THE INFORMATION CONTENT OF TREASURY BILL RATES: THE CASE OF NAIROBI SECURITIES EXCHANGE

BY

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DECLARATION

This is my original work and has not been presented for a degree at any other university

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Odipo Rebecca Date

This Research Project has been submitted for examination with my approval as university supervisor

…….

Dr Josiah Aduda Date

DEDICATION

I dedicate this work to God my Father, my immediate family, friends and acquaintances who have given me immense support and encouragement to complete this project in fulfillment of my MBA Degree course.

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ABSTRACT

The efficient markets theory stipulates that market prices fully reflect all available information. Market efficiency can be in the weak form, semi-strong form or strong form. Weak form efficiency refers to a situation where market prices fully reflect all historical information about a stock price. Semi-strong form efficiency refers to a situation where market prices reflect all historical and present information about a stock while strong-form efficiency refers to a situation where market prices reflect all historical, present and private information about a stock. This paper investigates the semi-strong form efficiency of the Nairobi Security Exchange by finding out the information content of Treasury bill rates.

The study uses the Event Study methodology. Changes in the average 90-day Treasury bill rates represent the event under study. The event window comprises five days before and five days after the announcement day. Comparison or estimation periods of twenty eight before and after the event windows are used. The study from 2007 to 2013 included sixteen sampled companies shortlisted from the NSE 20 Stock index and considered ten events when the Treasury bill rate changed. This came to a total of one hundred and sixty events. Statistical analysis was carried out using Microsoft Excel and SPSS packages with T-test distribution being determined at 95% confidence level.

Results of the study indicate that there is a statistically significant difference between comparison period returns and event window returns in thirteen of the sixteen sampled companies. However, graphs of Cumulative Abnormal Returns do not support patterns that indicate information content of Treasury both prior to and after the Treasury bill announcement date.

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ABBREVIATIONS

CAR	Cumulative Abnormal Returns
CBK	Central Bank of Kenya
CDS	Central Depository System
CEO	Chief Executive Officer
EMH	Efficient Market Hypothesis
GDP	Gross Domestic Product
LTD	Limited
MAR	Mean Abnormal Returns
MBA	Masters of Business Administration
MCAR	Mean Cumulative Abnormal Returns
NSE	Nairobi Securities Exchange
NYSE	New York Stock Exchange
OMO	Open Market Operations
OMTO	Open Market Type Operations
SPSS	Statistical Package for the Social Sciences
UON	University of Nairobi

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CHAPTER ONE

1.0 INTRODUCTION

1.1 Background to the Study

The subject of interest rates dominates much of economic and business thinking in Kenya. At the heart of this concern is the consequence such high interest rates have on economic performance of the country, on individual enterprise performance and on the welfare of the average individual. (Kimura, 1997). The behaviour of interest rates directly affects the ease of access of and cost of capital, consumer prices and the general cost of living. (Murithi, 2003).

Over the years, financial analysts have been concerned about the impact of the treasury bill rate on the behaviour of asset returns. The interest rate on treasury bills is generally viewed as the representative money market rate. Treasury bill interest rates are used as an index for variable rate financial contracting. (Mutoko, 2006).

The background of this study provides the conceptual argument and the context for the information content of Treasury bill rates on the Nairobi Securities Exchange.

1.1.1 Treasury Bill Rates

Treasury bills are short term securities or borrowing instruments issued by the Central Bank on behalf of the Treasury. They are issued by the Government to raise money on a short term basis – for a period of up to 1 year. An investor buys at a discount and receives payment of face value on maturity date. The difference represents a discount, which is the interest earned (Ngugi, 2004). Treasury bills sell at regularly scheduled auctions to refinance current budget deficits and to smooth out the uneven flow of revenues from corporate and individual tax receipts (Cook, 1993).

Changes in Treasury bill rates usually have a large impact on the shilling and interest rate environment. The base rate or prime rate set by banks to determine the cost of borrowing follows the lead of Central Bank by adopting a rate pegged on the Treasury

bill rate. This affects the price at which funds are availed to institutions and individuals. A drop in interest rates favours firms that rely on borrowed funds. The reverse is true and interest rate levels may determine whether a firm records a profit or loss (Slovin, Sushka, & Waller, 1994).

Factors affecting Treasury bill rates include a concern about the default or liquidity risk in other financial markets, economic conditions and monetary policy actions (Mutoko, 2006), increasing Government budget deficits (Ross, 1993) and Inflation and expected inflation (Urich & Watchel, 1984).

Short term interest rates such as discount rates, treasury bill rates, inter-bank rates, repurchase orders and others are used severally by governing authorities to transmit monetary policy to the economy through their effect on market interest rates. Restrictive Monetary policy is likely to push up both short term and long term interest rates leading to less spending by interest sensitive sectors of the economy such as housing, agriculture and consumer durable goods. Easing policy results in lower rates that stimulate economic activities. (Muriithi, 2003).

1.1.2 Information Content

Efficient markets react fully and correctly to all available and useful information (Fama 1991). Prices, the most influential variable in the stock market, vary due to economic and non-economic information. However, investors believe that past patterns in stock price movements will continue as the information is slowly incorporated in the stock prices. If information is incorporated slowly, it might be possible to earn an excessive return on the basis of spotting changes in equilibrium. On the other hand, if information is quickly incorporated in stock prices, such systematic gains cannot be obtained.

Empirical investigations of the efficient market hypothesis tests whether any new information relevant to market is spontaneously reflected in the stock prices or not. It implies that any changes in future prices depend only on the arrival of new information. This is difficult due to the role of unanticipated information. Another

consequence of this hypothesis is that arbitrage opportunities are wiped out instantaneously.

