# STOCK SPLITS ANNOUNCEMENTS IN KENYA: A TEST OF STOCK MARKET EFFICIENCY 

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FULFILLMENT OF THE AWARD OF MASTERS DEGREE IN BUSINESS ADMINISTRATION OF THE UNIVERSITY OF NAIROBI, SCHOOL OF BUSINESS

## DECLARATION

## STUDENT'S DECLARATION

This research proposal is my original work and has not been presented for examination to any other university. Neither the proposal nor part of it should be reproduced without prior authority of the author.

Signature
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## SUPERVISOR'S DECLARATION

This research project has been submitted for examination with my approval as the University Supervisor

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## DEDICATION

This study is dedicated to my loving wife, Nelly, daughter, Amani, and my Mum and Dad who are my stronghold. Your smiles brighten my day and gives me the strength to go another day.

## ACKNOWLEDGEMENT

First and foremost, I thank Almighty God for his guidance and providence which has enabled me to undertake this project that has been involving in terms of time and resources.

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#### Abstract

A central issue in the analysis of markets is the degree to which they are efficient and investors care about market efficiency because stock price movement affects their wealth and are motivated to save and invest in the capital market only if their securities in the market are appropriately priced. Market inefficiency may thus affect consumption and investment spending which in turn influences the overall performance of the economy. This study sought to test the Nairobi stock exchange efficiency in the semi-strong form by assessing the stock market reaction to stock split announcement.

The study used an event study methodology to examine the market reaction to stock splits announcements through share price performance on the 11 companies that had conducted stock splits. The study used secondary data collected from NSE on the daily stock prices of the companies that had conducted stock splits and the NSE 20-Share market index for 30 day pre and post-split announcement. The study used Market Model (MM) to analyze the abnormal returns and price variability of the shares of the companies that announced the stock splits.

The study found that stock prices of the companies that had conducted splits had low or negligible abnormal returns following split announcement especially from the second day to the tenth day while the period prior to the announcement had high abnormal returns. The study concluded that though the stock market is efficient in the semi-strong form, it is not perfectly efficient. The study recommend that the CMA to put into place stringent measures to curb the possibility of insider trading owing to high abnormal returns prior to stock splits.


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# LIST OF ABBREVIATIONS 

| AAR | Average Abnormal Returns |
| :---: | :---: |
| AIG | American International Group |
| AR | Abnormal Return |
| ASRV | Average Security Returns Variability |
| CAR or CAAR | Cumulative Abnormal Return |
| CDSC | Central Depository and Settlement Corporation |
| CMA | Capital Market Authority |
| CPI | Consumer Price Index |
| EMH | Efficient Market Hypothesis |
| EPS | Earnings Per Share |
| FCD | Fully Convertible Debenture |
| GDP | Gross Domestic Product |
| IT | Information Technology |
| LSE | London Stock Exchange |
| MM | Market Model |

NSE

NYSE

OLS

OTC

SDD

SRV

STDEV

TVA

Nairobi Stock Exchange

New York Stock Exchange

Ordinary Least Square

Over The Counter

Specially Designed Dividend

Security Returns Variability

Standard Deviation

Trading Volume Activity

## CHAPTER ONE

### 1.0 INTRODUCTION

### 1.1 Background of the Problem

A central issue in the analysis of markets is the degree to which they are efficient. Although 'efficiency' has a variety of meanings in different contexts, a situation is sometimes termed 'efficient' if it is not possible to increase the well-being (utility) of any one person without reducing the utility of another; Pareto efficiency. In the analysis of stock markets, however, the examination of efficiency assumes an informational dimension, the existence of which may well be related to that of Pareto efficiency, but the meaning of which is quite distinct. In an efficient market, the competing market participants reflect information rationally and instantaneously on prices, making past relevant information useless in predicting future prices. An efficient market should react only to new information but since this is unpredictable by definition, price changes or returns in an efficient market, cannot be predicted (Ross, 2008).

According to Raja and Sudhahar (2010), in an efficient market, when a new information item is added to the market, its revaluation implications for security returns are instantaneously and unbiasedly impounded in the current market price. Reilly and Brown (1997) define an efficient market as one in which stock prices adjust rapidly when new information arrives and, therefore, the current prices of stocks have already reflected all information about the stock. Thus, the market leaves no pattern to exploit the trading opportunities and to make excess economic gains.

Fama (1970) distinguished three types of market efficiency. A market is said to be weak form efficient if past prices are useless in predicting future prices. If stock markets are weak-form efficient, then investors can not earn super-normal profits (excess profits) from trading strategies based on past prices or returns. Therefore, stock returns are not predictable, and hence follow a random walk. A market is semi-strong efficient if all publicly available information like inflation, interest rates and earnings have no predictive power, thus, the current market prices not only reflect all information content of historical prices but also reflect all the information, which are publicly available about the companies being studied. Investors, who base all their decisions on the information that becomes public, cannot gain above-average returns.

As Adelegan (2003) posits, the basic case for the semi-strong efficiency theory is that the actions of the many competing analysts, who make up the market, ensure that it is an efficient processor of information, and that the share price incorporates instantaneously and in an unbiased manner all available information. Thus, agents process information efficiently and immediately incorporate this information into stock prices. If current and past information is immediately incorporated into current prices then only new information or 'news' should cause changes in price. Since news is by definition unforecastable, then price changes (or returns) should be unforecastable. No information at time ' $t$ ' or earlier should help to improve the forecast of returns or equivalently to reduce the forecast error made by the individual (orthogonality ${ }^{1}$ ).

[^0]Finally, a market is strong form efficient if all information is reflected on prices, including the inside information. Since all information - even apparent company secrets is incorporated in security prices and thus, no investor can earn excess profit by trading on public or non-public information (Fama, 1970).

Investors always seek to establish market efficiency because stock price movement affects their wealth. An implication of an efficient market is that no excess returns can be made from this information because current prices already reflect the information. However, excess returns (if any) should not be statistically significant from zero (Fox and Opong, 1999). More generally, stock market inefficiency may affect consumption and investment spending and therefore influence the overall performance of the economy.

The levels of efficiency are nested; strong-form efficiency implies semi-strong form efficiency, and semi-strong efficiency in turn implies weak-form market efficiency (Dickinson and Muragu, 1994). This has made the concept of efficient securities markets to gain prominence in both the academic and business world of today and is now supported by empirical evidence from many of the world's markets. As Brealey and Myers (1984) puts it, the concept of market efficiency is not only widely accepted by academicians but it also permeates investment practice and Government policy towards the security markets.

A test of semi-strong form efficiency (Fama, Fisher, Jensen, and Roll, 1969) indicated that investors cannot earn an above normal return on publicly available information such as historical prices, volume information, accounting statements, annual reports, stock splits, dividend announcements, new issues of stock announcements, and earnings
announcements. When a market is semi-strong efficient, stock prices should reflect all information released making it impossible to earn above abnormal returns by acting on public announcements (ibid).

### 1.1.1 Stock Splits

Stock splits have proved to be a conundrum since it is a "nonevent" and nevertheless it has economic consequences for the firm involved (Lamoreux and Poon, 1987). A stock split simply involves a company altering the number of its shares outstanding and proportionately adjusting the share price to compensate. The balance sheet items remain same except that the total number of outstanding shares of the company increases proportionately to the ratio of split. Split can occur at any ratio. The most commonly used ratios are $2: 1,3: 2,5: 4,4: 3$ etc. After a two for one (2:1) split, each shareholder has twice as many shares but each represents a claim on only half as much of the corporation's assets and earnings (Dhar and Chhaochharia, 2008). Grinblatt et al. (1984) document rising stock prices at the announcement of such a transaction and furthermore, at the execution date itself abnormal returns (residual between the observed return and the expected return) are observed.

However, there are some question marks related to stock splits. First, since a stock split does not change the proportional ownership of shares, and secondly, as the market capitalization remains unchanged the question arises why firms engage in these transactions at all (McNichols and Dravid, 1990). Furthermore, there is a discrepancy between theory and practice. According to theory, the price of the stock should not change. This, since the split itself does not affect the firm's cash flow and is, as above
mentioned, merely an accounting change (Dennis and Strickland, 2003). In practice however, there is empirical evidence of significant abnormal returns related to the announcement of a stock split and the ex-split date (Asquith et al., 1989).

The implications of the semi strong efficient market is that the only way to use a split to increase the expected return, is if inside information concerning the split is signaled, i.e. made public (Dhar and Chhaochharia, 2008). The prime concern of this study is to analyze the information impact of the announcement of stock split on prices of stocks listed on Nairobi Stock Exchange (NSE).

### 1.1.2 Nairobi Stock Exchange

The stock market is a platform, which deals in the exchange of shares of publicly quoted companies, and government, corporate and municipal bonds among other instruments for money. The Kenyan Stock market, the Nairobi Stock Exchange which was formed in 1954 through incorporation into a company as a voluntary organization of stock brokers, is now one of the most active markets in Africa.

Nairobi Stock Exchange has been operating through the telephone with a weekly meeting at the Stanley Hotel till in 1994, when the market moved to its current location, on the 1st Floor of the Nation Centre, with the introduction of the Central Depository and Settlement Corporation (CDSC). The CDSC increased the market efficiency since investors are able to open share and bond accounts, in electronic accounts similar to their bank accounts hence buying and selling shares are made easier and quicker.

Currently there are 54 quoted companies representing different sectors namely the Agricultural, Commercial and Services, Finance and Investment, and Industrial and Allied sectors. Trading on the stock exchange has become a fashionable tool for raising capital. Investors have become increasingly aware of the potential of the Nairobi stock exchange (Kihumba, 1993). The mid eighties and early nineties witnessed many firms raising new equity from the stock market for the first time and consequently many investors investing in their shares through primary initial offering and secondary markets. NSE has grown to become the continent's fourth-largest exchange by trading volume and fifth largest by market capitalization as a percentage of GDP. It cross-lists some of its equities - most notably Kenya Airways - with neighboring East African bourses the Uganda Securities Exchange and the Dar es Salaam Stock Exchange in Tanzania.

NSE market index comprises of a selection of listed companies which represent a significant portion of market capitalization and trade actively. The three main indices at the NSE are the Nairobi Stock Exchange (NSE) 20 Index, NSE All Share Index (NASI) and the American International Group (AIG) index which are the three main indicators of stock market trends (Zimele, 03/07/2009). In Kenya, only 11 companies have conducted stock splits.

### 1.2 Statement of the Problem

Returns or gains on stocks is a fundamental concept in finance. Both investors and borrowers are concerned about returns and they seek to know the behavior of stock prices following a corporate event. Investors are, as a result, interested in knowing the efficiency of the capital market. Investors care about market efficiency because stock
price movement affects their wealth. The small and medium investors can be motivated to save and invest in the capital market only if their securities in the market are appropriately priced. Thus, stock market inefficiency may thus affect consumption and investment spending which in turn influences the overall performance of the economy.

