market overreacts to product and research and development announcements.

Within the past quarter century, the stock market has increasingly become more important to a firm's and an investor's success. The market allows firms the opportunity to finance projects, such as building a new factory, purchasing more office space, buying more land and other ventures that increase their assets. For individual investors, it is a source of income that could go towards their retirement fund or pay their child's future college education. In the past decade, vast improvements in the internet and computer

technology have allowed information to flow more freely and quickly[1]. Individual investors can now research the market and buy and sell stocks at the click of a button from their home. With such an ease in the capability to invest, it is not surprising that about half of American households are invested in the stock market[2].

As an increasing number of Americans invest in stocks, it becomes ever more important for companies to boost their value. A company indicating future growth via announcing a new product or future research and development is enticing for investors. But do the company's indications reflect the fundamental value of a stocks price? If the market is efficient, according to Eugene Fama's famous Efficient Market Hypothesis (EMH), all available public information is reflected in security prices[3]. If this is true, then investors are reacting rationally and the companies stock is trading at its true value. If proven false, then the company is either under or overvalued leading to a rejection of the widely accepted EMH.

The purpose of this study is to determine if the stock market reacts excessively to two different types of announcements. The first announcement refers to brand new, innovative products and the second involves announcements regarding product upgrades. It will be conducted over a 12 year period from 1993 through 2004. As numerous

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[1] "Stocks, Commodities and Markets." Internation Information Programs, http://usinfo.state.gov/products/pubs/oecon/chap5.htm (accessed on September 25, 2006).

[2] McEntee, Gerald W. "Wealth Flows to the Wealthiest as the Percentage of Americans Own Stock Falls." Economic Policy Institute, http://www.epinet.org/newsroom/releases/2006/08/SWApr-wealth-200608final.pdf#search=%22percentage%20of%20americans%20who%20own%20stock%22 (accessed September 25, 2006).

[3] Eugene F. Fama. "Efficient Capital Markets: A Review Of Theory And Empirical Work." Journal of Finance. 25, no. 2 (1970): 383.

industries exist within the stock market, it is necessary to view multiple announcements in different industries to make the data set more representative of the market.

Previous research has been conducted on stock market reactions, but it still remains a debatable topic. Eddy and Saunders did a study and found that new product announcements did not have a considerable effect on stock prices[4]. The only criticism of their study is that they looked at monthly returns, which may be too long of a window to look at product announcements independent of other variables, such as quarterly earnings that may have came out in that period. On the other hand, Chaney and Devinney with a similar study examining stock prices over a three day period centered on the product announcement date. They had positive results showing abnormal returns of approximately 0.60 percent. Chaney and Devinney's correction of the time span over which stock prices were evaluated consequently gave them significantly more reliable results[5].

Several economic theories pertain to this study. Aside from the previously stated EMH, other established theories contradict Fama's EMH. Most notable among these is the Overreaction Hypothesis, which states that individuals tend to overweight recent information and underweight prior data resulting in an overreaction in stock price[6]. The main gap in literature in reference to different market theories is that irrational behavior is not included. This is significant because the EMH assumes every investor is acting

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[4] Albert R. Eddy, and George B. Sauders. "New Product Announcements and Stock Prices." Decision Sciences 11, no. 1 (1980): 90.

[5] Paul K. Chaney, and Timothy M. Devinney. "New Product Innovations and Stock Price Performance." Journal of Business Finance & Accounting, 19, no. 5 (1992): 677.

[6] Werner F. M. De Bondt, and Richard Thaler. "Does the Stock Market Overreact?." Journal of Finance, 40, no. 3 (1985): 793.

rationally. In other words, investors act rationally if they are trying to maximize their utility. Yet, irrational behavior does exist in the stock market. Yong Wang describes one form as 'herd behavior.' Instead of investors relying on their own intuition and information, they instead replicate what others do[7]. Another form of irrational behavior is overconfident investing. These are the investors that overestimate their own personal beliefs and do not take public information into account enough. If public information reveals that the investors personal beliefs were correct, this causes the stock price to overreact[8]. Over the past several decades, there have been voluminous amounts of literature published on product announcements and their implications toward market efficiency. Only future research will allow the multiple hypotheses and theories to be either proven or disproved.

The methodology will consist of an empirical study of stock prices one day before an innovative product and product upgrade announcements and the two trading weeks subsequent. The methodology will be based off the published works of Woolridge and Snow (1990) and Chaney and Devinney (1992). The abnormal returns will calculated by using two different approaches. One method is the mean-adjusted returns approach (MARA)[9]. Simply put, one calculates the difference between the actual return of security on day t and the mean return of the stock market on day t. The S&P 500's exchange traded fund SPY, which highly correlated with the S&P 500 Index, will indicate the daily return on the stock market. The abnormal returns will be calculated for the day prior to

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[7] Yong Wang. "Near-Rational Behaviour and Financial Market Fluctuations." Economic Journal, 103, no. 421 (1993): 1465.

[8] Kent Daniel, David Hirshleifer, and Avanidhar Subrahmanyam. "Investor psychology and security market under- and overreactions." Journal of Finance, 53, no. 6 (1998): 1841.

[9] J. Randall Woolridge and Charles C. Snow. "Stock Market Reaction To Strategic Investment Decisions." Strategic Management Journal. 11, no. 5 (1990): 357.

the announcement and the following two trading weeks. The other method that will be used to calculate abnormal returns uses the Capital Asset Pricing Model (CAPM). The CAPM calculates an expected return for a security. CAPM will discussed in more detail in the following chapters. After calculating the expected return, simply subtract it from the actual return of the security to derive the abnormal return. This methodology will only be used to calculate results over a three day window; the day prior to the announcement to the day after the announcement.

Product announcements will be obtained from the Gale Group New Product Announcements/Plus (NPA/PLUS) database, which contains press releases from all industries covering product announcements. Secondly, all daily stock price data will be obtained from Yahoo Finance's historical quotes website. The stock prices used will be the adjusted close because it adjusts for dividends and stock splits.

Chapter II will discuss the theory associated with the EMH, more specifically market efficiency in the *weak form*, *semi-strong form* and the *strong form*. The fairly recent created field of behavioral finance and the theory associated with it will be discussed as well. Lastly, this chapter will explain the process by how professional investors select stocks, either through technical or fundamental analysis.

Chapter III will review literature that pertains to the theories and studies related to this paper. Large quantities of works have been published on the topics of the EMH and behavioral finance. In addition, papers related to stock market overreaction will be reviewed.

Chapter IV will explain in detail how the data was obtained and the methodology associated with this paper. The latter part of the chapter will discuss the results.

Lastly, Chapter V will recap the purpose of this paper, along with comparing the results found with those of Woolridge and Snow (1990) and Chaney and Devinney (1992).

Since much research has been conducted on market reactions and stock performance, the results of this study are not expected to be a revelation in the field of finance. However, they should offer dependable outcomes that will help an investor gauge the markets response to these two specific announcements. I suspect that the stock market will overreact to these announcements. I do not think the overreaction will be of epic proportions, but enough for investors to capitalize of off. Findlay and Williams wrote a paper on the supporting evidence defining the EMH. They concluded that the evidence was presumptions assumed as facts that were not particularly strong[10]. The validity of the EMH will be a topic of debate for quite some time, but this study will give substantial data defying market efficiency.

[10] M.C. Findlay, and E.E. Williams. "A fresh look at the efficient market hypothesis: how the intellectual history of finance encouraged a real 'fraud-on-the-market'." Journal of Post Keynesian Economics. 23, no. 2 (2000): 181.

CHAPTER II

THEORY

Efficient Market Hypothesis

The purpose of this paper is to find out if the stock market is efficient or inefficient in response to product announcements. When considering this idea of efficiency, one should not think of the managerial and administrative efficiency of the people working within the stock market. Efficiency in this case refers to how well information is processed and incorporated into a securities price. Eugene Fama, the originator and clear advocate of the Efficient Market Hypothesis (EMH), considers an efficient market as one in which prices fully reflect all available information on an unbiased level at all times[1]. Since Fama's introduction of the EMH to the academic and financial world, it has been a focus of interest that has sparked copious amounts of research and publications both refuting and supporting the EMH. The literature pertaining to the widely debated EMH is thoroughly discussed in the following chapter, as this chapter describes market efficiency and its related financial theories.