1.1.3 Information Content of Treasury Bills Rates

Not much has been studied on the information content of Treasury bill rates in Kenya and around the world. Studies have concentrated on the information content of discount rates and official central bank interest rates. Official bank rates comprise the rates applied at one or more central bank standing facilities and in some cases at which the central bank operates a regular tender (Hardy, 1998). Discount rate changes are made at substantial intervals and are discontinuous instruments of monetary policy which have been established by the administrative action of a public body having special information and competence to judge whether expansion of bank credit and money is consistent with the economy's overall cash needs for transactions and liquidity (Waud, 1970).

Movement in the prime rate or base lending rate set by commercial banks has also been found to have a significant impact on the financial and capital markets. (Slovin, et al, 1994)

In Kenya, interest rates on Treasury Bills in Kenya are generally viewed as the representative money market rate and their yields are used by banks to fix their own lending rates. (Daily Nation, 19 June 2007).

Treasury Bills in Kenya

In Kenya, treasury bills were first issued in 1969. They are sold in maturities of 91 days and182 days through weekly tenders. A 364 day Treasury bill is also sold once every month (CBK brochure). The bills are purchased by a wide variety of investors including commercial banks, insurance companies, pension schemes, parastatals, corporate entities and individuals. The financial sector dominates in holding the bulk of the bills.

Prior to liberalization, applications were made and the bank accepted tenders, starting with those at the lowest rate until the pre-announced tender amounts were realized. In case there were several bidders at the cut-off rate, CBK had the right to allot the bills on a pro-rata basis. The bills were issued as paperless securities through a book entry Central Depository System (CDS). Under the CDS, the CBK opened a Treasury bill account for the investor into which the value of the purchased bill was credited. Investors retained a copy of the bank's credit voucher as evidence of payment. They were also required to furnish the CBK with their bank account numbers so that, as the bills become due for redemption, the proceeds were credited directly to their account. Minimum purchase value in the primary market was one million Kenya shillings. (Ngugi &Wambua, 2004).

Upon liberalization of the Treasury bill rate in November 1990 and until present, the bills are determined through an auction process with the amount issued per auction depending on the financing needs of the government and the objective of monetary policy at the time of the issue. Through auctioning, CBK allocates the bids competitively based on the discount rates, beginning with the lowest tender. While bidding, investors make competitive and non-competitive or average bids. For the latter bids, instead of quoting the price, the investor bids for the average rate. This option of average bids is only open for bids up to a maximum of ten million Kenya Shillings. A withholding tax of 15 per cent is charged on the interest unless the investor is tax exempt and issues a tax exemption certificate. The CBK computerized the handling of Treasury bills by introducing the CDS in January 1997. (Ngugi & Wambua, 2004). The Central Bank of Kenya reduced investment amount in treasury bills from one million to one hundred thousand in December 2008.

With the Central Bank of Kenya utilizing the open market type operations (OMTO) framework for monetary policy, treasury bill rates became an important signaling interest rate for monetary policy action. As long as the open market operation was driven largely by monetary policy objectives, then the Treasury bill rate sent the monetary policy stance signal. (Ngugi & Wambua, 2004).

The effectiveness of the indirect rates depends on the efficiency of the indirect monetary transmission mechanism. Sluggish responses of interest rate to monetary policy actions characterize an uncompetitive banking sector, weak regulatory and legal infrastructure, fiscal pressure, and the level of financial depression. The liberation process should be accompanied by restructuring of the banking sector to enhance competitiveness, strengthening of the legal and regulatory framework to ensure effective enforcement of financial contracts, attaining fiscal discipline to facilitate independence of the monetary authority and developing adequate indirect monetary policy tools (Ngugi, 2003)

Leite (1993) noted that when budget deficits are large, requiring massive financing, primary sales of government securities tend to be the dominant influence in the financial markets. This in turn, limits the use of OMOs as an effective short run policy instrument, distorting the level and structure of interest rates. Thus, it is observed that for an appropriate level and structure of interest rates, the government should gradually reduce its budget deficit to a level that would permit it to borrow directly from the financial market in competition with the private sector without crowding out the private sector and without recourse to special regulations such as high liquidity requirements. (Ngugi, 2003).

1.2 Research problem

The function of an efficient stock market is to process information and guide capital towards its best economic use. Modern finance theory emphasizes the role of information in asset markets. This is the integral part of efficient market hypothesis.

The efficient market hypothesis suggests that profiting from predicting price movements is very difficult and unlikely. The main engine behind price changes is the arrival of new information. A market is said to be efficient if prices adjust quickly and, on average, without bias, to new information. As a result, current prices of securities reflect all available information at any given point in time. There is no reason to believe that prices are too high or too low and security prices adjust before an investor has time to trade on and profit from the new pieces of information.

Not much has been studied on the information content of Treasury bill rates in Kenya and around the world. Studies have concentrated on the information content of discount rates and the official central bank interest rates. Official bank rates typically comprise the rates applied at one or more central bank standing facilities and in some cases at which the central bank operates a regular tender (Hardy, 1998). Financial markets respond 'non-technical' discount rate changes announced because of the Central Bank's concern over the growth rate of money and credit, or its concern over the pace of economic activity, the inflation rate, or some other macroeconomic variable (Smirlock & Yatwitz, 1985). They also respond to changes due to increases in bank prime rates.

Globally, empirical research on information content has been carried out on several events such as on accounting information, block trades, new issues of securities, stock splits and portfolio performance measurement. The studies indicate significantly abnormal returns as a result of events such as accounting information, block trades, issue of new securities and stock splits.