Therefore it is imperative for stock market to be an efficient processor of information, and that the share price incorporates instantaneously and in an unbiased manner all available information. That is, how quickly and correctly security prices reflect available information show the efficiency of the capital market. Although stock market is composed of 'informed' and 'uninformed' traders, semi-strong market efficiency ensures that the stock prices reflect publicly available information hence none benefits more than the other. ${ }^{2}$

In the developed countries, many research studies have been conducted to test the efficiency of the capital market with respect to information content of events. Brennan and Copeland (1988) developed the information signaling theory that relates stock splits post announcement price drifts to the information content that splits signal gold prospects about a firm. However, Eugene and Daves (2004) repeated the study empirically and found out that if a firm announces stock splits, its stock price tends to rise but if the firm does not announce increases earnings and dividends during the next few months, the stock prices will drop to the earlier level. Rodney and Bartley (2007) observed that the

[^1]stock prices do not immediately and fully respond to stock spit announcement but that the information seems to be incorporated within the relatively brief period between the announcement and the split date is suggestive of the presence of some market friction that impairs the market ability to fully price new information rapidly.

In contrast in developing countries, very few studies have been conducted to test the semi-strong efficiency of the stock market with respect to stock split announcements. Taking Kenya in particular, Ondigo's (1995) study, that tested the semi-strong efficiency of NSE by analyzing the informational content of annual reports, did not provide evidence of semi-strong efficiency and found the results to be inconclusive. Ondigo thus suggested for further extensive research using other sources of public information.

Omondi's (2010) study sought to establish the stock market reaction to stock splits by examining the stock price performance during the event windows (pre-split, during announcements and post-split window). Omondi found that stock splits are followed by increase in stock market prices in some companies and decrease in others. Parkinson (1987) studied the bonus issue of companies listed at NSE found NSE to inefficient. However, Parkinson focused on monthly and weekly stock data respectively.

Muthui (2009) focused on investigating the effect of stock splits on stock prices with a specific view to test the existence or absence of abnormal returns after stock split announcement at the NSE with an objective of determining whether stock split announcement has significant effect on stock prices. Muthui's study assumed that capital markets are sufficiently efficient to evaluate the impact of information arising from simultaneous events and factors that occur alongside stock splits. Chemarum (2009)
examined the effect of stock splits at the NSE with the aim of establishing how NSE reacts to the stock splits announcements. Chemarum found that Kenyan stock market reacts positively to stock splits as shown by increases in volumes of shares traded around the stock split and increases in trading activities after the stock splits.

However, these studies lacked depth and comprehensiveness which this study seeks to leverage from. Although Omondi's (2010) study on stock splits at NSE did find that stock prices increase or decrease following stock splits announcement, she did not look at how quickly NSE do assimilate stock splits announcement in stock prices. Furthermore, her study did not use any model but only relied on trendlines to depict stock market reaction to stock split. Muthui's (2009) study did not test the NSE efficiency but was based on the assumption that capital markets are sufficiently efficient to argument the impact of information arising from simultaneous events and factors that occur alongside stock splits and that the existence of significant abnormal returns was purely driven by stock splits announcements. Just as Omondi and Muthui, Chemarum (2009) did not test for market efficiency but focused on how NSE reacts to stock split announcement. This study improves on previous studies by assessing the speed with which share prices adjust to the information contained in stock splits using daily data at Nairobi Stock Exchange (NSE). Further, this study will use market model (MM) to test the market efficiency and test the speed with which split announcement is incorporated in stock prices.

### 1.3 Research Objective

### 1.3.1 Broad Objective

To find out whether Nairobi stock market is efficient in the semi-strong form by testing the responsiveness of stock prices to stock split announcements.

### 1.3.2 Specific Objectives

The following specific objectives are developed from the broad objective:
i. To examine the information content of stock split announcement at NSE
ii. To test the speed with which the stock split announcement contained information impounded in the share prices of companies listed at NSE.

### 1.4 Importance of the Study

A study of stock market efficiency is one key area that will be an eye-opener for investors, academia and government as listed below:

## Investors

By testing the market efficiency of NSE, the study would be an eye opener to the current and would be investors in NSE as they will know whether their stock prices would be influenced by the current publicly available information or not. Given that some investors peg their stock investment on past information and prices, the findings of this study would thus recommend deviance from such practices if NSE is semi-strong efficient.

## Government

As already established stock market efficiency affects consumption and investment spending hence overall performance of the economy, thus the study findings by establishing the state of NSE efficiency would be invaluable to the government. The government by knowing the efficiency of NSE will thus make proper policies to mitigate poor performance of the economy owing to market inefficiency.

## Management

This study will also be of benefit to corporate management as they would learn how stock splits would cause the market to react by the adjustment in the stock prices. Hence, they would determine whether it is appropriate to conduct stock splits or not.

## Regulatory Bodies

Regulatory agencies such as NSE and Capital Market Authority (CMA) can use the study to regulate the operations of listed companies in the stock exchange. The study will enable the regulatory authorities to device how to set rules and regulations governing the operations of the stock exchange so as to make sure that managers/companies do not manipulate stock prices by conducting splits. Owing to market reaction (overreaction or normalcy) the regulators would know whether to effects the "circuit-breakers" or not. .

## Academicians

Though some studies have been conducted on semi-strong market efficiency they have been inconclusive as Ondigo's (1995) study suggests. This study will beneficial to the
academicians in Kenya by narrowing the knowledge gap. The study will form a good base upon which further research will be based since it will help in forming empirical study and act as a source of secondary material.

## CHAPTER TWO

### 2.0 LITERATURE REVIEW

### 2.1 Introduction

This chapter presents the literature that has been done on efficient market hypothesis develops several methods that can be used to test the efficiency. The chapter is thus structured into market efficiency theories, informational disclosure and event studies, studies on semi-strong efficiency and tools used for semi-strong form efficiency.

### 2.2 Reaction of Stock Market to Splits

Several hypotheses have tried to explain the reaction of the market around the announcement day and can be summarized as follows:

### 2.2.1 Signaling Hypothesis

It interpreted the positive stock market reaction to split announcements as an investors' response to managers' signaling favorable inside information. Signaling explanations are consistent with abnormal increases in earnings and/or dividends around the split.

Brennan and Copeland (1988), McNichols and Dravid (1990), and Brennan and Hughes (1991), interpreted the positive stock market reaction to split announcements as a response to managers signaling favorable inside information. Signaling explanations are consistent with abnormal increases in earnings and/or dividends around the split. When a manager believes that the future share price will decrease, he may not be willing to split the stock due to the increased cost of trading a lower priced stock, or due to their
reluctance to split the stock and then have the share price fallen below the manager's perceived optimal trading range. While managers may not explicitly intend for the split to be a positive signal about the future prospects of the firm, the split conveys information to the market. Institutional owners may be better able to take advantage of this signal, compared to individual owners, either because they trade much more than individuals, and are not as wealth constrained, or because they are more efficient at interpreting and processing the signal.

### 2.2.2 Liquidity Hypothesis

The most common rationale behind stock splits according to this hypothesis is that there is an optimal price range for securities. This optimal price range is a relatively lower price for the underlying security. It is assumed that the liquidity/marketability of the security will improve after the split, as the lower price of the stock will attract more small investors.

The most common rationale behind stock splits according to the liquidity hypothesis is that there is an optimal price range for securities. The stocks that trade in this range are presumed to be more liquid since they have lower brokerage fees as a per cent of value traded. This optimal range is considered to be a compromise between the desires of wealthy investors and institutions that will minimize brokerage costs if securities are highly-priced, and the desires of small investors who will minimize odd-lot brokerage costs if securities are low-priced. The optimal trading range hypothesis is in contrast to the decrease in trading activity after a stock split that was observed by Copeland (1979) and Conroy, Harris and Bruce (1990). Also, Muscarella and Vetsuypens (1996) showed
that liquidity after a stock split improves which is accompanied by wealth gains for the investors. Their findings support the model of Amihud and Mendelson (1986) that predicts a positive relationship between equity value and liquidity. According to this model, rational investors discount illiquid securities heavier than liquid ones due to the higher transaction costs and the greater trading frictions they face.

### 2.2.3 Retained Earnings Hypothesis

In declaring a stock distribution that reduces retained earnings, managers are seen as signaling their confidence in being able to replenish the retained earnings account with future earnings' streams.

It is generally accepted that firms declaring stock distributions of 25 per cent or greater consider them as stock splits which, therefore, have no effect on retained earnings. Stock distributions of less than 25 per cent are considered as stock dividends that reduce the retained earnings account. Since stock dividends reduce retained earnings, and thus the firm's ability to pay cash dividends, they have been viewed as conveying information regarding managers' outlook about future earnings. In declaring a stock distribution that reduces retained earnings, managers are seen as signaling their confidence in being able to replenish the retained earnings account with future earnings' streams. In effect, the signal has value because it is costly. This line of reasoning has been called the "retained earnings hypothesis" (Peterson, Millar and Rimbey, 1996).

### 2.2.4 Neglected-Firm Hypothesis

It states that if there is little known about a firm its shares trade at a discount. Thus, firms use the split to both draw attention and ensure that information about the company is going to be spread wider than before.

Arbel and Swanson (1993) in the context of stock splits predominantly propose the neglected-firm hypothesis. It states that if there is little information about a firm, its shares trade at a discount. Thus, the firm's managers use the split to draw attention to ensure that information about the company is wider recognized than before.

### 2.2.5 Optimal Tick Size Hypothesis

A company may split its stock to move its share price into the range where the institutionally mandated minimum absolute tick size is optimal relative to the share price. Angel (1997) introduced the optimal tick size hypothesis. According to this hypothesis, in equity markets there is an institutionally mandated minimum absolute tick size, which is optimal relative to the share price. A wider tick size reduces transaction costs and offers more incentives for limit orders, enhancing liquidity. On the other hand, a wider tick size increases the cost to investors inherent in a wider percentage spread. Hence, there is a cost trade-off and an optimal point where the companies want to be. A stock split is one mechanism used by the companies to move their share prices into the optimal range of the tick size.

### 2.2.6 Self Selection Hypothesis

It states that managers use splits to move share prices into a trading range, but condition their decision to split on expectations about the future performance of the firm. Ikenberry, Rankine and Stice (1996) used the self-selection hypothesis as a synthesis of the signaling and the trading range hypothesis. In particular, it states that managers use stock splits to move share prices into a trading range, but condition their decision to split based on expectations about the future performance of the firm.

### 2.3 Market Efficiency

The notion of stock market efficiency, first introduced by Fama (1965), has played a central role in both theoretical and empirical work on the reflection of information in stock prices. As defined by Fama (1970), a stock market is efficient if prices always fully reflect available information. Information is divided into three subsets, distinguishing between weak, semi-strong and strong form efficiency with respect to historical prices, publicly available information, and private information, respectively. A related strand of literature, reviewed in Verrecchia (2001), has dealt with the theoretical modeling of how the disclosure of information affects investors as reflected in stock prices and trading volume. Grossman and Stiglitz (1980) stated that prices can only fully reflect costless information, since there must be a return to acquiring information at a cost, otherwise there will be no information acquisition. This insight led to a revised definition of efficiency in Fama (1991), where two versions of the hypothesis that security prices fully reflect all available information are given. The strong version stipulates that information and trading costs are always zero, while the weaker version states that prices should
reflect information to the point where the marginal benefits of acting on information do not exceed the cost. As noted in Ball (1994) this in essence involves a reclassification from the three earlier and more statistically-based information subsets to subsets based on the cost of information. Empirical work has to a large extent supported the efficiency hypothesis, although several anomalies have been uncovered (Fama, 1991 and Kothari, 2001), for example, the post announcement drift, which concerns the tendency for stock prices to continue to drift after information disclosures.