The EMH has been broken down into three potential levels of efficiency to facilitate testing. The difference in each level is a particular set of information, with each

[1] Eugene F. Fame. "Efficient Capital Markets: A Review Of Theory And Empirical Work." Journal of Finance. 25, no. 2 (1970): 383.

level being more comprehensive than the previous. The three levels of the EMH are known as follows: the *weak form*, the *semi-strong form*, and the *strong form*[2].

Weak Form Efficiency:

Efficiency in the weak form means that current stock prices fully reflect all security market information, including historical prices, trading volume data, rates of return, company news and other information generated by the market. Since current prices are assumed to have included any available information, past stock prices and volume data cannot be utilized to make future abnormal returns. An abnormal return is a return that is higher than normal for the given risk associated with that particular security. Therefore, daily stock prices are independent from preceding stock price movements. If the market were truly to operate in such a manner then studying past price movements and patterns, commonly referred to as technical analysis, would be of no help to investors[3].

This idea of past information being considered useless as a means of earning abnormal returns asserts that stock prices behave like a random walk. The *random walk* theory claims that future price directions and patterns cannot be based on past actions[4]. When the random walk theory is applied to the stock market, it implies that any short term changes in stock prices cannot be forecasted. This would obviously offend any professional on Wall Street because it implies that if a blind-folded person were to randomly point at a portfolio in the Wall Street Journal, he would be just as likely to pick

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[2] Ibid.

[3] Simon M. Keane. *Stock Market Efficiency: Theory, Evidence, Implications.* (Oxford: Philip Allan Publishers Limited, 1983), 34.

[4] Burton G. Malkiel. *A Random Walk Down Wall Street.* (New York: W.W. Norton & Company, 2003).

a successful portfolio as a professional who carefully constructed his or her portfolio. The term random seems rather harsh and is somewhat misrepresentative of its true meaning. Random is used because it assumes prices respond only to new information, and since good or bad information is randomly made available, prices move in an unpredictable manner. Professionals contest the random walk theory, a term coined by academics, with two techniques called fundamental and technical analysis. These forms of analysis will be discussed is greater detail later in the chapter[5].

Multiple tests have been conducted to test the weak form of efficiency. One test based on using certain trading rules, more specifically a filtering technique, was conducted to try an exploit any patterns in stock prices. The results showed that abnormal returns could be made, but none of the returns were significant enough to cover the transaction fees associated with trading[6]. Far more evidence exists confirming market efficiency in the weak form than evidence in its opposition. As a result, markets are generally considered efficient in the weak form. It is not possible to earn abnormal returns using trading rules based on technical analysis.

Semi-Strong Form Efficiency:

Efficiency in the semi-strong form means that current stock prices fully reflect all available public information. Since all market information considered by the weak form is public, such as trading volume, stock prices and rates of return, one would notice that the semi-strong form includes the weak form. Other forms of public information consist

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[5] Ibid., 25.

[6] Frank K. Reilly and Keith C. Brown. *Investment Analysis: Portfolio Management*. (Ohio: South-Western, 2003), 181.

of price-to-earnings ratios, dividend-yield ratios, price-book value ratios, stock splits, earnings and dividend announcements and any economic and political news. Therefore, if any investor bases his or her investing strategy on new information after it has already been made public that investor will not earn abnormal returns because the securities price will already have reflected that newly public information[7].

Many studies have been conducted to test the semi-strong form of efficiency, more specifically, how quickly the market reacts to publicly available information. The tests completed prior to this paper can be segregated into two groups: prediction studies and event studies[8].

The prediction studies performed attempted to predict future rates of return using time-series analysis or cross-sectional distribution. The time-series tests involve examining a firm's historical performance data; in this case with the intent of finding out if public information can provide quality estimates of future returns. Testing for short term returns was inconclusive, while the analysis of long term returns using dividend yields was rather successful[9]. Cross-sectional distribution tested whether firms could earn above or below average risk-adjusted returns using public information. The set of information included price-to-earnings ratios, growth rate ratios, the size effect, book value ratios, and neglected firms and trading activity. The results indicated that the

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[7] Simon M. Keane. *Stock Market Efficiency: Theory, Evidence, Implications.* (Oxford: Philip Allan Publishers Limited, 1983).

[8] Frank K. Reilly and Keith C. Brown. *Investment Analysis: Portfolio Management.* (Ohio: South-Western, 2003), 182.

[9] Ibid., 183.

publicly available ratios used in the cross-sectional distribution analysis gave evidence against market efficiency in the semi-strong form[10].

The second set of studies is based around the available economic information. The studies included the analysis of stock splits, initial public offerings (IPO's), exchange listings, world events and economic news, announcements of accounting changes and corporate events. Unlike the prediction studies, the results of the event studies offered support of the semi-strong form of efficiency. All of the announcements made, with the exception of exchange listings, were quickly incorporated into the security's price. Although the studies performed provided a mixed review, markets are still considered fairly efficient in the semi-strong form of the EMH. It would take a lot of effort to earn abnormal returns using public information[11].

Strong-Form Efficiency:

Efficiency in the strong form means that current stock prices fully reflect all available public and private information. Therefore, no investor has access to information that allows them to earn abnormal returns. If the market were truly to operate in such a manner, trying to find out a security's intrinsic value, commonly referred to as fundamental analysis, would be of no importance because existing prices should already reflect a security's intrinsic value[12].

Four groups of investors have been analyzed over time to see if they earned abnormal rates of return consistently. If these groups were to constantly beat the market,

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[10] Ibid., 185-188.

[11] Ibid., 188-193.

[12] Simon M. Keane. *Stock Market Efficiency: Theory, Evidence, Implications*. (Oxford: Philip Allan Publishers Limited, 1983).

they either knew information unknown to the rest of the market, or they reacted to public information before the market had time to react, thus negating the validity of the EMH in the strong form. The four groups are as follows: corporate insider trading, stock exchange specialists, security analysts and professional money managers[13]. The results are as follows.

A) Corporate Insider Trading

Corporate insiders, comprised of major corporate officers, members of the board of directors, and owners of 10 percent or more of a firm's equity class securities, are required by the SEC to report every month on their transactions in the stock of the firm they are affiliated. After six weeks the SEC makes this information available to the public. This information was analyzed to uncover whether or not insiders bought shares prior to upward price movements or sold shares prior to downward price movements. Significant evidence made it clear that insiders were constantly earning excess returns, with implications leaning towards private information that only the insiders knew. Other studies also indicated that public investors who traded with insiders because of insider transaction announcements reaped the benefits of excess returns. At this point in time, the results of these tests have not provided any substantiated proof that markets are efficient in the strong form[14].

B) Stock Exchange Specialists

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[13] Frank K. Reilly and Keith C. Brown. *Investment Analysis: Portfolio Management*. (Ohio: South-Western, 2003), 193.

[14] Ibid.

Studies conducted in the past have given light to the fact that stock exchange specialists have possibly made abnormal returns as they have access to information regarding unfilled orders. Traditionally, these specialists make their money buy selling stocks at a price higher than what they originally were bought. Specialists have made money after unexpected news was released in the form of buying or selling large blocks of stock[15].

C) Security Analysts

Security analysts work full-time to discover undervalued stock and then make recommendations on which stocks to purchase. Tests have been conducted to see if abnormal rates of return were generated if investors had actually taken a security analysts advice. One analysis took Value Line, a large advisory service, and examined the returns generated by investors who took the security analyst's advice. Value Line works by recommending stocks on a scale of 1 to 5 (1 being most favorable, 5 being the worst) every week. The foundation of the scale rests on four pieces of information, all of which are public. When Value Line first implemented the ranking system, the firm's ranked 1 outperformed the market and the firm's ranked 5 underperformed the market. As time progressed, the analysis indicated that the abnormal adjustments were completed after the second day, indicating that the market is efficient[16].

D) Professional Money Managers

Of all the professional investors, the money managers should be the group that make above average returns. Performance data on particular types of funds are becoming

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[15] Ibid., 194.

[16] Ibid.

increasingly more available. Studies conducted on mutual funds operated by money managers found that after all the transaction fees were paid, about two-thirds of the mutual funds did not even match the market. Other studies on pension plans and endowment funds have shown similar results[17].

There are mixed results regarding market efficiency in the strong-form. Corporate insider trading and stock exchange specialists are different than the two latter groups because of their investment strategy, which relies on the access of special information. On the other hand, Value Line's ranking system adjusts very rapidly and gives the impression that after transaction costs it is not profitable. Money managers, although considered very knowledgeable in financial markets, have still not proved that they can consistently beat the market, thus providing support for the strong-form EMH[18]. Empirically when considering the three sub-divisions of the EMH, the weak-form is considered to be the most efficient while the strong-form is the least.