Locally, studies on various events such as on accounting information (Ondigo, 1995), stock dividends (Mbugua, 2004), (Kiptoo 2006), rights issue (Njoroge, 2003), CEO change announcements (Ondieki, 2011), seasoned equity issue (Mumbua, 2011) and stock splits (Leisen, 2012) indicate mixed results on the information content of the events studied.

Interest rates on Treasury Bills in Kenya are generally viewed as the representative money market rate and their yields are used by banks to fix their own lending rates. (Daily Nation, 19 June 2007). The Central Bank of Kenya steers the base rate towards its target by buying and selling short term Treasury bills in the open market. (Mutoko, 2006). This study seeks to explore whether there is a significant variation in stock returns after the Central Bank announces its 91 day trading results of Treasury Bills on Friday each trading week.

1.3 Objective of the Study

The objective of the study is to determine whether stock prices at the Nairobi Securities Exchange adjust to Treasury bill rate changes.

1.4 Value of the Study

Several stakeholders are interested in the in the efficiency and operations of the stock market.

Investors will be able to appreciate the impact of fluctuations of the Treasury bill rate on their earnings, cash-flows and stock prices. They will be able to decide when to invest and the composition of their portfolios. Academicians who want to study on the efficiency of the stock market using the same or similar parameters will also be able to replicate the study for comparative purposes.

The Government policy makers will improve their alignment of fiscal and monetary policies with an incentive for greater fiscal discipline and providing a stable macro economic environment for sustainable development. (Mutoko, 2006). The Central Bank will be able to determine the best tools to select in influencing economic variables such as interest rate and stock market indices by effectively combining open market operations with non-open market operations.

Fund managers who are charged with the responsibility of investing in viable projects, will be able to gauge entry and exit strategies into the stock market based on the Treasury bill rate movements. Financial analysts will be able to gauge the performance of the stock market vis a vis the macro economic fundamentals such as inflation, exchange rates, foreign capital flows and interest rates and their inter-relationships.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Introduction

The literature review seeks to review a few theories and empirical evidence of the Efficient Market Hypothesis, to examine the behaviour of Treasury bill rates and to explain the Event Study methodology.

Various theories have confirmed the existence of semi-strong market efficiency in the developed countries. The semi-strong efficiency relates to dividend and earning announcements, cashflow position and economic news such as world news and political domestic events. However mixed results on semi-strong efficiency have been found in developing countries such as Kenya.

2.2 Review of Theories

The main thrust of capital markets is the transference of funds between lenders (savers) and borrowers (producers) efficiently. Lenders (savers) and borrowers (producers) are said to be better off if efficient capital markets are used to facilitate fund transfers. The borrowing/lending rate is a vital piece of information used by each producer, who will accept projects until the rate of return on the least profitable project just equals the opportunity cost of external funds. In an allocationally efficient market, scarce savings are optimally allocated to productive investments in a way that rewards everyone. (Copeland & Weston, 1992). In order for markets to be allocationally efficient, they need to have both internal (Informational) and external (Operational) efficiency. External efficiency refers to a situation where information is quickly and widely disseminated, allowing each security's price to adjust rapidly in an unbiased manner to new information so that it reflects investment value. Internal efficiency (operational efficiency) implies a situation where brokers and dealers compete fairly so that the cost of transacting is low and the speed of transacting is high. (Sharpe, Alexander & Bailey, 2005).

The Efficient Markets Hypothesis (EMH) maintains that market prices fully reflect all available information (Lo, 2007). It is the price of an asset that reflects all relevant information that is available about the intrinsic value of the asset. (Jones & Netter, 2008). The Efficient Market Hypothesis was developed independently by Paul A Samuelson and Eugene F. Fame in the 1960s. Both used different research agendas to arrive at the same conclusion. Paul Samuelson (1965), interested in the mechanics and kinematics of prices with or without uncertainty, sort solutions for dynamic asset allocation and the consumption saving problem.

In contrast, Fama's (1963: 1965a, 1965b, 1970) seminal papers were based on his interest in measuring the statistical properties of stock prices and in resolving the debate between technical analysis and fundamental analysis. (Lo, A., 2007).

2.2.1 Random Walk Hypothesis

In the Random walk hypothesis, a change occurs in the price of stock because of certain changes in the economy, industry or company. Information about these changes in the economy, industry or company alters the stock prices immediately and the stock moves to a new level, either upwards or downwards, depending of the type of information. This rapid shift to a new equilibrium level whenever new information is received is recognition of the fact that all information which is known is fully reflected in the price of the stock.

Changes in stock prices show independent behaviour and are dependent on the new pieces of information that are received but within themselves are independent of each other. (Kevin S, 2001).

2.2.2 The Value of Information

Fama (1976, 1991) defines efficient capital markets as those where the joint distribution of security prices at a period, given the set of information that the market uses to determine security prices is identical to the joint distribution of prices that would exist if all relevant information available at that period were used. This implies that there must be a difference between the information the market uses and the set of

all relevant information. Applying information theory, this also implies that, net of costs, the utility value of the gain from information to an individual is nil.

The capital market is efficient relative to a given information set only after consideration of the cost of acquiring messages and taking actions. (Copeland & Weston, 1992)

2.2.3 The theory of Rational Expectations and Market Efficiency

Unlike in the 1950s and 1960, where economists viewed expectations as formed from past experience only, the theory of Rational Expectations states that expectations will be identical to optimal forecasts (the best guess of the future) using all available information. (Mushkin, 2008).