The EMH states that security must fully reflect all available information. This theory has been subjected to much research and analysis, and has been a major source of disagreement between practitioners and academics (Copeland and Galai, 1983 and Fama, 1998). Prior to 1950 's it was believed that traditional investment analysis could be used to ant perform the stock market. In 1950's studies emerged (Kendall, 1953) that changes is security prices followed a random pattern. This generated theorizing and research that led to the efficient market notion (Kiio, 2006).

At the random reception of information the percentage price changes should be random since news is by definition unpredictable and thus resulting price changes must be unpredictable and random. As a result, prices fully reflect all known information and even uninformed investors buying a diversified portfolio at the tableau of prices given by the market will obtain a rate of return as generous as that achieved by experts. This happens if the market is efficient. If the market is inefficient, there may be patterns of share prices. The prices could be a series of price increases followed by price decreases (Kiio, 2006)

The advocates of behavioral finance attributes the abnormal returns after stock split as purely based on ability of the market to digest the corporate news and factor the value of the information in the stock prices. Nourredine (1998) observes that in perfect capital markets, stock splits warned neither create nor destroy value. But in real world stock splits have an impact on value and therefore firms splits their stocks which they would not make an effort to do if it was completely irrelevant.

### 2.4 Informational Disclosures and Event Studies

While the efficiency hypothesis avoids the issue of how individuals process information and implicitly assumes homogeneous information, the disclosure literature has provided additional insight by more explicitly modeling this process and allowing for heterogeneous information. Indeed, Kim and Verrecchia (1997) show that empirical observations regarding the behavior of trading volume and price around announcements can only be supported by a theoretical model that allows for both heterogeneous private information about the value of the firm (pre-announcement information) and diverse investor interpretation of the disclosure due to heterogeneous event-period information. Their results show that the change in stock price depends on the average preannouncement and event-period information. Underscoring this result, Liang (2003) finds a significant positive relationship between the post-earnings announcement drift and heterogeneous information. Finally, the theoretical paper by Holthausen and Verrecchia (1988) suggests that the stock market's reaction should be inversely related to the level of pre-disclosure information, which is referred to as the pre-disclosure information hypothesis. These theoretical and empirical studies therefore indicate that the information environment plays a central role in the stock market's reaction to information disclosures.

Studies of the semi-strong form of the efficient markets hypothesis can be categorized as tests of the speed of adjustment of prices to new information. The principal research tool in this area is the event study as it examines the effect of an announcement on share price as a test of the semi-strong form of the EMH. Event studies indicate that security prices respond efficiently to new information. It remains possible that assets may be persistently over or under-valued over long periods of time. It is more difficult to test whether prices conform to fundamental values, than it is to test whether prices respond appropriately to information.

Nonetheless, despite the difficulty of testing whether the level of security prices is correct, the literature has also evolved in this direction. Shiller (1981) examines the variation in stock market prices, and finds that price fluctuations are too large to be justified by the subsequent variation in dividend payments. Shiller finds that "measures of stock price volatility over the past century appear to be far too high - five to thirteen times too high - to be attributed to new information about future real dividends.... The failure of the efficient markets model is thus so dramatic that it would seem impossible to attribute the failure to such things as data errors, price index problems, or changes in tax laws."

### 2.5 Studies on Market Efficiency

In the developed markets, many studies have been conducted to test the efficiency of stock markets with respect to corporate event announcements. However, only very few studies have been conducted in developing countries. Some of the select studies relevant to the semi-strong efficiency are reviewed here-after:

Beaver (1968) examined the reaction of the Trading Volume Activity (TVA) and Security Returns Variability (SRV) to annual earnings announcement with a sample of 143 New York Stock Exchange (NYSE) firms. The result indicated 33 percentage increases in TVA and 61 percent increase in SRV in earnings announcement week over the non-announcement weeks. A study by Pinches (1970) found that the random walk hypothesis implies that the price movements are virtually independent of past price movement. The study reveals that the random - walk hypothesis may be incorrect or, at least incomplete.

Obaidullah (1990), in his paper on the adjustment of stock price to half-yearly earnings announcement in India, studied 33 securities which performed well. Obaidullah reported that earnings showed an increasing trend much before the announcement week. Srinivasan (1997) examined security price behavior associated with rights issues related events and provides evidence on corporate capital structure, capital market efficiency and event study methodology. The author concludes that a rights issue of equity is seen as 'bad' news by investors and a rights issue of fully convertible debenture (FCD) is seen as 'neutral' news. Fama (1995) presented evidence on the nature of the earnings information conveyed by stock splits during 1982-1989; a period of lower inflation and higher real economic growth. Results for 1982-1989 indicate that the market interprets stock splits as signals of subsequent earnings increase. Dimson and Mussavian (1998) conducted a study on market efficiency and found that the efficient markets hypothesis is simple in principle but remains elusive. It is hard to profit from even the most extreme violations of market efficiency. The efficient markets model continues to provide a framework that is widely used by financial economists.

Im, Dow and Grover (2001) evaluated the effectiveness of information technology investments. In this study, the researcher examined the changes in the market value of the firm as reflected in the stock price in response to IT investment announcements. Reactions of price and volume were negatively related to firm size and became more positive over time. Jijo and Rao (2002) in their study, "Market Reaction to Stock Splits An Empirical Study", have examined the reaction of stock prices around the date of announcement of stock splits and ex-split date. It was found out that on the date of announcement, there was an abnormal return of 5.27 percent and on day $+1,2.42$ percent. The result of abnormal returns around the ex-split day shows that much of the abnormal returns take place on day $0(3.68 \%)$ and day +1 (2.04\%). A study by Partrick Dennis (2003) investigated the stock splits and liquidity in the case of the Nastaq -100 Index Tracking Stock and found that the average daily turn over before the split was 23.95 percent and after the split was 22.81 percent. A " $t$ " test for difference in mean failed to reject the hypothesis that the turnover before the split (the $t$-statistic is 0.8 ) comparing the number of traders before and after the split. It is apparent that there was a little less than twice as many traders after the split than before. A study on Market reaction to stock market splits in India by Gupta and Gupta (2007) maintains that stock splits are associated with positive abnormal returns around the announcement. By and large splits are found to improve the trading volume of shares and there was increase in the daily number of traders. But they do not increase the daily turnover and consequently the liquidity of stocks in India. At the end, the author concluded that the majority of shares which underwent split were trading at low market prices. It appears that reasons for a
stock split by low priced companies could be explained by neglected firm hypothesis, which appears to be valid for the Indian stock market.

Oppong (1980) examined the information content of 580 annual earnings announcements of 197 firms in the period 1966 - 1970. The sample selection criteria was consistent to that used by Beaver (1968). The measure of information content was the residual return. Oppong considered the magnitude of the residual return and not the direction. After extensive analysis of the residuals, Oppong concluded that the annual earnings of firms sampled have no information content. In his words "... even if the annual earnings reports of the sampled firms do have information content, the residual variance information measures are not capable of capturing it. In other words Oppong suggest that Market Model may not be appropriate for the sample of firms he selected. However, Oppong's conclusions could be associated with the firms in the sample. Since information is available form other sources (for example interim reports, dividends, bonuses and other campy announcements), unless these other sources are controlled, annual earnings report may turn to have no information content.

Morse (1981) using a sample of 25 NYSE/ASE stocks and 25 OTC stocks in the period 1973 - 1976, examined the behavior of both the trading volume activity and security return variability. Morse reported both increased trading volume activity and increased variability at the time of earnings release for both samples. As opposed to Grant (1980), Morse reported no significant differences between NYSE/ASE and the OTC samples for both measures. A possible reason for this could be the fact that Morse's OTC sample was drawn from a population of actively traded securities. All the same the study shows that earnings release for both OTC and NYSE ASE firms have information content.

Foster (1981) also reported consistent findings using security return variability measure for a sample of interim and annual earnings announcement by 53 US firms over the period 1963-1978. The conclusion was that" $\ldots$ in the two days trading period up to and including the period of earning in the WSJ, there was a 78 per cent increase in the security return variability relative to the variability of two day security returns in the non - announcement periods". The sample was then partitioned into portfolios on an industry basis and the researcher focused his analysis on whether differences in security return variabilities existed across industries in the selected sample. The conclusion was that "... Industry membership appear to be an important variable explaining differences across firms in the magnitude of security return variability statistic at the time of announcement.

Schwerk (1981) examined the relationship between stock returns and inflation. He examined the daily returns to the Standard and Poor's Composite portfolio around the Consumer Price Index (CPI) announcement dates from 1953-1978. Schwerk used the residual method in his analysis. His conclusions were that the stock market seems to react negatively to the announcement of unexpected inflation in the CPI, however the magnitude of the reaction was small. Interestingly the stock market seemed to react at the time of announcement (about one month after price data were collected), thus the CPI data had information content according to this study.

Studies that have examined the behavior of security prices at the time of dividend release include Asquith and Mullins (1983), Brickley (1983) and Dielman, and Oppenheimer (1984). Asquith and Mullins examined a sample of firms that either paid their first dividend in their corporate history or initiated dividend after omitting them for at least ten years. The time period of the study was 1954-1980. Brickley on the other hand
examined a sample of specially designed dividend SDD's labelled by management as "extra special or year end". The sample was 165 SDD's made by NYSE/ASE firms in the period 1969-1979. Dielman and Oppenheimer (1984) also examined a sample of 202 NYSE firms that made large dividend changes in the period 1969-1977. In all the above studies the conclusion was that "... firms that increase dividends, announce extra or special dividends, or initiate dividend payments for the first time experience positive abnormal returns. Firms that decreased dividends or omit payments altogether experience negative abnormal returns". These results are consistent with the hypothesis that capital markets use dividend release as a signal about the future earnings prospects of the firm and hence they have information content.

McNichols and Manegold (1983) using a sample of 34 firms compared the average relative variance measure for annual announcement before and after firms began reporting quarterly earnings (ASE firms were required to report earnings quarterly from 1962 but before then many ASE firms only reported earnings annually). McNichols and Manegold defined the relative variance measure similar to the abnormal return variance used by Beaver (1968). They calculated the mean and variance of daily rates of return for the non-announcement period for each firm and then calculated the return variance of me announcement period as the square of the difference between mean non-announcement return and the daily return. The researchers found that the relative variance measure was significantly lower after the commencement of quarterly reporting. This evidence is fairly consistent with the relative reduction of information content of annual earnings reports following the introduction of quarterly reporting. The evidence from this study indicate
then that both interim and annual earnings have information content, however some information content of annual report is already incorporated in interim report.

Patell and Wolfson (1984) used a sample of 96 firms listed on the NYSE/ASE to examine the intra day behavior of security returns in the period surrounding the earnings announcement. They examined the number of extreme security price changes in a 26 hour trading period surrounding each announcement. An extreme price was defined as one that falls in either of the 5 percent tails of the distribution for the appropriate one hour or overnight trading period. The researchers concluded that" ... there is a very strong reaction at the announcement, the major portion of which decays within two hours but with detectable traces that linger in the following day". Thus earnings have information content.