Stock Selection

As noted previously in the chapter, the EMH asserts that no investor can consistently beat the stock market. While there is much truth to be said of these theories, investors on Wall Street have derived their own methods at trying to generate above-average rates of return. Knowing a security's future course of direction is the most essential piece of information that every professional investor wants to attain. Given an idea of what a security is likely to do allow investors to buy and/or sell at the most

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[17] Ibid., 195.

[18] Ibid., 195-196.

help them beat the market. The second principle is that stocks tend to move in trends and with momentum. While charts only tell of past market movements, this type of analysis tries to give investors an idea of what other investors may do in the future[21].

Fundamental Analysis:

Technical analysis is reliant on past movements to predict future movements, with complete disregard for a firm's value. On the other hand, fundamental analysis is a method applied to find a firm's intrinsic value[22]. This form of stock selection is based on the firm-foundation theory, which argues that every investment tool has a fundamental value. These investment tools can range from stocks to real estate. This theory is applied to the market when investors believe certain securities are under or overvalued. When the market price falls below a firm's intrinsic value, then one should buy, and when the market price rises above a firm's intrinsic value, then one should sell because the market will eventually correct itself and the prices will revert to their fundamental worth[23].

Fundamentalists analyze a firm's dividend payouts, growth, risk and interest rates to estimate its intrinsic value. To the contrary to chartists, fundamentalists believe that the market is 10 percent psychological and 90 percent logical. On Wall Street today, roughly 90 percent of professional investors use fundamental analysis[24].

Flaws of Technical and Fundamental Analysis:

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[21] Ibid., 127-128.

[22] Ibid.

[23] Ibid., 29.

[24] Ibid. 127.

While the majority of investors consider themselves fundamentalists, there is a clear disparity in what methods are perceived to be of greater value. Not to give the notion that fundamental analysis is a more valuable approach because if it were then the professionals in the market would all be fundamentalists.

Chartists use past trends and movements as the basis for their future transactions. When a there is a trend they buy, and when the trend stops they sell. A huge flaw in regard to this approach is that the market can sporadically change and reverse itself very quickly, preventing chartists from taking advantage of the opportunity because of the time constraint. Another flaw is that this method can self-destruct rapidly. If an investor used his own strategy and then all other investors began using it, the strategy would be of no worth because no worthwhile money could be generated if everyone is buying or selling the same stocks[25]. The final flaw of technical analysis relates to the EMH. If the EMH holds true, then prices adjust too quickly to new information, hence making technical analysis a pointless technique.

Fundamental analysis has its own set of potential flaws as well, the most important being incorrect information and a faulty analysis. So much time is literally spent researching and interpreting financial data that if this data were to be inaccurate it would throw an analyst off considerably. Also, financial firms spend a considerable amount of money through transaction fees acquiring information. On the other hand, if the information is correct but the analyst misinterprets the data he could miscalculate future growth rates. An analyst may not properly address a firm's intrinsic value either. The growth rate that an analyst estimated may be correct, but if it is already reflected in the price, difference in a stock's price and value may stem from a false estimate of value.

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[25] Ibid., 134.

Lastly, fundamentalists rely on the market to correct its supposed "mistake." The market may not always correct itself keeping the stock's price away from its proper value[26].

Behavioral Finance

The topic of behavioral finance has evolved over the past 15 years and stands in sharp contradiction to the EMH. All financial theory makes the assumption that investors are acting in a rational manner, more explicitly, investors are trying to maximize their utility. This rational investor would take into account all available information and incorporate it into their decision making. Since the stock market has been in existence, particularly the past quarter century, there have been patterns of irrational behavior that have bewildered the academic and professional investor. Irrational behavior leads to anomalies, bubbles and unusual stock price movement. After studying these stock market mysteries, the financial world gave birth to a new way of viewing markets. Behavioral finance is a method of approaching finance from a broader social science perspective, including psychology and sociology, in an attempt to understand better how the human psyche effects investors and the decision making process[27]. enigma

Different forms of irrational behavior have spawned new financial theory. The one theory most relevant to this paper was enunciated most lucidly in Werner De Bondt and Richard Thaler's paper on stock market overreaction. They hypothesized that individuals tend to overweight recent information and underweight prior data, in turn,

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[26] Ibid., 140-141.

[27] Robert J. Shiller. "From Efficient Markets Theory to Behavioral Finance." Journal of Economic Perspectives, Vol. 17, No. 1 (Winter, 2003): 83.

creating an overreaction in a stock's price. Investors tend to overreact to unexpected and dramatic news on economic and worldly matters[28].

Another form of irrational behavior was most recently illustrated in the tech bubble of the 1990's. In what Alan Greenspan described as the irrational exuberance, a huge bubble was created and eventually burst in March of 2000. Prices did not rise because investors believed these firms were undervalued; instead prices rose because investors knew that if they bought the stock today, the price would be higher the next day. Yong Wang describes this turn of event as herd-behavior, which is rather self-explanatory[29].

There are many critics of this perspective of finance. Many of their arguments revolve around the notion that the evidence supporting behavioral finance is empirically weak and that investors are still unable to beat the market consistently. Much more information has accrued over the years as this is a new and interesting topic in finance. Further studies and there results are explained in more detail in the following chapter.

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[28] Werner F. M. De Bondt and Richard Thaler. "Does the Stock Market Overreact?." Journal of Finance, 40, no. 3 (1985): 793.

[29] Yong Wang. "Near-Rational Behaviour and Financial Market Fluctuations." Economic Journal, 103, no. 421 (1993): 1465.

CHAPTER III

LITERATURE REVIEW

When the efficient markets hypothesis entered the economic and financial world, it was welcomed with open arms and enjoyed continued support amongst its generation. Markets were, and still are considered by many, efficient because all information that is available should be incorporated into a stock's price exhibiting its true fundamental value. Therefore, certain types of analysis were considered useless in trying to predict a stock's future market value. Fundamental analysis, which is trying to find a firm's intrinsic value, nor technical analysis, which involves studying the patterns of past stock prices, would be beneficial for investors[1]. As time progressed and fresh new ways of evaluating financial markets emerged, the concept of whether or not markets were truly efficient entered the spotlight. Eventually, the market's response towards particular announcements became a topic of debate amongst academics. This chapter will review literature based on overreaction in the stock market to product announcements and its implication towards market efficiency.

Whether or not the stock market is efficient is a topic that has been studied for decades. The Efficient Market Hypothesis (EMH) was developed in 1965 by Eugene Fama and states that security prices fully incorporate all available information. Over the

[1] Burton G. Malkiel, "The Efficient Market Hypothesis and Its Critics." Journal of Economic Perspectives, Vol. 17, No. 1 (Winter, 2003): 59.

past few decades, there have been publications skeptical about Fama's widely accepted hypothesis. Much of the empirical work committed to testing the EMH has been directed towards three sub-categories: *weak form*, *semi-strong form* and *strong form*[2]. The weak form efficiency declares that security prices are reflected by historical data. The semi-strong form efficiency states that all publicly available information reflects security prices. The strong form asserts that both private and public information is represented in security prices[3].

When investors make abnormally high returns on a consistent basis people begin to question the EMH. Farmer and Lo (1999) state that the investor constantly beating the market does not necessarily imply market inefficiency but could be the reward for unusual skill, extraordinary effort, or for breakthrough's in financial technology[4]. One reason the EMH has been a debatable hypothesis is because of the abnormalities that exist. One such abnormality, the overreaction hypothesis, states that individuals tend to overweight recent information and underweight prior data resulting in an overreaction in stock price[5]. Overreaction in financial markets was recognized long before the EMH had been devised, as John Maynard Keynes claimed that "day-to-day fluctuations in the profits of existing investments, which are obviously of an ephemeral and nonsignificant character, tend to have an all together excessive, and even an absurd, influence on the

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[2] Eugene F. Fama, "Efficient Capital Markets: A Review Of Theory And Empirical Work." Journal of Finance. 25, no. 2 (1970): 383.

[3] Ibid.

[4] J. Doyne Farmer and Andrew W. Lo. "Frontiers of finance: Evolution and efficient markets." Proceedings of the National Academy of Sciences of the United States of America. 96, no. 18 (1999): 9992.