Forsthe, Palfrey and Plott (1982) identify four different hypotheses. Each hypothesis assumes that investors know with certainty what their own payoffs will be across time, but they also know that different individuals may pay different prices because of differing preferences. The first hypothesis, known as naïve hypothesis, asserts that asset prices are completely arbitrary and unrelated either to how much they pay out in the future or to the probabilities of various payouts. The second hypothesis, known as the speculative equilibrium hypothesis, implies that all investors base their investment decisions entirely on their anticipation of other individual's behaviour without any relationship to the actual payoffs that the assets are expected to provide. The third hypothesis is that asset prices are systematically related to their future payouts. This is the intrinsic value hypothesis and it says that prices will be determined by each individual's estimate of the payoffs of an asset without consideration of its resale value to other individuals. The fourth and final hypothesis, called the Rational Expectation Hypothesis, predicts that prices are formed on the basis of the expected future payouts of the assets, including their resale value to third parties. (Copeland & Weston, 1992).

A rational expectations market is efficient because prices will reflect all information. In the rational expectations model, different payoffs indicate heterogeneous

expectations. An unresolved issue about market efficiency is whether there is full aggregation of information in pricing. (Copeland & Weston, 1992).

2.3 Event Study Methodology

Event studies are used to gauge how fast security prices react to the release of information. Returns of a security after the date of announcement may either be normal, abnormally high or low. The definition of a normal return is linked to an equilibrium-based asset pricing model such as the market return model, the Single Index Market Model, the Scholes –Williams beta method and the mean return model. (Njoroge, 2003). An improperly specified asset pricing model can invalidate a test of market efficiency. Hence Event Studies are joint tests of market efficiency and the asset pricing model's validity (Fama 1991, Beechey, Gruen & Vickrey, 2000).

An event study consists of an event which is likely to affect the value of a company or asset. It also consists of an event window which is a period over which the impact of the event on the value of the asset takes place. An event study comprises an estimation window which helps to work out parameters of a model. Normal returns are estimated from chosen models which could be statistical models such as the constant mean model or variants of the market model. Assumptions of the event study are that markets are efficient, the events were unanticipated and there are no confounding effects during the event window.

2.4 Empirical Evidence

Several studies have been carried out in relation to the semi-strong form of efficiency. Some of the studies include those on accounting information, block trades, new issues of securities, stock splits and portfolio performance measurement.

Scholes (1972) and Kraus and Stoll (1972) provided the first empirical evidence about the price effects of block trading. Scholes used daily returns to analyze 345 secondary distributions between July 1961 and December 1965. Secondary distributions are initiated by the shareholders who receive the returns of the sale. The distributions are usually underwritten by an investment banking group that buys the entire block from

the seller. The shares are then sold on a subscription basis after normal trading hours. Stock exchange or brokerage commissions are not paid by the subscriber. The issues here revolve around the speed with which the market adjusts to the effect of the block trade; the possibility of making abnormal returns from price changes; the liquidity and /or information effects. Kraus-Stoll (1972) study related to open market block trades and examined price effects for all block trades of 10,000 shares or more carried out on the NYSE between July 1, 1968 and September 30, 1969. They had prices for the close of day before the block trade, the price immediately prior to the transaction, the block price, and the closing price the day of the block trade. Abnormal performance indices based on daily data were consistent with Scholes results. More interesting were intraday price effects. There was clear evidence of a price pressure or distribution effect. The stock price recovers substantially from the block price by the end of the trading day. The recovery averaged 713%. (Copeland & Weston, 1992).

Studies on the pricing of new issues of common stock such as Stigler (1964), Reily and Hatfield (1969), Stickney (1970), Shaw (1971), McDonald and Fisher (1972) and Logue (1973) and all faced a seemingly insoluble problem. How could returns on unseasoned issues be adjusted for risk if time series data on pre-issues prices were non-existent? An ingenious way around this problem was employed by Ibbotson (1975).The results indicated a statistically significant abnormal returns. Hence, either the offering price is set too low or investors systematically overvalue new issues at the end of the first month of seasoning. (Copeland & Weston, 1992).

The best known study of stock splits was conducted by Fama, Fisher, Jensen and Roll (1969). Since stock splits are frequently associated with increased dividend payouts, it would be expected that split announcements would contain some economic information. Cumulative average residuals were calculated from the simple market model, using monthly data for an interval of sixty months around the split ex date for 940 splits between January 1927 and December 1959. Fama et al found that there was considerable market reaction prior to the split announcement. In fact, the average cumulative abnormal returns for the 30 month period up to the month of announcement were in excess of 30%. The study suggested that stock splits might be

interpreted by investors as a message about future changes in the firm's expected cash flows. They hypothesized that stock splits might be interpreted as a message about dividend increases, which in turn imply that the managers of the firm feel confident that it can maintain a permanently higher cash flow. Splits per se have no effect on shareholder wealth. Rather, it merely serves as a message about the future prospects of the firm. Thus, splits have benefits as signaling devices.

2.5 Treasury Bills and the Stock Market

The stock market consists of the equity and bond market and is a major component of the capital market. Stock market development plays a vital role in realizing sustainable economic development and growth through domestic resource mobilization. Despite its importance, macroeconomic variables such as GDP, inflation rate and unemployment rate have a great impact on its development. Factors such as low investments, high interest rates, limited international aid flows, political uncertainty and persistent economic mismanagement disrupt economic activity. (IPAR, Volume 11 Issue 4, 2005).

Growth in the economy should result in growth of the stock market. However, a number of impediments hinder the growth of the stock market. Impediments include poor valuation of market shares, the small size of companies, shareholder composition wholly local or foreign, size and type of investor for example banks and insurance are not enthusiastic to list on the stock market and the elaborate listing requirements. (Kimura.& Amoro, 1997).