Richardson (1984) examined a sample of 153 NYSE/ASE firms in the period 1976-1978. Using the security return variability measure, he computed the residual during the announcement of annual earnings reports. Richardson reported that there was a 40 per cent increase in the variability of security returns during the announcement of annual earnings reports. On partitioning the sample into firm size decide and re-examining the mean security return variability, Richardson found other variables that explain the magnitude of the variability of the security returns as: the extent of information available to market participants and the extent of information available from macro sources. Richardson's study seem to suggest that the effect of annual reports on security prices depends on the quantity of information available within the stock market and from sources other than the market.

Maingut (1984) sampled 100 firms listed in the London Stock Exchange (LSE) in the period 1976-1978. Included in the sample were firms that had only one dividend announcement in the week of annual earnings announcements (UK earnings and dividends are announced at the same time therefore one can only examine the impact of both earnings and dividends). The mean return variability in the announcement week was compared to the mean for 8 weeks relative to the announcement week. The conclusion by the researcher was that " ... the annual earnings number released by UK companies do possess information content". While the maximum response did take place at the announcement week, there did appear to be some anticipatory reaction in the week preceding the announcement.

Waymire (1984) examined a sample of 479 point projections of annual 'BPS by management reported in the WSJ. A consensus forecast was then calculated as the average of the analyst's forecast of annual EPS which was then used to proxy expected earnings. Forecast deviations were then computed. Waymire then exarnL.'1ed the security returns in the three day trading period surrounding the date of reporting of the management forecast. The conclusion was that a significant positive association exist between magnitude of forecast deviation and the magnitude of abnormal returns in the period immediately around the forecast disclosure date.

Emanuel (1984) examined a sample of 1196 earnings announcement by New Zealand companies in the period 1967-1979. He computed the magnitude of the unexpected earnings change and formed six portfolios based on ranks of observations from the most positive to the most negative unexpected earnings release. The cumulative abnormal returns in the 50 weeks up to and including the earnings release were computed for all the
six portfolios. Since new Zealand firms typically release dividend information with earnings information, Emanuel examined that combinations of earnings changes and dividend changes in the same period. Emanuel concluded that security returns were positively correlated with the sign and magnitude of both the unexpected earnings and unexpected dividend information.

In Kenya, Parkinson (1987) studied 50 companies continuously quoted in the NSE in the period 1974 - 1978. Out of these companies 22 made 28 bonus issues. Parkinson found out that using a particular trading strategy, there was an abnormal gain of 6.2 per cent per month (about 74.4 per cent per annum) associated with these issues. Parkinson concluded that this was an example of technical inefficiency. Parkinson however noted that this trading strategy could not be applicable due to market thinness and the astuteness of investors.

Ondigo (1995) examined the information content annual reports of 18 "blue chip" companies quoted in NSE in the period 1990-1994. He used market model to measure the information content by analyzing, residual returns, whose parameters were estimated by means of Ordinary Least Square (OLS) regression using realized values of the individual stock returns and the returns of the market during the non report period. The mean residuals were then tested for significance at 5 per cent level. The researcher found out that the annual reports and accounts of the sample firms for the period under study do not have information content which are statistically significant. Thus, the study did not provide any evidence for semi strong efficiency of NSE.

Omondi (2010) analyzed the market reaction to stock splits in an effort of determining factors promoting stock splits practices in Kenya. The study analyzed market reaction to stock splits during pre-announcement period, announcement period and after the books closure. Omondi found that stock prices of companies that conducted the splits to increase or decrease immediately during the split announcement period.

A general criticism of the residual analysis methodology had been presented by Roll (1977) and Foster (1986). These scholars argue that cause and effect between information and security prices is especially difficult to measure because information is continuously causing price movements and the set of information affecting the security prices is extremely large. It is thus very difficult to isolate the effect of one piece of information. This methodology is not always capable of detecting information. Stronger evidence from efficient market research exist where there is information content rather than where there is none.

A weakness also cited of capital market research is that it is a joint test of both information content and market efficiency. The absence of price response is usually interpreted to mean the information tested has no information content. This interpretation is only correct if the market is efficient. But if the market is inefficient there is no way of determining what the absence of the price response means.

## CHAPTER THREE

### 3.0 RESEARCH METHODS

### 3.1 Introduction

This chapter deals with the way the research was carried out and the methods used in enabling the study achieve its main objective of finding out the market efficiency of stock market in Kenya by analyzing the semi-strong form efficiency at NSE. The research design used in this study is explained in detail. The population of study, the sampling method and sample population are also explained herein. The chapter also deals with the way in which data was collected as well as the data analysis method.

### 3.2 Research Design

The study used the event study methodology to examine the market reaction to stock splits announcements through share price performance, thus determined whether NSE was efficient in the semi-strong form. The event study approach was introduced by Fama et al. (1969) and is common when investigating stock price effect on specific types of events, such as for example stock splits.

Since the study sought to investigate the market efficiency of stock market in Kenya by analyzing the reaction of the stock market (NSE) to the information availed to the market, a time-series design was deemed the best design to fulfill the objective of the study.

### 3.3 Data Collection Instruments and Procedure

The study made use of secondary data sources available at the NSE offices. The secondary material was collected on the data available on the daily closing stock prices and the market index (NSE 20-Share Index). According to Blasco et al. (1997), it is appropriate to fix the time scale at a sufficiently long interval (e.g. daily or weekly) to avoid the dynamics of market microstructure without running into non-stationary problems.

Daily closing stock prices for all listed companies was obtained from NSE database on all the companies that had issued stock splits. In Kenya, 11 companies had conducted stock splits by mid of 2010 (see appendix II).

### 3.4 Data Analysis

The study sought to test whether Nairobi stock market is efficient in the semi-strong form; hence, the prices should reflect the present information. In order to test for this the analysis was done in the following way to empirically test the informational efficiency of the NSE with special reference to stock splits. This study used the market model (MM), which Brown and Warner (1985) find is well-specified under a variety of conditions when using daily returns. According to Brown and Warner, a market model is estimated for each firm using Ordinary Least Squares.

## a) Analysis of Average Security Returns Variability (ASRV or SRV)

Security returns variability (SRV) was used to analyze the reaction of the market to stock splits and was calculated as shown below:
$\mathbf{S R V}_{\mathrm{i}, \mathrm{t}}=\mathbf{A R}_{\mathrm{i}, \mathrm{t}}^{\mathbf{t}} / \mathbf{V}(\mathbf{A R})$

Where: $\mathrm{SRV}_{\mathrm{i}, \mathrm{t}}=$ Security Returns Variability of security i in time t
$A R_{i, t}^{2}=A b n o r m a l$ returns on security $i$ on day $t$
$\mathrm{V}(\mathrm{AR})=$ Variance of Abnormal Returns during the announcement period

However, the Abnormal Returns (AR) was calculated using by the equation as below; $\mathbf{A} \mathbf{R}_{\mathrm{i}, \mathrm{t}}=\mathbf{R}_{\mathrm{i}, \mathrm{t}}-\mathbf{R}_{\mathrm{m}, \mathrm{t}}$. Where $\mathrm{R}_{\mathrm{i}, \mathrm{t}}$ is the actual returns on security i at time t and $\mathrm{R}_{\mathrm{m}, \mathrm{t}}$ is the actual returns on NSE 20-Share Index at time t. According to Sponholtz (2008), the abnormal returns can be used to answer the following questions; is there information content in the stock split announcements? If there is information content, then how quickly does the market react and adjust to the new information? And does the market on average have realistic expectations of the stock split announcements?

For the stock splits, the SRV was adjusted by the split factor so as to establish the Analysis of Average Security Returns Variability (ASRV) since the share prices reduced significantly by the split factor given the reduction in the par value. ASRV was determined by:

$$
\begin{equation*}
\operatorname{ASRV}_{\mathbf{t}}=\mathbf{S R V}_{\mathrm{i}, \mathrm{t}} \mathbf{X}(\mathbf{1} / \mathbf{n}) \tag{2}
\end{equation*}
$$

Where,

ASRV $_{\mathrm{t}}=$ Average Security Returns Variability at time t
$S R V_{i, t}=$ Security Returns Variability i security at time $t$
$\mathrm{n}=$ Number of stock split in the sample

So as to ensure statistical significant in the statistics to be computed as a population parameter (semi-strong efficiency), significance of reaction in security prices $\left(\operatorname{ASRV}_{t}\right)$ was tested by using the $t$-statistics as follows:
$t_{\text {stat }}=(A S R V-1) X \sqrt{ } / \mathbf{s}$

Where, n is the number of quarters in the sample and s is the Standard Deviation of abnormal return.

## b) Analysis of Abnormal Returns (AAR)

The Average Abnormal Returns was calculated by the equation given below:

$$
\begin{equation*}
\mathbf{A A R}_{\mathrm{t}}=\mathbf{1} / \mathbf{n} \sum \mathbf{A} \mathbf{R}_{\mathrm{i}, \mathrm{t}} \tag{3}
\end{equation*}
$$

Where, $A A R_{t}$ is the average abnormal returns on day $t$ and $A R_{i, t}$ is the abnormal returns on security i at time t .
c) Analysis of Cumulative Abnormal Returns (CAR)

The CAR was calculated as:
$\mathbf{C A R}_{k}=\sum \mathbf{A A R}_{\mathrm{t}}$

Where, $\mathrm{CAR}_{\mathrm{k}}$ is the cumulative average abnormal returns for the $\mathrm{k}^{\text {th }}$ period and $A A R_{\mathrm{t}}$ is average abnormal returns of sample stock split at time $t$. The study also established the significance of the $\mathrm{AAR}_{\mathrm{t}}$ using the t -test as follows;
$\mathbf{t}_{\text {stat }}=\mathbf{A A R} \mathbf{R}_{\mathrm{t}} \mathbf{X} \sqrt{\mathbf{n}} / \mathbf{s}$

Where, $\mathrm{AAR}_{\mathrm{t}}$ is the Average Abnormal Returns on time $\mathrm{t}, \mathrm{n}$ is the number of stock split in sample and s is the Standard Deviation of Average Abnormal Returns.