[5] Werner F. M. De Bondt and Richard Thaler. "Does the Stock Market Overreact?." Journal of Finance, 40, no. 3 (1985): 793.

market[6]." A couple other anomalies exist, including the January effect and the Day-of-the-Week effect. The January effect shows that there are unusually high returns during the first two weeks of the year. The Day-of-the-Week effect reports that Monday's returns are significantly higher than any other day of the week[7].

These anomalies tend to be overrated and are considered an easy way to try and contradict the EMH. These effects are considered anomalies in view of the EMH because they suggest predictable, constantly higher returns, while an efficient market should have a "random walk." The idea of a random walk is that all information is immediately reflected in stock prices; therefore tomorrow's stock prices will only reflect tomorrow's information leaving both days independent of one another. A key factor in deciding if these anomalies are of noteworthy significance to financial markets is whether any patterns of serial correlation are consistent over time. In this context, serial correlation refers to the correlation of an anomaly with itself over successive time intervals. That is why the January effect and the Day-of-the-Week effect are not considered as anomalies that negate market efficiency because they have not proved dependable from period to period. Also, the effects are too small relative to the transaction costs associated in trying to exploit them. Traders on Wall Street now poke fun at the supposed January effect by claiming it is more likely to occur on the previous Thanksgiving[8]. Eugene Fama, clearly still in support of his efficient markets hypothesis,

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[6] John M. Keynes, *The General Theory of Employment, Interest and Money*. London: Harcourt Brace Jovanovich, 1964. (reprint of the 1936 edition)

[7] Werner F. M. De Bondt and Richard Thaler. "Does the Stock Market Overreact?." Journal of Finance, 40, no. 3 (1985): 793.

[8] Burton G. Malkiel, "The Efficient Market Hypothesis and Its Critics." Journal of Economic Perspectives, Vol. 17, No. 1 (Winter, 2003): 64.

responds to these excess return anomalies as occurring only in the context of very particular models and that these results tend to vanish once they are exposed to different models for expected normal returns. It has also been noted that as investors catch wind of a pattern rumored to be predictable, they will exploit the pattern to where it is no longer profitable[9].

Findlay and Williams wrote a paper on how well the EMH defined concluding that the evidence towards defining the EMH was never particularly strong. Most of the supposed evidence is presumptions that have been regarded as fact. After decades of empirical studies there is still no consensus regarding whether or not market efficiency exists[10].

Empirical tests related to the stock markets reaction towards product announcement have been conducted to assess market efficiency. Chaney and Devinney (1991) looked at a collection of new product introductions from the *Wall Street Journal Index* from 1975 to 1988 and evaluated the stock prices for the three days following the product announcement. They discovered that innovative product or service announcements returned and excess of 0.6%. They realized that firms announcing truly new innovative products outperformed firms, or earned higher abnormal returns, that announced the upgrade of an existing product. In particular, technology based industries earned the greatest returns[11].

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[9] Ibid.

[10] M.C. Findlay and E.E. Williams. "A fresh look at the efficient market hypothesis: how the intellectual history of finance encouraged a real 'fraud-on-the-market'." Journal of Post Keynesian Economics. 23, no. 2 (2000): 181.

[11] Paul K. Chaney, and Timothy M. Devinney. "New Product Innovations and Stock Price Performance." Journal of Business Finance & Accounting, 19, no. 5 (1992): 677.

Woolridge and Snow (1990) show that the stock market compensates firms successfully investing in long-term product development through the introduction of new products. This study disproved the common theory that the market was characterized as misguided. In other words, the market was forcing firms to make short-term strategic decisions which were potentially interfering with their long-term performance[12].

This trend has led to other tests towards the short-run and long-run value of a stock. Multiple articles are written about the gain in momentum that stocks experience in the short run. De Bondt and Thaler viewed monthly return data for New York Stock Exchange commons stocks from January 1926 to December 1986. They discovered how portfolios that prior had been considered 'losers' and 'winners' performed after a thirty-six month period. 'Loser' and 'winner' stocks were classified as stocks that endured large losses or enjoyed favorable capital gains for up to five years.[13] It was concluded that original 'loser' portfolios outperformed 'winner' portfolios by 25% after three years. Also, De Bondt and Thaler made it quite evident that positive excess returns were made by the 'loser' portfolios in the month of January[14]. Robert A. Haugen attributes this to the market failing to recognize that good news has a tendency to initiate continual good news reports and vice versa. Once the market realizes that the firm is overvalued, then the market value of the stock begins to revert towards its average[15].

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[12] J. Randall Woolridge and Charles C. Snow. "Stock Market Reaction To Strategic Investment Decisions." Strategic Management Journal. 11, no. 5 (1990): 362.

[13] Werner F. M. De Bondt and Richard Thaler. "Does the Stock Market Overreact?." Journal of Finance, 40, no. 3 (1985): 796.

[14] Werner F. M. De Bondt and Richard Thaler. "Does the Stock Market Overreact?." Journal of Finance, 40, no. 3 (1985): 793.

[15] Robert A. Haugen, *The New Finance*. 3rd ed. Prentice Hall, 2003.

Investor overconfidence and self-attribution only add to the momentum as well. An overconfident investor will overestimate the accuracy of his private information, but not the information that is publicly available. In some cases, once newly acquired public information shows that the investor's private information was valid, it triggers further overreaction. As further information is made public over time, this momentum begins to cease and gradually the prices are driven back towards their fundamentals[16]. This is also typical when P/E ratios are viewed as the initial value of the firm. Companies with high P/E ratios are considered overvalued because investors become too optimistic after seeing multiple good reports (ex: product announcements). Once future earnings do not turn out as well as predicted, the price of the stock begins to drop to its true value[17].

While long-run reversion towards the mean value is supported by many scholars, many studies have shown inconsistent results, in particularly in different time periods. It has also been suggested that stock return reversals may be consistent with the efficient functioning of the market as a whole. Malkiel proposes that a correlation may exist between interest rates and return reversals since interest rates have a tendency to revert to the mean as well. Throughout time, there has been a tendency for prices of stocks and bonds to go down when interest rates rise and vice versa. If it is true that interest rates do indeed revert to their fundamental rate over time, this suggests that it will generate return reversals[18].

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[16] Kent Daniel, Hirshleifer, David, and Avanidhar Subrahmanyam. "Investor psychology and security market under- and overreactions." Journal of Finance, 53, no. 6 (1998): 1839.

[17] Werner F. M. De Bondt and Richard Thaler. "Does the Stock Market Overreact?." Journal of Finance, 40, no. 3 (1985): 793.

[18] Burton G. Malkiel, "The Efficient Market Hypothesis and Its Critics." Journal of Economic Perspectives, Vol. 17, No. 1 (Winter, 2003): 63.

During the 1990's, a new way of evaluating the stock market emerged in the way of behavioral finance. That is applying a broader social science perspective to finance through looking at human psychology and sociology to better understand how economic decisions affect market prices and returns. This perspective in finance contradicts many of the underlying values in the EMH as it calls into question how rational investors ultimately may be. A rational investor should not be seen as someone who tries to maintain some sense of moral or ethical behavior, but as someone trying to maximize their utility at least cost[19].

Until behavioral finance sprouted up amongst economists, the main gap in scholarly literature pertaining to different market theories was that irrational behavior was not included. Summers (1986) argues in his paper that current evidence does not "establish that financial markets are efficient in the sense of rationally reflecting fundamentals[20]." The EMH assumes that all investors are acting rationally, when in reality, that is not the case. One form of irrational behavior is what Yong Wang describes as 'herd behavior.' This form of behavior, which is also described by the price-to-price feedback theory, can be related best by the recent stock market bubble that burst in March of 2000. Many investors had begun making significant returns as stock prices increased, causing the public to become more enthusiastic as it heightened their expectations for prices to keep increasing. This, in turn, increased investor demand and produced another round of price increases. This process continued until the high stock prices could no

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[19] Robert J. Shiller, "From Efficient Markets Theory to Behavioral Finance." Journal of Economic Perspectives, Vol. 17, No. 1 (Winter, 2003): 83.

[20] Lawrence H. Summers, "Does the Stock Market Rationally Reflect Fundamental Values." Journal of Finance, 41, no. 3 (1986): 591.

longer be sustainable causing the bubble to burst. Instead of relying on their own intuition and information, they instead replicated what other investors did because they assumed prices would increase for an economically irrational reason[21]. Although this feedback theory is spoken of more often, it has come into sight only through its recent economic impact. The theory has long been brought into disrepute amongst academic research[22].