Short term interest rates such as discount rates, treasury bill rates; inter-bank rates; repurchase orders and others, are used severally by Governing authorities to transmit monetary policy to the economy through their effect on market interest rates. Restrictive Monetary policy is likely to push up both short term and long term interest rates leading to less spending by interest sensitive sectors of the economy such as housing, agriculture and consumer durable goods. Easing policy results in lower rates that stimulate economic activities. (Muriithi, 2003).

The banking sector dominates in holding the bulk of Treasury bills in Kenya. Banks possess both private and public information about their customers and the Central bank. This makes them effective in pricing instruments that transmit monetary information to the economy. (Slovin, et al, 1994).

When banks invest their money in Treasury bills, it reduces the amount of money available in the economy for expansion and development. This results in a crowding-out effect. A crowding effect is an economic theory explaining an increase in interest rates due to rising government borrowing in the money market. The problem occurs when Government debt 'crowds' out private companies and individuals from the lending market by borrowing at high rates to attract potential investors and raise revenue for fiscal expenditure or to fill budget deficit gap. (Mutoko, 2006).

Factors influencing Treasury bill rates include the demand for fixed income securities in general, for example, a concern about default or liquidity risk in other financial markets may cause investors to shift to Treasury bills to avoid risk. This is referred to as 'flight to safety' (Mutoko, 2006).Government budget deficits have conventionally been thought to increase interest rates including those of Treasury bills since the interest rate is determined by the supply and demand of credit. An increase in the deficit increases the demand for credit relative to the supply and consequently, increases the increases rate (Ross, 1993). Economic conditions such as a period of business expansion may see Treasury bill rates increase while Monetary policy actions by the CBK that affect the base rate such as increasing the cash ratio or liquidity premium of banks influences interest rates for close substitutes such as short term Treasury bills. Inflation and expected inflation, especially the Producer Price Index, and unanticipated money supply increases lead to immediate increases in interest rates (Urich & Watchel, 1984).

In Kenya, the Treasury bill market was fully liberalized in November 1990 so that bill rates were determined through the auction process. With the CBK utilizing the open market type operations (OMTO) framework for monetary policy, Treasury bill rates became an important signaling interest rate for monetary policy action. As long as the

open market operation is driven largely by monetary policy objectives, then Treasury bill rate sends the monetary policy stance signal. (Ngugi & Wambua, 2004).

The effectiveness of the indirect rates depends on the efficiency of the indirect monetary transmission mechanism. Sluggish responses of interest rate to monetary policy actions characterize an uncompetitive banking sector, weak regulatory and legal infrastructure, fiscal pressure, and the level of financial depression. The liberation process should be accompanied by restructuring of the banking sector to enhance competitiveness, strengthening of the legal and regulatory framework to ensure effective enforcement of financial contracts, attaining fiscal discipline to facilitate independence of the monetary authority and developing adequate indirect monetary policy tools. (Ngugi, 2003)

Leite (1993) noted that when budget deficits are large, requiring massive financing, primary sales of government securities tend to be the dominant influence in the financial markets, this in turn, limits the use of OMOs as an effective short run policy instrument, distorting the level and structure of interest rates. Thus it is observed that for an appropriate level and structure of interest rates, the government should gradually reduce its budget deficit to a level that would permit it to borrow directly from the financial market in competition with the private sector without crowding out the private sector and without recourse to special regulations such as high liquidity requirements. (Ngugi, 2003).

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Not much has been studied on the information content of Treasury bill rates in Kenya and around the world. Studies have concentrated on the information content of discount rates and the official central bank interest rates. Official bank rates typically

comprise the rates applied at one or more central bank standing facilities and in some cases at which the central bank operates a regular tender (Hardy, 1998). The information content of discount rates on financial assets has been confirmed in various studies (Cook & Hann, 1988, Hardy 1998, Thorton, 1998, Wagster 1993, and Waud 1970). Their findings indicate that financial markets respond to 'non-technical' (Smirlock & Yatwitz, 1985) discount rates which are the discount rates changes announced because of the Central Bank's concern over the growth rate of money and credit, or its concern over the pace of economic activity, the inflation rate, or some other macroeconomic variable. Discount rate changes are made only at substantial intervals and they are discontinuous instruments of monetary policy which have been established by the administrative action of a public body having special information and competence to judge whether expansion of bank credit and money is consistent with the economy's overall cash needs for transactions and liquidity. (Waud, 1970).

In Kenya, banks use the 91-day Treasury bill yield to fix their own lending rates. (Daily Nation, 19 June 2007). The Central Bank of Kenya steers the base rate towards its target by buying and selling short term Treasury bills in the open market. (Mutoko, 2006).

2.6 Conclusion

While most of the empirical research of the 1970s supported semi-strong market efficiency, a number of apparent inconsistencies arose by the late 1970s and early 1980s. These so called anomalies are a regular pattern in an asset return which are reliable, widely known, and inexplicable. The fact that the pattern is regular and reliable implies a degree of predictability, and the fact that the regularity is widely known implies that many investors can take advantage of it. (Lo, 2007).

Fama (1998) also notes that anomalies sometimes involve under-reaction and sometimes overreaction (Jones & Netter, 2007). Investors may overreact to performance, selling stocks that have experienced recent losses or buying stocks that have enjoyed recent gains. Such overreaction tends to push prices beyond their 'fair' or 'rational' market value, only to have rational investors take the other side of the

trades and bring prices back in line eventually. Implications of this phenomenon are price reversals and contrarian investment strategies in which 'losers' are purchased and 'winners' are sold. Debont and Thaler (1985) document the fact that the winners and losers in one 36 month period tend to reverse their performance over the next 36 month period. Many of these reversals occur in January (Lo, 2007).