## CHAPTER FOUR

### 4.0 DATA ANALYSIS AND INTERPRETATION

### 4.1 Introduction

This chapter presents the data findings on stock market reaction to announcement of company's stock split by analyzing the share/stock prices and market return around stock split announcement. These data were collected from the NSE offices and analyzed using Excel and SPSS (version 17). Analysis involved evaluation of abnormal return and security variability around split issue. By mid of 2010, 11 companies had conducted stock splits as shown by the table 4.1 below:

Table 4.1: Descriptive Statistics of the Stock Splits of the Announcement Day

|  | Number of <br> Stock Splits | Split Size |  |  |  | Average <br> Split <br> Size |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
|  |  | $\mathbf{1 0 : 1}$ | $\mathbf{1 : 1 0}$ | $\mathbf{5 : 1}$ | $\mathbf{1 : 5}$ | $\mathbf{2 : 1}$ | Sis |
| 2004 |  | 1 |  | 1 |  |  | 7.5 |
| 2005 | 0 |  |  |  |  |  |  |
| 2006 | 4 | 2 |  | 1 | 1 |  | 3.8 |
| 2007 | 2 | 2 |  |  |  |  | 10 |
| 2008 | 1 |  |  |  |  | 1 | 2 |
| 2009 | 1 |  | 1 |  |  |  | 0.1 |
| 2010 | 1 | $\mathbf{1}$ |  |  |  |  | 10 |
| Total | $\mathbf{1 1}$ | $\mathbf{1}$ | $\mathbf{2}$ | $\mathbf{1}$ | $\mathbf{1}$ | $\mathbf{6 . 5 7}$ |  |

From table 4.2 it can be seen that years 2007 and 2010 had the highest split factor of 10 followed by 2004 which had the an average split size of 7.5 while 2009 had the lowest at 0.1 . However, 2006 had the highest number of splits given that 4 companies conducted stock splits. The study considered the event window of 61 days consisting of $t-30$ to $t+30$ relative to event day t 0 . Event date is date of announcement of the stock split. This
conforms with Carlos and Bacon (2009) who adopted the same approach in establishing the impact of stock split announcements on stock price.

### 4.2 Abnormality of Returns Following Split Announcement

The study analysed the returns of the split shares and compared the same with the market returns so as to establish the abnormality of returns following stock splits. The analysed data was presented in appendix III and IV. Appendix IV which presents the abnormal returns for the entire market following the stocks split announcements shows that $\mathrm{t}-2$ to t 1 had a positive abnormal returns of values greater than $1 ; 1.0894,2.3329,4.5166$ and 3.2317 respectively. The period between t 2 to t 10 had average abnormal return of less than 1 which means that no investor benefitted from above normal returns pointing at market adjusting to the stock splits. This implies that the market do not react fast to stock splits which could point to efficiency, but not perfectly efficient. However, period between between $\mathrm{t}-15$ to t 1 had above normal returns meaning that the investors enjoyed above normal returns. This could point at insider trading just before the stock splits anouncement or management using stock splits to adjust stock price to a more marketable range.

### 4.3 Security Returns Variability (SRV)

The study sought to establish the variability of the stock return following the stock split announcements thus determine the market reaction to stock splits. The information presented in appendix V shows that that the variability in stock prices do increase erratically with time though there is more variability in the days preceding and after stock splits. In 2006, the security return variability rose to 11.1829 , in 2004 the SVR rose to
6.0276 while in 2010 the SRV was 0 . However, the $t$-significance shows 15 of the statistics were significant; 10 of which were in the post-announcement period. 6 out of the 10 were between t 0 and t 15 . The announcement day had an average ASRV of 3.9164 at $95 \%$ confidence level. Apart from day $\mathrm{t} 1, \mathrm{t} 11, \mathrm{t} 15, \mathrm{t} 12, \mathrm{t} 15, \mathrm{t} 16, \mathrm{t} 22, \mathrm{t} 24, \mathrm{t} 26, \mathrm{t} 28$ and t29, other periods had ASVR of less than 1. Results support the semi-strong form efficient market hypothesis since stock prices adjust so fast to public information that no investor can earn an above normal return by trading on the announcement day and period thereafter.

Table 4.2: Average Value of ASRV for Stock Split Announcement

| Estimation Period | Security Return Variability |
| :--- | :--- |
| From day -15 to day +15 | 4.3362 |
| From day -15 to day -1 | 1.0607 |
| From day 0 to day +15 | 3.4875 |
| From day 0 to day +1 | 3.8742 |
| From day -1 to day 1 | 3.3604 |
| Form day -3 to day +3 | 1.8787 |
| From day -7 to day +7 | 1.0753 |

To analyze the speed at which the stock market absorbs the stock split announcement in its prices, the study presented the average security return variability across the announcement periods as shown in table 4.2. As indicated by the table, stock variability was more in post announcement period than pre-announcement period; while $\mathrm{t}-15$ to $\mathrm{t}-1$ had ASRV of 1.0607, t0 to t 15 had ASRV of 3.4875. Between t 0 and t 1 the ASRV was 3.8742, $\mathrm{t}-1$ to t 1 had a variability of 3.3604 . Day $\mathrm{t}-3$ to t 3 had ASRV of 1.8787 and $\mathrm{t}-7$ to
t7 had ASRV of 1.0753. Therefore, the stock market positively absorbed stock split contained information positively.

Using the data presented in appendix VI, the study analyzed the cumulative abnormal return over time and presented the data in figure 4.1 to 4.5 .

Figure 4.1: Cumulative Average Abnormal Returns 2004


In 2004, figure 4.1 shows that the abnormal return rose steadily but less steepy between $t$ 30 to $\mathrm{t}-10$ which then rose steepily towards the end of the event window.

## Figure 4.2: Cumulative Average Abnormal Returns 2006



Figure 4.2 above present the price reaction to stock splits conducted in 2006. Innitially between t-30 and t 0 there was an increase in abnormal return which steadily declined following the stock split announcement

Figure 4.3: Cumulative Average Abnormal Returns 2007


In 2007, there was a negative abnormal return pre-stock split anouncement which rose steadily between t-10 and t0. Following the stock split announcement, the abnormal returns fell drastically as shown by figure 4.3.

Figure 4.4: Cumulative Average Abnormal Returns 2008


Figure 4.4 shows that there was a bi-directional changes in abnormal returns both preevent and post event period. Although the abonormal returns improved with stock splits announcement, the rise in abormal returns began to decline after the 25 day.

Figure 4.5: Cumulative Average Abnormal Returns 2010


Figure 4.5 show that there was infinitesimal changes to abnormality in returns following stock splits which was followed by a sharp increase in abnormaality of stock returns.

Figure 4.6: Overall Cumulative Average Abnormal Returns


The study also sought to average the cummelative abnormal return for the entire period and presented the data in figure 4.6 . From the figure, between $t-9$ to t0 period there is positive abnornal returns which is reduced drastically following split announcement (between t0 to t4). The abornal returns changes potively but erratically between t 24 to t30. It, thus, appears that companies experiencing bull run are resorting to stock splits.

Table 4.3: CAR Across the Event Windows

| Days | Mean of CAR | Variance |
| :--- | :--- | :--- |
| $\mathrm{t}-30$ to $\mathrm{t}-21$ | 3.200135 | 2.698851 |
| $\mathrm{t}-20$ to $\mathrm{t}-1$ | 11.606 | 54.117 |
| t0 to t 1 | 30.50557 | 16.91172 |
| $\mathrm{t}-1$ to t 1 | 29.065 | 26.12547 |
| $\mathrm{t}+2$ to $\mathrm{t}+20$ | 22.383 | 1.745567 |
| $\mathrm{t}+20$ to $\mathrm{t}+30$ | 29.035 | 57.56523 |
| $\mathrm{t}-30$ to $\mathrm{t}+30$ | 16.28562 | 98.38799 |

To track abnormal returns over a number of trading days, cumulative abnormal return (CAR) is computed through out the event period for the stock split as presented in table 4.3. from the table, it can be noted that CAAR for the sampled stocks are positive during entire event window.

## CHAPTER FIVE

# 5.0 SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS 

### 5.1 Introduction

This chapter discusses the summary of the finding in chapter four. Conclusion and recommendations drawn from these findings are discussed in relation to the objectives of the study which was to establish the Nairobi Stock Exchange reaction to stock split announcements thus test the efficiency of the same in semi-strong form.

### 5.2 Summary of Findings

The study found that the stock returns experienced a high abnormality during announcement and days surrounding the announcement in 2004, 2006, 2007 and 2010. Overall, apart from day $\mathrm{t} 1, \mathrm{t} 11, \mathrm{t} 15, \mathrm{t} 12, \mathrm{t} 15, \mathrm{t} 16, \mathrm{t} 22, \mathrm{t} 24, \mathrm{t} 26, \mathrm{t} 28$ and t 29 , other periods had ASVR of less than 1. Pointing to normal returns which is in line with the efficiency hypothesis of no investors benefiting from the abnormal returns. The study found that 15 days prior to split announcement had ASRV of 1.0607 while during and 15 days after the split announcement had ASRV of 3.4875 attributable to high ASRV on the 11 day after split announcement.

The study further established that the cumulative returns exhibited an increasing trend up to the announcement day which reduced after the announcement with little increase in abnormal returns absorption of the information into the stock prices hence no investor
could benefit from the public information. However, the abnormality in returns increases towards the end of the event period.

The study also found that between $\mathrm{t}-2$ and t 1 had a positive abnormal returns of values greater than $1 ; 1.0894,2.3329,4.5166$ and 3.2317 respectively and period between t 2 to t10 had average abnormal return of less than 1 . Thus invetsors could not use the information to gain above normal returns from the second day to the tenth day following split announcement. Nevertheless, the period prior to stock split had a positive abnormal returns pointing to the market running bullish owing to insider trading or the managemenet using stock splits to reduce the stock splits to a tradable range.

### 5.3 Conclusions

From the findings presented in the previous chapter and following the summary presented above, it was found that the companies share returns exhibits erratic positive returns before the split announcement from day -15 to day -1 . This changed drastically with stock split announcement from day 2. Hence the information made by the companies is useful for valuing the securities though the market do not react fast to the information. The study also found that information of split announcement is used by some investors to make abnormal returns at some point during post-announcement period.

Therefore, the study concludes that the security prices react to the announcement of stock splits. The results support the semi- strong form efficient market hypothesis since stock prices adjust to public information though not fast enough that no investor can earn an above normal return by trading during post announcement period especially between day t 2 and t 10 . However, some period after the announcement have above normal returns.

Thus, study concludes that the Kenyan stock market, in general, is efficient, but not perfectly efficient, to the announcement of stock split. This informational inefficiency can be used by the investors for making abnormal returns at any point of the announcement period as some days during the period had high abnormal returns.

### 5.4 Recommendations

The average cummulative abnormal returns exhibited a reducing trend following split announcement, therefore, the study recommneds that management can use stock splits to adjust stock price to a more marketable range, downward for stock splits. The study also recommends that Capital Market Authority (CMA) to take stern action or stringent regulations against the possibility of insider trading as there is generally high abnormal returns during periods to stock split announcements.

### 5.5 Areas for Further Studies

The study recommends that a similar study can be done on other corporate events like bonus issue, merger and acquisitions, cross listing, rights issues so as to determine how the stock market reacts so as to be in a position to conclude whether Kenyan stock market is efficient in the semi-strong form as different events conveys different information.

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## APPENDICES

## Appendix I: Letter of Introduction

## The CEO,

Nairobi Stock Exchange,
Dear Sir,

## REF: REQUEST TO CARRY OUT RESEARCH ON NSE MARKET EFFICIENCY

I am a student at the University of Nairobi, Faculty of Commerce pursuing a master's degree in Business Administration. As a requirement in fulfilment of this degree a I need to carry out a research on market efficiency of NSE.

I have chosen your organization because it is an epitome of excellent stock market in the world and has been rated the leading stock exchange market in East and Central Africa and information there-of can be elicited most efficiently and objectively. My desire is to analyze the daily stock prices of companies that have issued stock splits in Kenya.