Another form of irrational behavior is overconfident investing. As stated previously, these investors overestimate their own personal beliefs and do not take public information into account enough. If public information reveals that the investors personal beliefs were true, this causes the stock price to overreact[23].

Although the feedback theory has not been traditionally supported in economic research, much research in cognitive psychology has given more validity to the feedback theory. This research discovered systematic biases on human judgments of the likelihood of future events. People try to predict the future by looking for out the closest match to past patterns, while disregarding the observed probability of actually matching the pattern[24].

There is reason to believe that two types of investors exist after a study completed by Goetzmann and Massa. These types of investors are categorized as contrarian, or

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[21] Yong Wang, "Near-Rational Behaviour and Financial Market Fluctuations." Economic Journal, 103, no. 421 (1993): 1465.

[22] Robert J.Shiller, "From Efficient Markets Theory to Behavioral Finance." Journal of Economic Perspectives, Vol. 17, No. 1 (Winter, 2003): 93.

[23] Kent Daniel, Hirshleifer, David, and Avanidhar Subrahmanyam. "Investor psychology and security market under- and overreactions." Journal of Finance, 53, no. 6 (1998): 1839.

[24] Robert J. Shiller, "From Efficient Markets Theory to Behavioral Finance." Journal of Economic Perspectives, Vol. 17, No. 1 (Winter, 2003): 93.

smart money investors, and feedback investors. Feedback investors were those that bought after prices increased and smart money investors were those that sold after prices increased. Although most of the investors in the S&P 500 index mutual fund (Goetzmann and Massa's data source) did not trade a lot throughout the day, the smart money investors did profit more than the typical feedback investor[25]. Much of this research spawned from the discrepancy that the EMH asserted about irrational and smart money investors. If the market is efficient and irrational optimists buy a stock, smart money investors will be selling at the same time; and when irrational pessimists sell a stock, smart money investors will be buying, therefore eliminating the effect of irrational investors on stock prices through canceling out. The issue that arises with that belief is that finance theory does not necessarily imply that smart money investors fully cancel out irrational investors[26].

An issue that must be taken into consideration when reading economic literature is the methodology in which the author(s) used because "given enough time and massaging of data series, it is possible to tease almost any pattern out of most data sets. Moreover, the published literature is likely to be biased in favor of reporting such results. Significant effects are likely to be published in professional journals while negative results, or boring confirmations or previous findings, are relegated to the filing drawer or discarded[27]." Throughout my reviewing of the extensive amounts of literature that

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[25] William N. Goetzmann and Massimo Massa. "Daily Momentum and Contrarian Behavior of Index Fund Investors." Unpublished Paper, Yale University. 1999

[26] Robert J. Shiller, "From Efficient Markets Theory to Behavioral Finance." Journal of Economic Perspectives, Vol. 17, No. 1 (Winter, 2003): 96.

[27] Burton G. Malkiel, "The Efficient Market Hypothesis and Its Critics." Journal of Economic Perspectives, Vol. 17, No. 1 (Winter, 2003): 72.

pertain to the study of the efficient markets hypothesis and product announcements, numerous authors have a tendency to point out other authors flaws and inconsistencies, which only bring into question the validity of much of the published literature.

Over the past several decades, more and more articles have been written about product announcements and their implications toward market efficiency. There is even more literature based on the validity of the EMH. An argument strongly implied in much of the literature associated in favor of the EMH is if markets were inefficient, then the market should be an exploitable opportunity. The main points of the literature regarding product announcements are that markets tend to reward firms that produced a truly new product more than firms that are only upgrading an existing product and that the long-run determines the fundamental value of the stock.

CHAPTER IV

DATA, METHODOLOGY AND ANALYSIS

Data

There were three steps in the data collection process. First, product announcements needed to be collected along with the exact date of the announcement. Second, the returns for the companies associated with the announcements along with the daily average returns for the stock market were collected as well. Lastly, each companies beta at the time of the announcement needed to be calculated.

Product announcements were gathered from an online database called the Gale Group New Product Announcements/Plus (NPA/PLUS). This database contained the full text of press releases from all industries covering announcements related to products, with a focus on new products. Product announcements for new product introductions and product upgrades were collected over a 12 year period from November 1993 to December 2004. The purpose of collecting announcements over 12 years was to discover what effects economic activity and the general behavior of the stock market had with company returns. Announcements were used over multiple industries, but nearly half (47.67%) of the announcements were in computer related industries. If a company made multiple announcements over the course of one day in regards to product announcements or company earnings the announcements was excluded from the sample. The purpose of

this product announcement data collection method was to reduce the effect of any outside influences to stock price. The data sample consists of 276 announcements from 133 companies in 45 industries.

Yahoo Finance provided daily historical stock prices for each company that made an announcement. The adjusted close of each stock was used because it adjusts for stock splits and dividends. Weekly and monthly stock returns were not used in this study because there are too many outside factors that may have influenced a change in a securities rate of return; thus not allowing product announcements to be held independent. For each firm, stock prices were collected starting from the day prior to the announcement to 10 days after the announcement. Yahoo Finance also provided the historical prices of the S&P 500's exchange traded fund called Spider (SPY). These historical prices were collected because they gave an accurate indication of the daily average return of the stock market. The SPY prices were collected for the same days as the prices collected for the product announcements. Having gathered all the historical prices, returns for each firm could then be computed. Returns for each day were simply computed by dividing the difference of the previous day's closing price and that day's closing price by the previous day's closing price.

Lastly, each firm's beta and the US 3 Month Treasury Bill rate for the dates of the announcements were needed for the Capital Asset Pricing Model. Beta is measure of a stock or fund's risk in relation to the market and had to be computed through regression analysis.[1] Beta was an important number for this particular test and will be discussed

[1] Reilly, Frank K. and Keith C. Brown. *Investment Analysis: Portfolio Management.* (Ohio: South-Western, 2003).

further in the methodology section. Historical US Three Month Treasury Bill rates, which served as risk free rates, were provided by the St. Louis Federal Reserve's website.

Methodology

This section will describe the methods used in this study for the purpose of analysis. This study is examining if there is an overreaction to product announcements in the stock market. To examine an announcements impact on a firm's value or in relation to the rest of the stock market there will be multiple methods of analysis. The methods of analysis will be relatively based off two past studies by Woolridge and Snow (1990) and Chaney and Devinney (1992).

MARA Approach:

Since there is no definite equation on how to calculate abnormal returns, multiple methods have been created for its calculation, some of which are more representative of an abnormal return than others. This first method, the MARA approach, is used in the Woolridge and Snow study. The MARA approach is known as the market-adjusted returns approach. The return on day t for security i is calculated in this manner:

$$r_{it} = u_{it} + e_{it}^{2}$$

where r_{it} is the return for security i on day t. u_{it} represents the expected return for security i on day t and e_{it} is the stochastic error term. This error term is uncorrelated over time

[2] J. Randall Woolridge and Charles C. Snow. "Stock Market Reaction To Strategic Investment Decisions." Strategic Management Journal. 11, no. 5 (1990): 357.

and has an expected value of zero. The equation above can be rewritten as follows for the purpose of this study:

$$e_{it} = r_{it} - u_{it}^{3}$$

The term r_{it} represents the actual stock return for security i on day t. This return was calculated using adjusted closing prices, which excludes dividends and stock splits, to maintain constancy throughout the stock return data. The term u_{it} represents the mean return for the stock market on day t. The mean return was calculated using the S&P 500's exchange traded fund called the Spider. This fund is highly correlated with the S&P 500 Index and provides sufficient average daily stock market return data for this study. The calculated difference between r_{it} and u_{it} is the abnormal or unexpected return for security i on day t shown as the term e_{it}. The abnormal or unexpected return reveals the effect the product announcement had on the value and price of the security.

CAPM Approach:

This next approach is a modified version of Chaney and Devinney's approach. The CAPM, also known as the capital asset pricing model, is a commonly used approach on Wall Street today to give an indication of a securities expected return. The CAPM incorporates a securities relation to systematic risk (beta), the mean return for the stock market and the risk-free rate of return.[4] Deriving beta was a process of its own and will be discussed after this section. The equation is as follows:

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[3] Ibid.