Empirical inefficiencies contributed to the emergence of a new school of thought called behavioural finance, which countered the assumption of rational expectations with evidence from the field of psychology that people tend to make systematic cognitive errors when forming expectations (Jones and Netter, 2007). Specific behavioural biases that are ubiquitous to human decision making under uncertainty, several of which lead to undesirable outcomes for an individual's economic welfare. Examples include over-confidence, loss aversion, herding, psychological accounting, miscalibration of probabilities, hyperbolic discounting and regret. These critics argue that investors are often – if not always – irrational, exhibiting predictable and financially ruinous behaviour. (Lo, 2007).

This paper seeks to ascertain whether the Nairobi Stock Exchange market is efficient in the semi-strong form in relation its reaction to changes in the treasury bill rate.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Introduction

The overall objective of this study is to find out whether stock prices adjust to information on changes in Treasury Bill Rate instantaneously and without bias. This chapter highlights the research design, population, sample, method of data collection and Data analysis.

The study uses the Event Study methodology which is a residual analysis of the comparison period and the event period.

3.2 Research Design

The Research design is a co-relational design that assesses the degree of relationship that exists between the returns of the event window and those of the comparable or estimation period. The event in this case is an increase or decrease in the average monthly Treasury bill rate by 50 basis points from the previous trading rate due to the volatility of the Treasury bill rate. The event window is five days before and after the announcement of the average Treasury bill rate. The comparison or estimation period is similar to the one used by Waud (1970) of thirty day before and thirty days after the event window.

3.3 Population

The target population is all the securities listed in the Nairobi Stock Exchange and the period is from January 2007 to December 2013.

3.4 The Sample

The sample consists of securities comprising the NSE 20 index. The NSE 20 index has been in use since 1964 and it represents twenty blue chip companies with strong fundamentals and which have consistently returned positive financial results. (NSE, 'My stocks'). This sample is non-probabilistic and represents securities that are

actively traded. The required criteria includes: that the securities have traded for more than six months; have sufficient data for the event and the estimation window and have enough data points, that is, have not stopped trading at some point.

The period of the study is from January 2007 to December 2013. Daily data is used which provides more observations and improves the efficiency of the estimation model. (Kiptoo, 2006).

Eighteen out of the twenty companies listed in the NSE 20 stock index are to be included in the sample. Twenty eight Treasury bill rate changes occurred during the sample period. However, some periods represented high volatility such as between April and July 2010 and between October 2011 and December 2012. To manage this volatility, rates were selected when there was a change from positive to negative and vice versa. This will result in a Treasury bill sample of fifteen events. The date of announcement (event) is the last Friday of the month since all the rates for the month are available and can be calculated by the investor.

3.4 Methods of data collection

Data sources include the daily closing prices of all shares in the sample. The closing prices are secondary data which are sourced from the NSE database and the weekly average 91 day Treasury bill rate representing the event is sourced from the Central Bank of Kenya database.

3.5 Data Analysis

Data will be analyzed using Excel worksheets and the SPSS Software package. Use is made of the Standard Market Model which assumes that the rate of return on individual securities or portfolios is linearly related to the rate of return on the market portfolio in the period.

$E(R_{jt}) = \alpha_t + \beta_t MR_t$ (est.)

Where:

R_{jt} - Return of security j

MR_t – Return on the Market

α , β_t – intercept and slope of regression.

The NSE 20 share index is used as a proxy for market returns

1. Actual returns of each firm over the estimation window is calculated using holding period returns considering both share prices and dividends.

$$R_{jt}(est) = \{\frac{P_{jt} - P_{j(t-1)}\} + D_{jt}}{P_{j\ (t-1)}} \times 100$$

Where:

Pjt is the share price of firm j in period t

Djt is the cash dividend paid on the share of firm j in period t

Pjt is the share price of firm j in period t-1

2. Return on market portfolio over estimation window.

$$MRt\ (est) = \frac{NSE_t - NSE\ (_{t-1})}{NSE\ _{(t-1)}}$$

3. α , β estimated by performing simple regression of results of Step 1 and 2 corresponding for each stock. Assuming stable linear relationship between market returns and securities, the slope and intercept of regression obtained as:

$$Rjt\ (est) = \alpha_j + \beta MR_t\ (est)$$

4. Return on market portfolio over event window.

5. Expected return on each security for each day over event window (Calculated by introducing results of step 4 into the estimate model in step 1).

$$ERj_t = \alpha_j + \beta MR_t\ (4)$$

6. Actual return of each firm over event window using holding period return.

$$R_{jt} = \frac{P_j + D_{jt}}{P_{jt} - 1} - 1 \times 100$$

Abnormal returns:

$$AR_j = R_{jt} - E(R_{jt})$$

A Cumulative effect over the event window may be present. The Cumulative Average Returns (CAR) is calculated by summing up (adding up) daily abnormal returns across time. The CAR is standardized to determine if CAR are statistical different from zero.

Cumulative abnormal returns: $CAR_t = \Sigma ARj_t$

Mean Abnormal Returns: $MAR_t = {}^{1}/_{N}\, \Sigma ARj_t \quad t = 1 \text{ to } t = N$

Mean Cumulative Abnormal Returns ($MCAR_t$) = Σ MAR from t = -30 to t = 30.

Test of Significance

Using the Central Limit Theorem:

$$Z = \frac{X - 1}{\sqrt{S}/_{n}}$$

Where:

X = Mean value

$\sqrt{S}/_{n}$ = Standard error

Calculated t statistic is compared with annualized distribution under the NULL hypothesis that average abnormal performance over the event window is equal to zero. For a capital market to be efficient in the semi-strong form, the value of the

CAR/MCAR should be equal to zero before the event, rise to a positive number just after the event and remain relatively constant.