Any assistance accorded to me in my noble cause and information given shall be treated as confidential and will be used purely for the purpose of this research and a final copy o the document shall be availed to you upon request. Your cooperation will be highly appreciated and thank you in anticipation.

Yours faithfully,

Munyi Jacob N., D61/P/8936/04

## Appendix II: Stock Splits in Kenya

| Company | Split Factor | Announcement | Books Closure |
| :--- | :--- | ---: | ---: |
| Kenya Oil Company | $10: 1$ | $23 /$ June/2004 | $5 /$ July/2004 |
| East African Breweries Ltd | $5: 1$ | 27/August/2004 | 26/November/2004 |
| EA Cables Ltd | $10: 1$ | $10 /$ August/2006 | 4/September/2006 |
| ICDC | $10: 1$ | 19/October/2006 | 4/January/2007 |
| Barclays Bank of Kenya | $1: 5$ | 8/November/2006 | 29/November/2006 |
| Sasini Tea Ltd | $5: 1$ | 18/December/2006 | 14/February/2007 |
| CMC Holdings Ltd | $10: 1$ | $11 /$ January/2007 | $26 /$ February/2007 |
| Kenya Commercial Bank | $10: 1$ | $5 /$ March/2007 | $2 /$ April/2007 |
| Nation Media Group | $2: 1$ | $18 /$ March/2008 | $25 /$ July/2008 |
| Equity Bank Ltd. | $1: 10$ | 12 -February-09 | $25 /$ March/2009 |
| KenolKobil | $10: 1$ | 20/May/2010 | $01 /$ June/2010 |

## Source: NSE, 2010

## Appendix III: Abnormal Returns

| Days | AR1 | AR2 | AR3 | AR4 | AR5 | AR6 |
| ---: | ---: | ---: | ---: | ---: | ---: | ---: |
| -30 | 1.633676 | -0.06387 | 0.3355 | 10.01986 | -2.43902 | -0.69235 |
| -29 | 0.014931 | 1.058538 | 5.2935 | 8.760828 | 0.483271 | 2.525606 |
| -28 | -0.20155 | -0.82326 | 0.2086 | 5.682791 | 0.497323 | 2.632543 |
| -27 | 1.916979 | -0.12927 | 0.8486 | -9.5022 | 0.611906 | -4.46763 |
| -26 | -0.31529 | -0.34477 | 8.9059 | -10.0969 | 0.733117 | -2.88783 |
| -25 | -0.01286 | 0.340963 | 7.9916 | -4.13626 | 1.106283 | 4.366805 |
| -24 | -0.60933 | 0.431102 | 8.7493 | 1.73913 | 0.515061 | 0.953145 |
| -23 | 0.66847 | 1.04742 | 17.1150 | -0.89217 | 0.70306 | -3.17568 |
| -22 | -0.66572 | 1.652566 | -9.6685 | 2.139255 | -2.08764 | 1.666842 |
| -21 | 0.308791 | 0.585437 | -6.9338 | -1.16298 | -0.9626 | -0.25357 |
| -20 | -2.03511 | 1.707296 | -1.0709 | 2.603876 | -0.57455 | 0.941164 |
| -19 | -2.30662 | 0.766252 | 0.6506 | 2.647319 | -3.27825 | -1.31237 |
| -18 | -0.5017 | 2.233711 | 1.0512 | 2.649236 | -0.15226 | 1.498529 |
| -17 | 2.453121 | -0.04896 | 0.9658 | 2.516361 | -2.34812 | 2.057896 |
| -16 | 0.829885 | -0.84131 | 6.3801 | -3.10815 | 1.203999 | 1.187148 |
| -15 | 0.565715 | -0.68867 | 1.5937 | 2.249538 | 0.028158 | -2.6366 |
| -14 | 1.419975 | -3.11047 | 9.6908 | -3.10078 | -0.36956 | 2.029145 |
| -13 | 0.69597 | -0.33223 | 4.8184 | -0.41673 | 0.175852 | 0.231966 |
| -12 | 0.576904 | 1.859112 | 1.2146 | 0.497323 | 0.945922 | 0.881085 |
| -11 | -0.22251 | 0.608916 | 1.5346 | 0.256615 | 1.065884 | 0.379378 |
| -10 | 5.704819 | 1.578489 | 3.0800 | 1.533117 | 0.676545 | 8.014109 |
| -9 | 1.85343 | 1.716197 | 4.4681 | -0.48102 | 5.1628 | 2.410634 |
| -8 | -0.41793 | -0.24138 | -1.7449 | -0.48056 | 6.443027 | 7.381128 |
| -7 | 2.246783 | -0.97852 | 2.6021 | 1.324178 | 5.077105 | 1.818868 |
| -6 | 0.241633 | 0.485452 | 0.0000 | -0.21264 | 8.534305 | -8.28166 |
| -5 | -0.16178 | 0.398028 | -2.9566 | 0.67674 | 6.669853 | -2.42081 |
| -4 | 0.248034 | 0.671074 | -0.4988 | 1.675297 | 1.280162 | 4.036926 |
| -3 | 2.724903 | 0.33591 | -1.9882 | -0.71415 | 4.177041 | 5.041318 |
| -2 | -0.00738 | 0.634511 | 9.6540 | 8.337653 | 2.287123 | 5.114603 |
| -1 | 2.098819 | -0.5846 | 9.3449 | 9.290955 | 6.336738 | -2.2834 |
| 0 | 0.220663 | 4.498691 | 41.6693 | 16.59 | 8.190233 | -0.01045 |
| 1 | 0.117165 | -2.43963 | -10.7226 | -8.66689 | -22.6723 | 2.684908 |
| 2 | 0.165933 | -0.09723 | -10.2900 | -7.9119 | -5.21637 | -4.78321 |
| 3 | 0.826796 | -0.31932 | -11.4779 | -2.46047 | -2.36052 | -1.97004 |
| 4 | 0.752702 | 0.247653 | -2.8379 | -7.34285 | -2.03494 | 0.838407 |
| 5 | -0.46636 | 0.001844 | -1.3952 | 6.230985 | 0.17529 | -0.12704 |
| 6 | 0.22237 | -0.09997 | -1.8892 | -2.10993 | -1.41767 | 1.109287 |
|  |  |  |  |  |  |  |
| -1 |  |  |  |  |  |  |


| 7 | 0.684292 | 0.691759 | 2.7584 | 0.64148 | -3.09043 | 0.01212 |
| ---: | ---: | ---: | ---: | ---: | ---: | ---: |
| 8 | 0 | -0.63014 | -1.3775 | -1.31393 | -0.54818 | 0.69758 |
| 9 | 0.096027 | 0.129069 | -2.8636 | -4.17691 | 0.721757 | -0.52395 |
| 10 | 0.019376 | 0.150283 | -2.8213 | 4.962135 | -2.52687 | -0.68445 |
| 11 | 1197.593 | 0.341983 | -2.1211 | -4.91933 | 0.267423 | -0.17303 |
| 12 | 4.936943 | 0.854926 | -0.8481 | -4.72982 | 1.830045 | -0.69407 |
| 13 | 0.725433 | 0.742546 | -1.3250 | 3.403391 | -0.81074 | 1.256485 |
| 14 | -2.03968 | -0.19608 | -2.2481 | 1.876808 | 0.549333 | -1.37649 |
| 15 | -4.1921 | 0.174217 | 0.0000 | 2.255889 | -3.80994 | -3.76148 |
| 16 | -6.77611 | 0.260495 | 1.8535 | -0.04539 | 1.313806 | 2.530041 |
| 17 | -2.75409 | -0.08996 | -8.3178 | 3.942903 | -7.56209 | 0.632102 |
| 18 | 0.051245 | 0 | 0.8153 | -8.13389 | 3.228614 | -1.01974 |
| 19 | -1.5757 | 0.256787 | -0.2601 | 3.273187 | 3.893262 | -1.27931 |
| 20 | -2.43618 | -0.33658 | 3.7428 | 1.564179 | 1.858134 | 0.858525 |
| 21 | 0.980385 | -0.07811 | 8.1972 | -0.59506 | -2.43904 | -1.90591 |
| 22 | -3.45149 | 0.361577 | -4.4118 | -2.09818 | -4.20044 | 1.842583 |
| 23 | -0.84131 | 0.121729 | -1.6719 | 1.564492 | -0.99123 | -1.65568 |
| 24 | -3.18304 | 2.329027 | 1.4352 | 0.032102 | -1.05061 | 0.825644 |
| 25 | 0.638266 | 0.378788 | -1.7995 | -1.28418 | 1.748459 | -0.21613 |
| 26 | -1.17139 | 3.515441 | 0.6011 | -0.60049 | -4.05511 | 1.556085 |
| 27 | 1.624772 | 1.367844 | -3.5843 | 2.342468 | -0.0685 | -3.01783 |
| 28 | 3.387063 | -0.54829 | -1.0941 | 2.027601 | 1.801298 | 2.609697 |
| 29 | 2.061251 | -16.7381 | -0.6367 | -1.13555 | -0.78629 | 73.70185 |
| 30 | 1.445107 | -0.51657 | 2.4952 | -3.67577 | -0.94207 | -0.26942 |

## Appendix IV: Average Abnormal Returns

| Days | AAR | t | Sig. (2-tailed) |
| :---: | :---: | :---: | :---: |
| -30 | . 4375 | . 816 | . 451 |
| -29 | 1.3938 | 2.180 | . 081 |
| -28 | . 5875 | 1.342 | . 237 |
| -27 | . 7102 | -1.000 | . 363 |
| -26 | 1.0529 | -. 267 | . 800 |
| -25 | . 3839 | . 951 | . 385 |
| -24 | . 2612 | 1.410 | . 218 |
| -23 | . 4774 | . 866 | . 426 |
| -22 | . 3698 | -. 635 | . 554 |
| -21 | . 3845 | -1.230 | . 273 |
| -20 | . 6196 | . 361 | . 733 |
| -19 | . 4158 | -. 523 | . 623 |
| -18 | . 3621 | 2.191 | . 080 |
| -17 | . 4290 | 1.210 | . 280 |
| -16 | . 2057 | . 735 | . 495 |
| -15 | . 1673 | . 261 | . 805 |
| -14 | 1.0176 | . 565 | . 596 |
| -13 | 1.7646 | 1.066 | . 335 |
| -12 | 1.2849 | 4.912 | . 004 |
| -11 | . 3819 | 2.378 | . 063 |
| -10 | 2.6129 | 2.938 | . 032 |
| -9 | . 5799 | 3.022 | . 029 |
| -8 | 1.4308 | 1.120 | . 314 |
| -7 | . 5264 | 2.515 | . 053 |
| -6 | 1.2743 | . 059 | . 955 |
| -5 | . 3490 | . 262 | . 804 |
| -4 | . 2696 | 1.926 | . 112 |
| -3 | . 8296 | 1.390 | . 223 |
| -2 | 1.0894 | 2.629 | . 047 |
| -1 | 2.3329 | 1.967 | . 106 |
| 0 | 4.5166 | 1.834 | . 126 |
| 1 | 3.2317 | -1.841 | . 125 |
| 2 | . 8559 | -2.758 | . 040 |
| 3 | . 2945 | -1.660 | . 158 |
| 4 | . 2251 | -1.346 | . 236 |
| 5 | . 1447 | . 656 | . 541 |
| 6 | . 0607 | -1.318 | . 245 |
| 7 | . 1299 | . 365 | . 730 |


| 8 | .0411 | -1.637 | .163 |
| :--- | ---: | ---: | ---: |
| 9 | .0692 | -1.380 | .226 |
| 10 | .1885 | -.131 | .901 |
| 11 | 43.0224 | .993 | .366 |
| 12 | 1.5179 | .171 | .871 |
| 13 | .1160 | .974 | .375 |
| 14 | .2478 | -.869 | .424 |
| 15 | 1.1385 | -1.404 | .219 |
| 16 | 2.3328 | -.104 | .921 |
| 17 | .7888 | -1.196 | .285 |
| 18 | .2792 | -.537 | .614 |
| 19 | .2432 | .756 | .483 |
| 20 | .3464 | 1.020 | .355 |
| 21 | .2046 | .438 | .680 |
| 22 | .7916 | -1.897 | .116 |
| 23 | .1092 | -1.144 | .304 |
| 24 | .8801 | .081 | .939 |
| 25 | .0676 | -.167 | .874 |
| 26 | .9100 | -.024 | .981 |
| 27 | .4095 | -.217 | .837 |
| 28 | 1.2688 | 1.869 | .121 |
| 29 | 17.2388 | .716 | .506 |
| 30 | .2198 | -.280 | .790 |