[4] Reilly, Frank K. and Keith C. Brown. *Investment Analysis: Portfolio Management*. (Ohio: South-Western, 2003).

$$E[R_{it}] = r_{f,t} + \beta_i(R_{mkt,t} - r_{f,t})$$

where $E[R_{it}]$ is the expected return of security i on day t. The term $r_{f,t}$ represents the risk-free rate of return on an asset, which is the 3 Month Treasury Bill, on day t. β_i is the beta, or systematic risk, associated with security I and $R_{mkt,t}$ is the return on the stock market on day t. This approach is loosely based of the MARA method; instead of using the mean return of the stock market on day t, the expected return calculated by the CAPM is incorporated in to the equation as follows:

$$e_{it} = r_{it} - E[R_{it}]^5$$

where e_{it} represents another abnormal or unexpected rate of return. The CAPM was calculated twice because two different betas were substituted for one another. The explanation for two different betas will be presented in the following section.

Beta:

Beta is a numerical value that indicates a securities systematic risk in relation to the entire stock market. Unfortunately, historical betas could not be provided so each securities beta had to be calculated through regression analysis. The regression equation was more or less a manipulation of the CAPM equation for computational reasons. The beta regression equation is as follows:

$$(r_{it} - r_{f,t}) = \alpha + \beta_i (r_{mkt,t} - r_{f,t})$$

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[5] Chaney, Paul K., and Timothy M. Devinney. "New Product Innovations and Stock Price Performance." Journal of Business Finance & Accounting, 19, no. 5 (1992): 679.

where the only term that changes is $E[R_{it}]$ to r_{it}. Instead of using an expected rate of return in the equation, the actual rate of return is substituted. The term $r_{f,t}$ remains as the risk free rate of return on day t along with $r_{mkt,t}$ which is the stock markets return on day t. The number calculated in $(r_{mkt,t} - r_{f,t})$ is the dependent variable and is ran against the independent variable that is the number calculated in $(r_{mkt,t} - r_{f,t})$. The coefficient in front of the independent variable is beta. How this regression was ran calculated two different betas. One regression equation used a constant while the other one did not. Chaney and Devinney's regression equation added a constant, but the regression equation in this particular study excluded a constant. For reasons of comparison, the regression was ran with a constant as well, but those results are independent from this study's results and will be discussed in the following chapter.

To acquire accurate betas that are consistent with a securities actual volatility requires numerous observation points. For each firm two years of the daily stock returns, market returns and risk free rate returns were applied to each regression equation. For example, if a firm released a product announcement in April of 1997, both 1997 and 1996 returns were implemented in the equation to ensure the accuracy of each beta.

Abnormal Returns:

Thus far the methods have only shown the impact of each individual security over the course of one day. One securities abnormal rate of return is not representative of the market as a whole, therefore other methods of analysis needed to be taken in to account. To understand if firms were on average overreacting to product announcements, the average abnormal return was calculated using this equation:

$$AR_t = \sum_{t=1}^{n} \frac{e_{it}}{n}$$ [6]

All of the announcements were organized the day an announcement was made in to an event time. In this study, the event time is day 0. AR_t represents the average abnormal return for event day t and e_{it} is the abnormal return for security i on day t. The term n is the total amount of announcements in the sample.

The next step involves evaluating the impact of each product announcement on a securities price over time. The CAR (cumulative abnormal return) equation indicates if a security is impacted by the product announcement. The CAR was calculated as follows:

$$CAR_n = \sum_{t=1}^{n} AR_t$$ [7]

where CAR_n represents the cumulative abnormal return as of day t. In this study, CARs were looked at over 2, 5 and 10 days. AR_t is the average abnormal return for event day t. The CAR is significant in this study because it provides an answer to the impact of product announcements on stock prices. The null hypothesis being tested is CAR = 0. If CAR = 0 then the information given by the product announcement had no bearing on a firm's stock price. On the other hand, if the CAR $\neq$ 0 then stock prices over or under react to the information in the released announcements.

Results

In this study's sample of product announcements made by firms from 1993 to 2004, daily stock returns were gathered from Yahoo Finance. Two types of

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[6] J. Randall Woolridge and Charles C. Snow. "Stock Market Reaction To Strategic Investment Decisions." Strategic Management Journal. 11, no. 5 (1990): 357.

[7] Ibid.

announcements, innovative products and product upgrades, were analyzed to discover if either announcement provided higher excess returns, if any, than the other. Since many of the announcements were made before the closing bell on the previous day (day -1), that day's excess returns will be evaluated as well.

Outcomes of Woolridge and Snow Methodology:

Of the results, the methodology imitating Woolridge and Snow will be analyzed first. The date of the announcement's press release (day 0) and the prior day will be referred to as the 'announcement period'. The subsequent two trading weeks of daily stock returns were analyzed to capture the entire effect of the announcement. Mean unadjusted returns, the percentage of unadjusted returns greater than zero, mean abnormal returns and cumulative abnormal returns are displayed in Table 1.

All Investment Announcements:

Section A of Table 4.1 provides all summary statistics for days 0, 1, 5 and 10 of the 276 product announcements. The AR (mean abnormal return) for the announcement period (days -1 and 0) were -0.061 percent ($T = -0.168$, $p < 0.05$) and 0.845 percent ($T = 3.319$, $p < 0.05$). Day 0 had a significant positive AR while day -1's AR was negative. Of the 12 day period, day 0 by far had the largest AR. The CAR for the announcement period was considerably higher than the day 5 and 10 CARs at 0.784 percent. The day 5 and 10 CARs were 0.002 percent and -0.001 percent indicating that the abnormal returns after the announcement period were insignificant. Furthermore, the negative return trend after the announcement period is an indication that the market is correcting itself after the

overreaction. Therefore, out of the 12 day window the announcement period was the only time when firms reaped noteworthy abnormal returns.

To understand the magnitude of a 2 day 0.784 percent abnormal return, let's put this number in to context. If a company's market value was $10 billion, in just 2 days their market value will increase by $78,400,000.

TABLE 4.1

Product Announcements and Stock Returns (12 Day window)

	Day	Mean Unadjusted Return - R	Percentage Unadjusted Return Greater Than Zero	Mean Abnormal Return - *AR*	CAR
Section A: Overall Results All Investment Announcements (*n* = 276)					
	-1	-0.061	44.44	-0.061	-0.061
	0	0.847	54.12	0.845	0.784
	5				0.002
	10				-0.001
Section B: Two Types of Investment Announcements					
Introductions (*n* = 258)					
	-1	-0.061	54.83	0.060	0.060
	0	0.749	55.6	0.748	0.808
	5				0.002
	10				0.000
Upgrades (*n* = 18)					
	-1	-1.797	75	-1.794	-1.794
	0	2.246	55	2.243	0.449
	5				-0.010
	10				-0.013

Innovative Investment Announcements:

Section B of Table 4.1 provides all summary statistics for days -1, 0, 5 and 10 of the 259 product introduction announcements. The ARs for the announcement period were 0.060 percent ($T = 0.158$, $p < 0.05$) and 0.748 percent ($T = 2.821$, $p < 0.05$). Since the majority of all the investment announcements were introductions, the results are very similar to those of all investment announcements statistics. Day 0 had the largest AR compared to the other days in the 12 day window. The CAR for the announcement period was 0.808 percent while the CARs for days 5 and 10 were 0.002 percent and 0.000 percent. Once again, even though the CARs were positive after the announcement period they were negligible.

Upgrade Investment Announcements:

Section B of Table 4.1 provides all summary statistics for days -1, 0, 5 and 10 of the 18 product upgrade announcements. The ARs for the announcement period were -1.794 percent ($T = -1.523$, $p < 0.05$) and 2.243 percent ($T = 2.585$, $p < 0.05$). The results of this small pool of data shows considerably different results compared to those prior. The ARs in the announcement period were extremely volatile. Even though the announcement period had a 0.449 percent excess return, day -1 and day 0 both experienced siginificant losses and gains. The CAR for the announcement period was 0.449 percent while the CARs for days 5 and 10 were -0.010 and -0.013.

Outcomes of Chaney and Devinney Methodology:

Unlike the Woolridge and Snow study that examined the abnormal returns for the subsequent two trading weeks after the announcement, these results only examine days -1, 0 and 1. This study, based of Chaney and Devinney, still considers day 0 as the date of the announcement, although the announcement period includes day 1.

All Investment Announcements:

Section A of Table 4.2 provides all summary statistics for all product announcements during the announcement period (days -1, 0 and 1). The ARs for the announcement period were -0.81 percent ($T = -1.598$, $p < 0.05$), 0.41 percent ($T = 1.602$, $p < 0.05$) and -0.30 percent ($T = -1.446$, $p < 0.05$). The average excess return over the three day announcement period was -0.23 percent with CAR of 0.70 percent. The announcement period underperformed the market, although stocks on the day of the announcement did considerably beat the market by 0.41 percent.