In inefficient markets, the value of CAR/MCAR continues to rise for several days after the effects of the event have worn off. (Kiptoo, 2006).

CHAPTER FOUR

4.0 DATA ANALYSIS AND PRESENTATION OF FINDINGS

4.1 Introduction

The overall objective of this study is to find out whether stock prices adjust to information on changes in Treasury Bill Rate instantaneously and without bias. This chapter highlights the descriptive analysis and findings of the Event Study carried out at the Nairobi Securities Exchange.

The Study includes sixteen stocks selected from the NSE20 Stock index for the period between 2007 and 2013. Use is made of Microsoft Excel and SPSS Packages for testing hypotheses. Tests are done at 95 percent confidence level.

4.2 Descriptive analysis

Simple averaging of the mean Cumulative Abnormal returns for the period prior to the events indicate that total mean returns of the comparative period are higher than those of the event window. Volatility of the cumulative abnormal returns was also higher during the comparative period than during the event period. Equity stocks recording higher than average cumulative returns include East African Cables Ltd, Equity Bank Ltd, Express Kenya Ltd and Nation Media Group. The most volatile stocks during this period were Equity bank, Kenya Power (Kenya Power and Lighting Company Ltd), Nation Media Group and Standard Chartered Bank.

Total mean returns during the comparative period after the event period were slightly lower than during the event period. Stocks recording large cumulative abnormal returns during the period include: Equity Bank, Express Kenya, Kenya Power and Nation Media Group. Volatility of stocks during the comparative period was higher than during the event period. Highly volatile stocks include Equity Bank, East African Cables Kenya Power, Nation Media Group and Standard Chartered Bank.

4.3 Findings

The findings are arranged according to Nairobi Securities Exchange classification of August 2011 (Business Daily, 2011). The classification, referred to as 'peer classification', enables easy comparison of performance in similar sectors. Equity securities are categorized according to ten sectors which include: agricultural, commercial and services, telecommunication and technology, automobiles and accessories, banking, insurance, investment, manufacturing and allied, construction and allied and energy and petroleum.

The sample includes equity securities from the Agricultural, Banking, Commercial and Services, Construction and allied Energy and Petroleum and Manufacturing and allied which represent six out of the ten or sixty percent of the equity sectors or counters.

Agricultural sector

Sasini Tea Ltd was the only representative firm from the Agricultural sector in the sample.

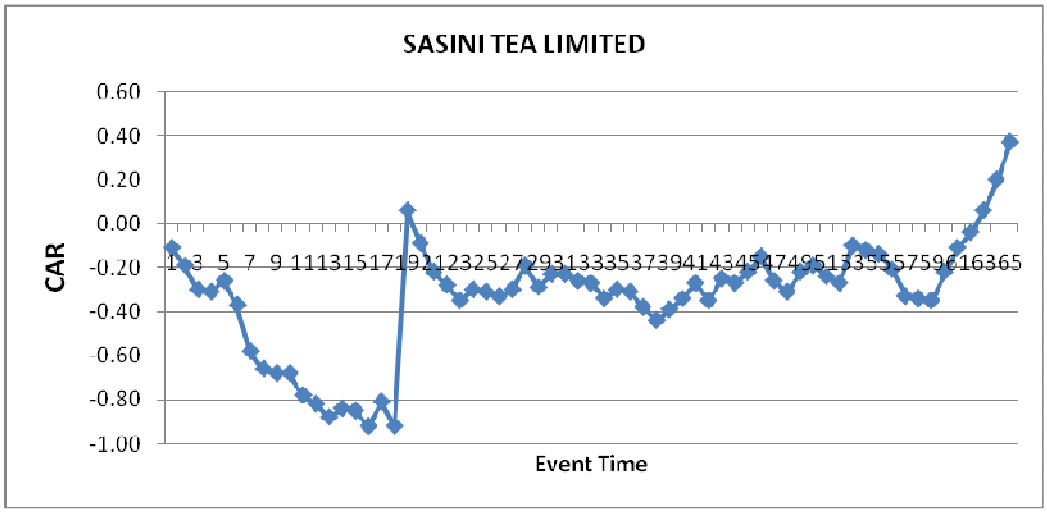

Figure 1: Cumulative Abnormal Returns – Sasini Tea Ltd

Cumulative abnormal returns are negative during both pre and post comparative and event periods (Figure 1, Appendix 4). T-test statistics indicate a significant difference between comparative period returns and event window returns for both pre and post announcement periods.

Banking Sector

The banking sector is represented by four banks namely: Barclays Bank of Kenya, Equity Bank Kenya Limited, Kenya Commercial Bank and Standard Chartered Bank Limited.