## Appendix V: Average Security Returns Variability

| Day | 2004 | 2006 | 2007 | 2008 | 2010 | Mean (ASRV) | STDEV | T-stat | Sig |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| -30 | 0.6486 | 1.3738 | 0.1320 | 0.0006 | 0.0323 | 0.4375 | 0.5234 | 2.047 | 0.096 |
| -29 | 0.3331 | 1.1696 | 0.0052 | 5.0313 | 0.4296 | 1.3938 | 1.8582 | 1.837 | 0.126 |
| -28 | 0.2113 | 0.4419 | 0.0055 | 1.8121 | 0.4668 | 0.5875 | 0.6349 | 2.267 | 0.073 |
| -27 | 0.8964 | 1.2381 | 0.0083 | 0.0640 | 1.3443 | 0.7102 | 0.5702 | 3.051 | 0.028 |
| -26 | 0.0594 | 1.7334 | 0.0119 | 2.8981 | 0.5617 | 1.0529 | 1.1117 | 2.320 | 0.068 |
| -25 | 0.0346 | 0.5069 | 0.0272 | 0.0663 | 1.2843 | 0.3839 | 0.4850 | 1.939 | 0.110 |
| -24 | 0.1453 | 0.3684 | 0.0059 | 0.7253 | 0.0612 | 0.2612 | 0.2629 | 2.434 | 0.059 |
| -23 | 0.4345 | 1.2624 | 0.0110 | 0.0000 | 0.6792 | 0.4774 | 0.4699 | 2.488 | 0.055 |
| -22 | 0.9193 | 0.4620 | 0.0967 | 0.1838 | 0.1871 | 0.3698 | 0.3010 | 3.009 | 0.030 |
| -21 | 0.1250 | 0.2239 | 0.0206 | 1.5485 | 0.0043 | 0.3845 | 0.5874 | 1.603 | 0.170 |
| -20 | 1.8711 | 0.0976 | 0.0073 | 1.0621 | 0.0597 | 0.6196 | 0.7380 | 2.057 | 0.095 |
| -19 | 1.4651 | 0.0977 | 0.2385 | 0.1619 | 0.1160 | 0.4158 | 0.5269 | 1.933 | 0.111 |
| -18 | 1.5442 | 0.1007 | 0.0005 | 0.0140 | 0.1512 | 0.3621 | 0.5936 | 1.494 | 0.195 |
| -17 | 1.4605 | 0.0906 | 0.1224 | 0.1863 | 0.2852 | 0.4290 | 0.5200 | 2.021 | 0.099 |
| -16 | 0.3775 | 0.3061 | 0.0322 | 0.2179 | 0.0949 | 0.2057 | 0.1282 | 3.932 | 0.011 |
| -15 | 0.2186 | 0.0801 | 0.0000 | 0.0698 | 0.4682 | 0.1673 | 0.1663 | 2.465 | 0.057 |
| -14 | 3.3650 | 0.5328 | 0.0030 | 0.9100 | 0.2773 | 1.0176 | 1.2111 | 2.058 | 0.095 |
| -13 | 0.1503 | 0.1016 | 0.0007 | 8.5670 | 0.0036 | 1.7646 | 3.4017 | 1.271 | 0.260 |
| -12 | 1.1081 | 0.0097 | 0.0199 | 5.2345 | 0.0523 | 1.2849 | 2.0187 | 1.559 | 0.180 |
| -11 | 0.1222 | 0.0110 | 0.0252 | 1.7412 | 0.0097 | 0.3819 | 0.6810 | 1.374 | 0.228 |
| -10 | 8.6351 | 0.0727 | 0.0102 | 0.0206 | 4.3257 | 2.6129 | 3.4394 | 1.861 | 0.122 |
| -9 | 1.7088 | 0.0885 | 0.5916 | 0.1192 | 0.3914 | 0.5799 | 0.5939 | 2.392 | 0.062 |
| -8 | 0.0597 | 0.0162 | 0.9214 | 2.4875 | 3.6694 | 1.4308 | 1.4331 | 2.446 | 0.058 |
| -7 | 1.5091 | 0.0529 | 0.5722 | 0.2748 | 0.2228 | 0.5264 | 0.5191 | 2.484 | 0.056 |
| -6 | 0.0842 | 0.0006 | 1.6167 | 0.0506 | 4.6194 | 1.2743 | 1.7801 | 1.754 | 0.140 |
| -5 | 0.0534 | 0.0436 | 0.9875 | 0.2656 | 0.3947 | 0.3490 | 0.3457 | 2.473 | 0.056 |
| -4 | 0.1488 | 0.0395 | 0.0364 | 0.0256 | 1.0976 | 0.2696 | 0.4164 | 1.586 | 0.174 |
| -3 | 1.8347 | 0.0239 | 0.3873 | 0.1905 | 1.7117 | 0.8296 | 0.7799 | 2.605 | 0.048 |
| -2 | 0.1197 | 1.3491 | 0.1161 | 2.1002 | 1.7619 | 1.0894 | 0.8281 | 3.222 | 0.023 |
| -1 | 1.1701 | 1.5539 | 0.8913 | 7.6982 | 0.3512 | 2.3329 | 2.7111 | 2.108 | 0.089 |
| 0 | 6.0276 | 11.1829 | 1.4889 | 3.8835 | 0.0000 | 4.5166 | 3.9164 | 2.825 | 0.037 |
| 1 | 1.7725 | 1.5187 | 11.4097 | 0.9723 | 0.4855 | 3.2318 | 4.1131 | 1.925 | 0.112 |
| 2 | 0.0095 | 1.3087 | 0.6040 | 0.8164 | 1.5409 | 0.8559 | 0.5396 | 3.886 | 0.012 |
| 3 | 0.1961 | 0.6457 | 0.1237 | 0.2454 | 0.2614 | 0.2945 | 0.1820 | 3.962 | 0.011 |
| 4 | 0.1557 | 0.7719 | 0.0919 | 0.0585 | 0.0473 | 0.2251 | 0.2760 | 1.997 | 0.102 |
| 5 | 0.0528 | 0.5394 | 0.0007 | 0.1295 | 0.0011 | 0.1447 | 0.2029 | 1.747 | 0.141 |


|  | 0.0150 | 0.0761 | 0.0446 | 0.0850 | 0.0829 | 0.0607 | 0.0271 | 5.491 | 0.003 |
| ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: |
| 7 | 0.2558 | 0.0381 | 0.2120 | 0.1435 | 0.0000 | 0.1299 | 0.0981 | 3.244 | 0.023 |
| 8 | 0.1180 | 0.0317 | 0.0067 | 0.0164 | 0.0328 | 0.0411 | 0.0397 | 2.540 | 0.052 |
| 9 | 0.0072 | 0.2737 | 0.0116 | 0.0351 | 0.0185 | 0.0692 | 0.1027 | 1.651 | 0.160 |
| 10 | 0.0068 | 0.3708 | 0.1417 | 0.3916 | 0.0316 | 0.1885 | 0.1639 | 2.817 | 0.037 |
| 11 | 214.6492 | 0.3502 | 0.0016 | 0.1090 | 0.0020 | 43.0224 | 85.8135 | 1.228 | 0.274 |
| 12 | 6.1295 | 0.3091 | 0.0743 | 1.0443 | 0.0324 | 1.5179 | 2.3342 | 1.593 | 0.172 |
| 13 | 0.2915 | 0.1659 | 0.0146 | 0.0015 | 0.1063 | 0.1160 | 0.1066 | 2.666 | 0.045 |
| 14 | 1.0206 | 0.0698 | 0.0067 | 0.0145 | 0.1276 | 0.2478 | 0.3888 | 1.561 | 0.179 |
| 15 | 4.2719 | 0.0696 | 0.3222 | 0.0757 | 0.9529 | 1.1385 | 1.5994 | 1.744 | 0.142 |
| 16 | 11.1580 | 0.0147 | 0.0383 | 0.0217 | 0.4311 | 2.3328 | 4.4154 | 1.294 | 0.252 |
| 17 | 1.8423 | 0.5083 | 1.2693 | 0.2973 | 0.0269 | 0.7888 | 0.6696 | 2.886 | 0.034 |
| 18 | 0.0006 | 0.9078 | 0.2314 | 0.1860 | 0.0700 | 0.2792 | 0.3248 | 2.105 | 0.089 |
| 19 | 0.6219 | 0.1468 | 0.3364 | 0.0009 | 0.1102 | 0.2432 | 0.2181 | 2.732 | 0.041 |
| 20 | 1.4733 | 0.0933 | 0.0766 | 0.0390 | 0.0496 | 0.3464 | 0.5638 | 1.505 | 0.193 |
| 21 | 0.2350 | 0.2919 | 0.1320 | 0.1195 | 0.2447 | 0.2046 | 0.0673 | 7.444 | 0.001 |
| 22 | 2.9286 | 0.1434 | 0.3916 | 0.2655 | 0.2287 | 0.7916 | 1.0715 | 1.810 | 0.130 |
| 23 | 0.1761 | 0.0454 | 0.0218 | 0.1182 | 0.1846 | 0.1092 | 0.0663 | 4.038 | 0.010 |
| 24 | 4.0701 | 0.0088 | 0.0245 | 0.2514 | 0.0459 | 0.8801 | 1.5974 | 1.350 | 0.235 |
| 25 | 0.1415 | 0.0364 | 0.0679 | 0.0890 | 0.0031 | 0.0676 | 0.0470 | 3.521 | 0.017 |
| 26 | 4.0063 | 0.0065 | 0.3650 | 0.0089 | 0.1631 | 0.9100 | 1.5537 | 1.435 | 0.211 |
| 27 | 1.1965 | 0.1299 | 0.0001 | 0.1074 | 0.6134 | 0.4095 | 0.4468 | 2.245 | 0.075 |
| 28 | 2.8722 | 0.0613 | 0.0720 | 2.8798 | 0.4587 | 1.2688 | 1.3201 | 2.354 | 0.065 |
| 29 | 84.3086 | 0.0194 | 0.0137 | 1.0001 | 0.8521 | 17.2388 | 33.5374 | 1.259 | 0.264 |
| 30 | 0.5859 | 0.2114 | 0.0197 | 0.2769 | 0.0049 | 0.2198 | 0.2115 | 2.546 | 0.052 |