Innovative Investment Announcements:

Section B of Table 4.2 provides all summary statistics for innovative product announcements during the announcement period (days -1, 0 and 1). The ARs for the announcement period were -0.77 percent ($T = -1.434$, $p < 0.05$), 0.29 percent ($T = 1.094$, $p < 0.05$) and -0.35 percent ($T = -1.609$, $p < 0.05$). The CAR over the announcement period dropped to -0.83 percent which is a 0.13 percent decline compared to all the product announcements. Only on the day of the announcement was there a positive abnormal return as the succeeding day seemed to correct for the market's mistake.

TABLE 4.2

Product Announcements and Stock Returns (3 Day window)

	Day	Mean Abnormal Return - *AR*	CAR
Section A: Overall Results All Investment Announcements (*n* = 276)			
	-1	-0.81	-0.81
	0	0.41	-0.40
	1	-0.30	-0.70
Section B: Two Types of Investment Announcements			
Introduction (*n* = 258)	-1	-0.77	-0.77
	0	0.29	-0.48
	1	-0.35	-0.83
Upgrade (*n* = 18)	-1	-1.46	-1.46
	0	2.20	0.74
	1	0.46	1.20

Upgrade Investment Announcements:

Section B of Table 4.2 provides all summary statistics for innovative product announcements during the announcement period (days -1, 0 and 1). The ARs for the announcement period were -1.46 percent ($T = -1.265$, $p < 0.05$), 2.20 percent ($T = 2.775$, $p < 0.05$) and 0.46 percent ($T = 0.761$, $p < 0.05$). Unlike innovative investment announcements, upgrades accumulated a 1.20 percent abnormal return over three days. The AR for the day of the announcement is very large and is most likely due to the inadequate sample size. Also, even though day 1 recorded a positive abnormal return the

announcement period still followed the same pattern as the other announcement; day 1 adjusted to the markets overreaction.

CHAPTER V

CONCLUSION

The stock market still remains as a chess game for investors. Strategy is of the utmost importance if a player wants to win and in the case of the stock market, investors playing are always adopting any new strategy they can get their hands on. In this study, the purpose was to examine if stocks overreacted to product announcements, thus giving an indication of the efficiency of the market. Market efficiency, a term coined by Eugene Fama, hypothesizes that markets "fully" reflect all available information in a security's price.[1] Since the introduction of the efficient market hypothesis, there has been an abundance of research dedicated towards supporting or refuting its validity in the financial world. To this day, nobody has been able to disprove the efficient market hypothesis. This paper intended to shed more light, in an unbiased manner, on the efficiency of financial markets by examining product announcements.

Multiple theories pertain to this thesis, but the EMH is the most important. The EMH can be broken down in to 3 sub-categories: *weak form*, *semi-strong form* and *strong form*. Briefly, a market is efficient in the *weak form* if it is not possible to use past prices and volume data to earn abnormal returns. Therefore, current prices always reflect information in past prices and volume patterns. A market is efficient in the *semi-strong*

[1] Eugene F. Fama "Efficient Capital Markets: A Review Of Theory And Empirical Work." Journal of Finance. 25, no. 2 (1970): 383.

form if it is not possible to use public information to earn abnormal returns. Current prices always reflect all available public information. Lastly, markets are efficient in the *strong-form* if it is not possible to use any information, public or private, to earn abnormal returns. In this case, current prices reflect all available information.[2] Investors use two techniques in selecting stocks to try and beat the market: technical analysis and fundamental analysis. Technical analysis is reliant upon past patterns to predict future movement. Fundamental analysis involves trying to figure out a firm's intrinsic value, and basing stock selection off what one thinks is a firm's fundamental value.[3]

Much of the literature pertaining to this paper's topic indicate that the market is not entirely efficient and that it overreacts. Woolridge and Snow (1990) looked at a variety of announcements and found that on average the market overreacted by 0.30 percent. Chaney and Devinney (1992) discovered that firms announcing a truly innovative product earned on average an excess of approximately 0.60 percent. The basis of this paper relates to the methodology surrounding the two published works noted above. The next section will provide an assessment of this paper's results in comparison to the results of Woolridge and Snow and Chaney and Devinney.

Comparison with Previous Studies

As mentioned before, the methodology implemented in this thesis was based off two past studies, one by Woolridge and Snow (1990) and the other by Chaney and Devinney (1992). Both studies provided valuable analysis methods but were published

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[2] Ibid.

[3] Malkiel, Burton G. "The Efficient Market Hypothesis and Its Critics." Journal of Economic Perspectives, Vol. 17, No. 1 (Winter, 2003): 59.

nearly fifteen years ago, which is a long time in the financial world. Over the course of fifteen years, multiple variables could alter the state of financial markets, such as economic and foreign activity. Therefore, an updated version of prior financial analysis may provide more accurate results to further enhance the understanding of present day market behavior. The intentions of this study were to mirror the approaches took in both Woolridge and Snow (1990) and Chaney and Devinney's (1992) papers with a few modifications. In some cases, the results in this thesis can be considered more accurate than those findings in the other two published works.

Woolridge and Snow:

The specific data used in this study varies with the data used in Woolridge and Snow. Woolridge and Snow incorporate announcements relating to joint ventures, research and development projects, capital expenditures and product/market diversification, while this study examines innovative product announcements and product upgrade announcements. For comparison, results pertaining to all investment announcements will be discussed. Table 5.1 illustrates the mean abnormal returns (ARs) and cumulative abnormal returns (CARs) for days -1, 0, 5 and 10 for Woolridge and Snow and this study. Section A provides results for this study and Section B provides results from the Woolridge and Snow study.

Both CARs during the announcement period are significantly large. This study's CAR may have been larger at 0.784 percent, but the ARs over the announcement period are drastically different than those in Section B. In Section A, the AR of day -1 was negative but the following day the AR quickly rose to 0.906 percent. In Section B, the AR of day -1 was positive and the following day the AR only rose by 0.050 percent.

While the CAR's of both studies are relatively close, the volatility of ARs in this study are of noteworthy mention. One speculation is that investors are more risk averse on day -1. If investors are unsure of the effect an announcement might have on the next day's prices, they may be more likely to sell on day -1. This may be a reason for the negative mean abnormal returns for day -1 in Section A. In this case, when the announcement was released the following day investors overreacted and bought shares, driving on average the securities prices up. On the contrary, Woolridge and Snow's results suggest otherwise. This difference in ARs may be a result of the different announcements analyzed for both studies. Investors seem more tentative about innovative products and

TABLE 5.1

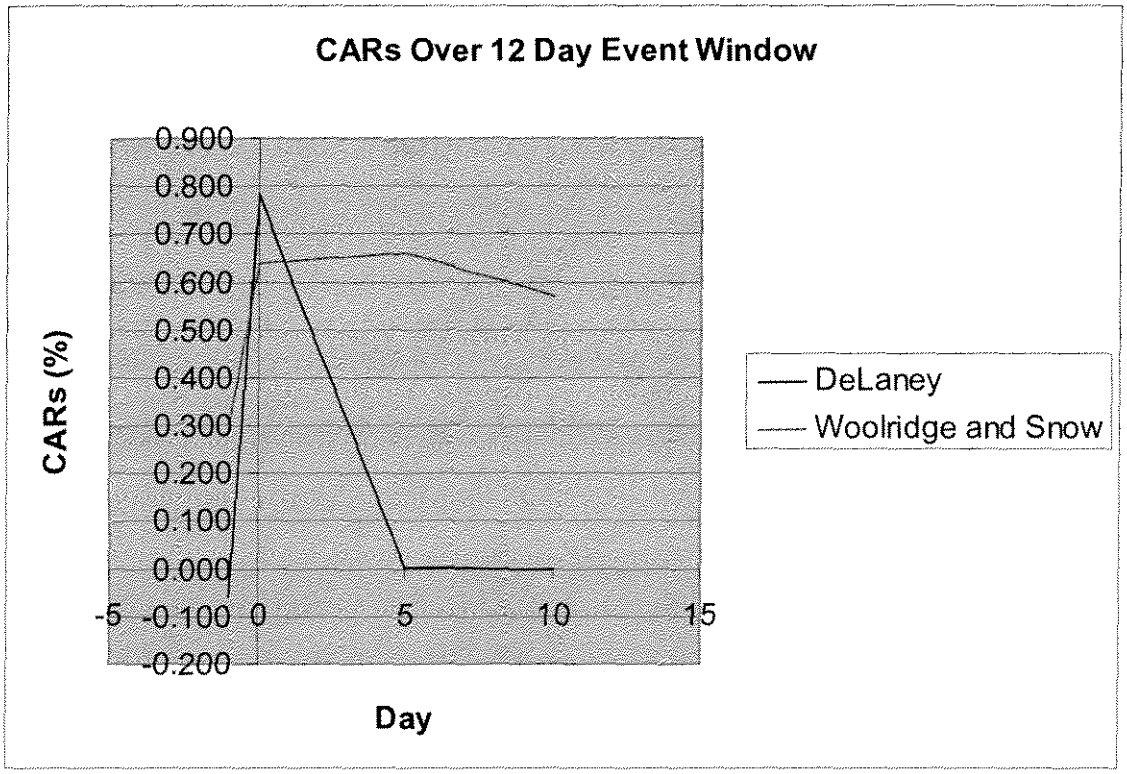
Product Announcements and Stock Returns (DeLaney and Woolridge/Snow)