## Appendix VI: Cumulative Average Abnormal Returns

| Day | 2004 |  | 2006 |  | 2007 |  | 2008 |  | 2010 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | AAR | CAR | AAR | CAR | AAR | CAR | AAR | CAR | AAR | CAR |
| -30 | 0.785 | 0.785 | 5.178 | 5.178 | -2.439 | -2.439 | 0.045 | 0.045 | -0.692 | -0.692 |
| -29 | 0.537 | 1.322 | 7.027 | 12.205 | 0.483 | -1.956 | -4.013 | -3.969 | 2.526 | 1.833 |
| -28 | -0.512 | 0.809 | 2.946 | 15.151 | 0.497 | -1.458 | -2.409 | -6.377 | 2.633 | 4.466 |
| -27 | 0.894 | 1.703 | -4.327 | 10.824 | 0.612 | -0.847 | 0.453 | -5.925 | -4.468 | -0.002 |
| -26 | -0.330 | 1.373 | -0.595 | 10.228 | 0.733 | -0.113 | 3.046 | -2.879 | -2.888 | -2.890 |
| -25 | 0.164 | 1.537 | 1.928 | 12.156 | 1.106 | 0.993 | -0.461 | -3.339 | 4.367 | 1.477 |
| -24 | -0.089 | 1.448 | 5.244 | 17.400 | 0.515 | 1.508 | 1.524 | -1.815 | 0.953 | 2.430 |
| -23 | 0.858 | 2.306 | 8.111 | 25.512 | 0.703 | 2.211 | 0.004 | -1.811 | -3.176 | -0.745 |
| -22 | 0.493 | 2.799 | -3.765 | 21.747 | -2.088 | 0.123 | 0.767 | -1.044 | 1.667 | 0.921 |
| -21 | 0.447 | 3.246 | -4.048 | 17.698 | -0.963 | -0.839 | -2.227 | -3.271 | -0.254 | 0.668 |
| -20 | -0.164 | 3.083 | 0.766 | 18.465 | -0.575 | -1.414 | 1.844 | -1.427 | 0.941 | 1.609 |
| -19 | -0.770 | 2.312 | 1.649 | 20.114 | -3.278 | -4.692 | 0.720 | -0.707 | -1.312 | 0.297 |
| -18 | 0.866 | 3.178 | 1.850 | 21.964 | -0.152 | -4.844 | 0.212 | -0.495 | 1.499 | 1.795 |
| -17 | 1.202 | 4.380 | 1.741 | 23.705 | -2.348 | -7.192 | -0.772 | -1.267 | 2.058 | 3.853 |
| -16 | -0.006 | 4.375 | 1.636 | 25.341 | 1.204 | -5.988 | 0.835 | -0.432 | 1.187 | 5.040 |
| -15 | -0.061 | 4.313 | 1.922 | 27.263 | 0.028 | -5.960 | -0.473 | -0.905 | -2.637 | 2.404 |
| -14 | -0.845 | 3.468 | 3.295 | 30.558 | -0.370 | -6.330 | -1.707 | -2.612 | 2.029 | 4.433 |
| -13 | 0.182 | 3.650 | 2.201 | 32.759 | 0.176 | -6.154 | -5.237 | -7.849 | 0.232 | 4.665 |
| -12 | 1.218 | 4.868 | 0.856 | 33.615 | 0.946 | -5.208 | 4.094 | -3.755 | 0.881 | 5.546 |
| -11 | 0.193 | 5.061 | 0.896 | 34.510 | 1.066 | -4.142 | -2.361 | -6.116 | 0.379 | 5.925 |
| -10 | 3.642 | 8.703 | 2.307 | 36.817 | 0.677 | -3.466 | -0.257 | -6.373 | 8.014 | 13.939 |
| -9 | 1.785 | 10.488 | 1.994 | 38.810 | 5.163 | 1.697 | 0.618 | -5.755 | 2.411 | 16.350 |
| -8 | -0.330 | 10.158 | -1.113 | 37.698 | 6.443 | 8.140 | 2.822 | -2.933 | 7.381 | 23.731 |
| -7 | 0.634 | 10.792 | 1.963 | 39.661 | 5.077 | 13.217 | -0.938 | -3.871 | 1.819 | 25.550 |
| -6 | 0.364 | 11.156 | -0.106 | 39.554 | 8.534 | 21.752 | -0.402 | -4.274 | -8.282 | 17.268 |
| -5 | 0.118 | 11.274 | -1.140 | 38.414 | 6.670 | 28.421 | -0.922 | -5.196 | -2.421 | 14.847 |
| -4 | 0.460 | 11.733 | 0.588 | 39.003 | 1.280 | 29.702 | -0.286 | -5.482 | 4.037 | 18.884 |
| -3 | 1.530 | 13.264 | -1.351 | 37.652 | 4.177 | 33.879 | -0.781 | -6.263 | 5.041 | 23.926 |
| -2 | 0.314 | 13.577 | 8.996 | 46.647 | 2.287 | 36.166 | 2.593 | -3.670 | 5.115 | 29.040 |
| -1 | 0.757 | 14.334 | 9.318 | 55.965 | 6.337 | 42.503 | -4.965 | -8.634 | -2.283 | 26.757 |
| 0 | 2.360 | 16.694 | 29.129 | 85.094 | 8.190 | 50.693 | -3.526 | -12.160 | -0.010 | 26.746 |
| 1 | -1.161 | 15.533 | -9.695 | 75.400 | -22.672 | 28.020 | 1.764 | -10.396 | 2.685 | 29.431 |
| 2 | 0.034 | 15.567 | -9.101 | 66.299 | -5.216 | 22.804 | 1.617 | -8.779 | -4.783 | 24.648 |
| 3 | 0.254 | 15.821 | -6.969 | 59.329 | -2.361 | 20.444 | 0.886 | -7.893 | -1.970 | 22.678 |
| 4 | 0.500 | 16.321 | -5.090 | 54.239 | -2.035 | 18.409 | 0.433 | -7.460 | 0.838 | 23.517 |
| 5 | -0.232 | 16.089 | 2.418 | 56.657 | 0.175 | 18.584 | -0.644 | -8.104 | -0.127 | 23.390 |
| 6 | 0.061 | 16.150 | -2.000 | 54.657 | -1.418 | 17.166 | -0.522 | -8.626 | 1.109 | 24.499 |


|  |  |  |  |  |  |  |  |  |  |  |
| ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: |
| 7 | 0.688 | 16.838 | 1.700 | 56.357 | -3.090 | 14.076 | 0.678 | -7.948 | 0.012 | 24.511 |
| 8 | -0.315 | 16.523 | -1.346 | 55.012 | -0.548 | 13.528 | 0.229 | -7.719 | 0.698 | 25.208 |
| 9 | 0.113 | 16.636 | -3.520 | 51.491 | 0.722 | 14.249 | -0.335 | -8.054 | -0.524 | 24.685 |
| 10 | 0.085 | 16.720 | 1.070 | 52.562 | -2.527 | 11.723 | 1.120 | -6.934 | -0.684 | 24.000 |
| 11 | 15.043 | 31.764 | -3.520 | 49.042 | 0.267 | 11.990 | 0.591 | -6.344 | -0.173 | 23.827 |
| 12 | 2.896 | 34.660 | -2.789 | 46.253 | 1.830 | 13.820 | 1.829 | -4.515 | -0.694 | 23.133 |
| 13 | 0.734 | 35.394 | 1.039 | 47.292 | -0.811 | 13.009 | 0.070 | -4.445 | 1.256 | 24.389 |
| 14 | -1.118 | 34.276 | -0.186 | 47.106 | 0.549 | 13.559 | 0.215 | -4.230 | -1.376 | 23.013 |
| 15 | -2.009 | 32.267 | 1.128 | 48.234 | -3.810 | 9.749 | 0.492 | -3.738 | -3.761 | 19.252 |
| 16 | -3.258 | 29.009 | 0.904 | 49.138 | 1.314 | 11.062 | -0.263 | -4.001 | 2.530 | 21.782 |
| 17 | -1.422 | 27.587 | -2.187 | 46.951 | -7.562 | 3.500 | 0.976 | -3.026 | 0.632 | 22.414 |
| 18 | 0.026 | 27.613 | -3.659 | 43.291 | 3.229 | 6.729 | 0.772 | -2.254 | -1.020 | 21.394 |
| 19 | -0.659 | 26.953 | 1.507 | 44.798 | 3.893 | 10.622 | -0.053 | -2.307 | -1.279 | 20.115 |
| 20 | -1.386 | 25.567 | 2.653 | 47.451 | 1.858 | 12.480 | 0.353 | -1.954 | 0.859 | 20.973 |
| 21 | 0.451 | 26.018 | 3.801 | 51.253 | -2.439 | 10.041 | -0.619 | -2.572 | -1.906 | 19.067 |
| 22 | -1.545 | 24.473 | -3.255 | 47.998 | -4.200 | 5.841 | -0.922 | -3.494 | 1.843 | 20.910 |
| 23 | -0.360 | 24.113 | -0.054 | 47.944 | -0.991 | 4.850 | -0.615 | -4.109 | -1.656 | 19.254 |
| 24 | -0.427 | 23.686 | 0.734 | 48.678 | -1.051 | 3.799 | 0.897 | -3.212 | 0.826 | 20.080 |
| 25 | 50.189 | 73.876 | -1.542 | 47.136 | 1.748 | 5.548 | 0.534 | -2.678 | -0.216 | 19.864 |
| 26 | 3.515 | 77.391 | 0.000 | 47.136 | -4.055 | 1.492 | -0.168 | -2.847 | 1.556 | 21.420 |
| 27 | 1.368 | 78.759 | -0.621 | 46.515 | -0.068 | 1.424 | -0.586 | -3.433 | -3.018 | 18.402 |
| 28 | -0.548 | 78.211 | 0.467 | 46.982 | 1.801 | 3.225 | -3.036 | -6.469 | 2.610 | 21.012 |
| 29 | -16.738 | 61.472 | -0.886 | 46.096 | -0.786 | 2.439 | -1.789 | -8.259 | 73.702 | 94.713 |
| 30 | -0.517 | 60.956 | -0.590 | 45.505 | -0.942 | 1.497 | -0.942 | -9.200 | -0.269 | 94.444 |


[^0]:    ${ }^{1}$ Independence of forecast errors from previous information is known as the orthogonality property

[^1]:    ${ }^{2}$ Informed traders learn the true underlying probability distribution which generates a future price, and they take a position in the market based on this information. Uninformed traders invest no resources in collecting information, but they know that current prices reflect the information of informed traders.