	Day	Mean Abnormal Return - *AR*	CAR
Section A: Overall Results All Investment Announcements (DeLaney)			
	-1	-0.061	-0.061
	0	0.845	0.784
	5		0.002
	10		-0.001
Section B: Overall Results All Investment Announcements (Woolridge and Snow)			
	-1	0.300	0.300
	0	0.350	0.640
	5		0.660
	10		0.570

product upgrades than announcements regarding joint ventures, research and development, capital expenditures and product/market diversification.

As indicated in Figure 5.1, there is a similar trend in CARs in the following two trading weeks. The pattern of the CARs show a decrease in abnormal returns in the subsequent 10 days. The decrease is more significant in this study's CARs, but nonetheless both studies results indicate that the market is correcting for the overreactions. This coincides with Haugen's theory of stock reversion to the mean. The market's initial overreaction is recognized by investors as they realize that the announcements were unrepresentative of a stock's value. This recognition results in a decrease of the stock's price.

FIGURE 5.1



Chaney and Devinney:

The methodology implemented previously is an exact replication of Woolridge and Snow. The methods based off Chaney and Devinney's study are closely related, but improved. Since there is no set equation to derive abnormal returns, Chaney and Devinney used their own method to derive the returns. Instead of using the average market return, a slimmed down version of the CAPM was used to find the expected market return. The equation applied by Chaney and Devinney is as follows:

$$E\{R_{it}\} = a_i + \beta_i R_{mt}$$

where $E\{R_{it}\}$represent the expected return of security i on day t, a_i is alpha, β_i is beta of security I and R_{mt} is the return on the market for day t. In this equation lies the fundamental difference between the methodologies. Beta is the most important variable in this equation as it indicates the relative volatility of a stock in relation to the market. The way beta was determined by Chaney and Devinney was by running a regression of company returns against a constant (alpha) and the return of the market. The regression equation is as follows:

$$R_{it} = a_i + \beta_i R_{mt}$$

This study aimed at deriving a more accurate beta by adding more variables to this equation. The CAPM was used in regression analysis instead to calculate beta and is as follows:

$$(r_{it} - r_{f,t}) = \beta_i (r_{mkt,t} - r_{f,t})$$

The one variable excluded in Chaney and Devinney's regression was the risk-free rate of return. This variable is a key component of the CAPM because it projects a more accurate expected rate of return. Why Chaney and Devinney did not add this variable is unknown. They may reckon their methodology projects better results, but not necessarily more accurate results.

To compare results, beta was calculated twice. One equation used to find beta was roughly a replica of Chaney and Devinney. The main variable added to the regression equation was a constant, although the equation also included the risk-free rate, which was not used by Chaney and Devinney. Nonetheless, the risk-free rate would only provide more truthful results. So in essence, this imitation only provided more precise results too. The other equation used to derive beta, which also provided this study's results, is the CAPM that was ran in a regression without a constant. Essentially, after running the same regression twice, with one of the regressions ran without a constant, the betas were significantly different. On average, the betas constructed from the equation that was loosely based off Chaney and Devinney were 1.18 ($T = 18.85$, $p < 0.05$). The betas constructed using the CAPM without a constant were on average 0.97 ($T = 53.53$, $p < 0.05$). The significance in these two numbers lies in its vicinity to 1. Betas that are closer to 1 are generally considered more precise, not to mention the betas derived without a constant were more statistically significant at a 95% confidence interval.

Table 5.2 provides a statistical summary of the ARs and CARs computed over days -1, 0 and 1 for both betas that were constructed. Section A shows results for the ARs and CARs that were calculated without a constant when beta was derived. The ARs over the announcement period showed a pattern similar to those constructed using the

Woolridge and Snow methodology. The AR for day -1 was negative and the AR for day 0 increased to a positive 0.41 percent. The following day's (day 1) AR decreased to -0.30 percent. The CAR over the announcement period was -0.70 percent. Section B shows results for the ARs and CARs that were calculated with a constant. The ARs show a similar pattern to Section A's results, but are inflated. In both cases, the date of the announcement (day 0) had the largest AR. The main difference between these two sections is the CAR over the announcement period. Section A shows a -0.70 percent CAR and Section B shows a 0.74 CAR. In this number lies the distinction between the betas. Section A provides more truthful results than Section B because the beta calculated for Section A is more accurate. Section B's average AR over the announcement period was 0.25 percent, which is very close to Chaney and Devinney's average AR of 0.20 percent while Section A's was -0.23.

TABLE 5.2

Product Announcements and Stock Returns (with and without constant)

	Day	Mean Abnormal Return - *AR*	CAR
Section A: Overall Results All Investment Announcements (without constant)			
	-1 0 1	-0.81 0.41 -0.30	-0.81 -0.40 -0.70
Section B: Overall Results All Investment Announcements (with constant)			
	-1 0 1	0.05 1.21 -0.52	0.51 1.27 0.74

In this study, the methodology based off Woolridge and Snow (1990) and Chaney and Devinney (1992) provide different results, but similar conclusions can be drawn from both. In both cases, the mean abnormal returns were negative for day -1 but increased considerably on day 0. This is an indication that the market overreacts to these announcements, but then corrects for its overreaction during the following days. Again, both sets of results show a significant decrease in ARs during the succeeding days after the announcement. Of both types of announcements, product upgrade announcements were impacted the most, but the data set only contained 18 announcements. Of the two sets of outcomes, the methods based of Chaney and Devinney provide the most truthful results. Using the CAPM to calculate abnormal returns is a more sound and convincing method than the methodology used in Woolridge and Snow.

Both methods provided evidence that the market is not entirely efficient, particularly in the *semi-strong form*. On the date of the announcement, on average there was a clear overreaction to the securities' prices. The market became aware of the overreaction the following day and corrected the mistake. This is significant because if the market had been efficient, the information made public would have adjusted a stock's price to its true value. In this case, the stock price rose too much, thus the stocks were overvalued.

Implications

Previous research by Chaney and Devinney suggests that innovative companies are rewarded with positive excess returns in the stock market. This study implies otherwise, but from a faulty data sample. Only 18 out of the 276 product announcements

were product upgrades. This is an incredibly small sample and is not representative of the market or its behavior.

This study could have benefited by looking at more types of announcements. Different types of announcements are made everyday in the market and to fully understand market behavior, a diverse sample of data is needed. In addition, not every announcement is realized and accounted for in the market, hence the need for a diverse sample including a wide range of announcements. For example, product announcements related to ceased manufacturing of products, products released abroad and research and development on an upcoming product may be included.

In addition, it would be helpful if there was further research on calculating abnormal returns. Many empirical studies related to market reaction to announcements cannot be compared that easily because each published work derived the abnormal return differently. Such research would allow future studies to calculate results that are more relevant to one another.

Since the empirical work of much of the research directly related to stock price overreaction to investment announcements was completed before the internet boom, it would be beneficial if research on stock price reaction to announcements post-internet was conducted. Pre-internet, most investors found out how the market performed the following day in the Wall Street Journal. Presently, the field of communication has advanced exponentially allowing vast amounts of information to be exchanged in a split second, therefore allowing investment decisions by investors to be made more quickly. Does more readily available information on the internet enable investors to make more rational decisions and reduce the chances of stock price overreactions?

This study indicates the market has overreacted to product announcements, thus refuting the EMH in its truest sense. Markets still remain efficient, but only to a certain degree. These results add to the vast amount of literature pertaining to market efficiency and hopefully can be of use for future investors.

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