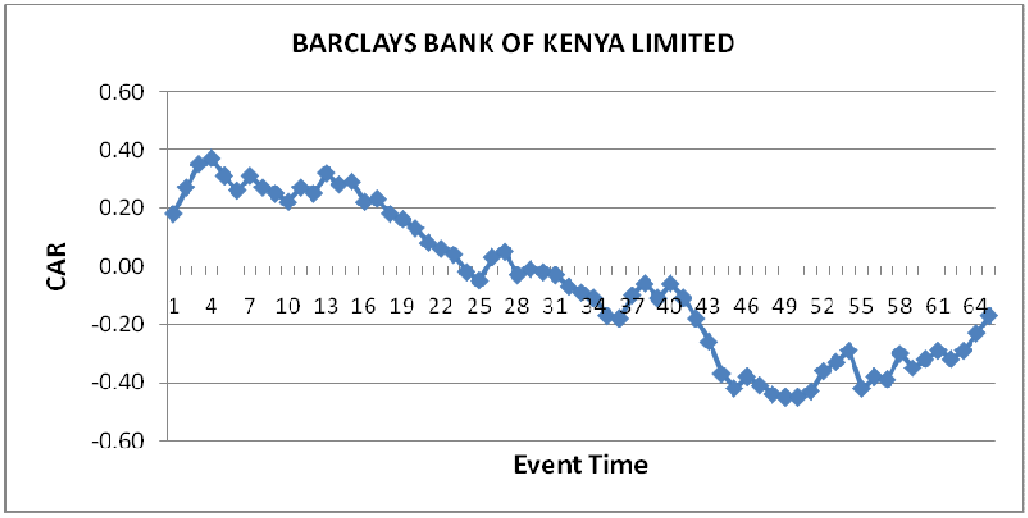

Figure 2: Cumulative Abnormal Returns - Barclays Bank of Kenya Ltd

The CAR diagram for Barclays Bank shows decreasing CARs until the fifteenth day after the announcement date (day 45) when the returns start rising. T-test statistics indicate significant difference between comparative and event window CAR both prior to and after the announcement day.

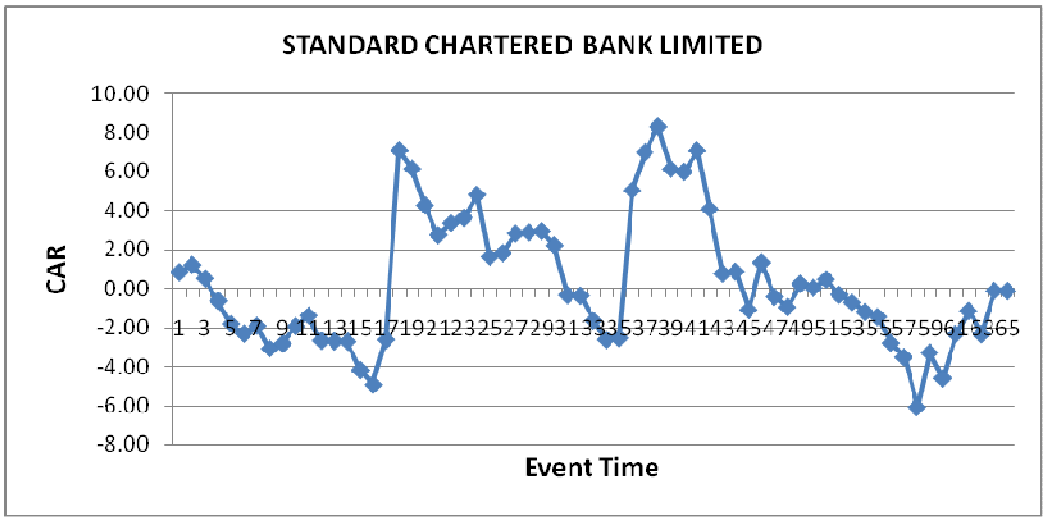

Figure 3: Cumulative Abnormal Returns – Standard Chartered Bank Ltd

CARs for Standard Chartered Bank show a declining trend towards announcement day with a steep rise immediately after the post announcement day event window. T-

test statistics do not indicate significant different between event period returns and comparative period returns both prior to and after the announcement day.

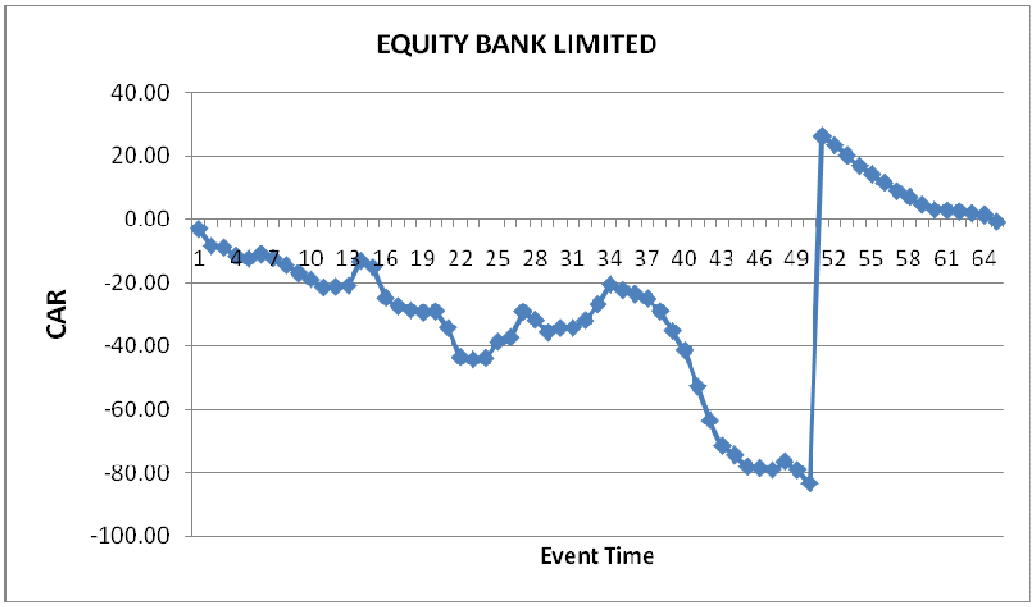

Figure 4: Cumulative Abnormal Returns – Equity Bank Ltd

CAR diagram for Equity Bank indicates declining negative returns during the period prior to announcement day. The returns decline sharply towards the end of the post announcement date event window. T-test statistics indicate significant abnormal returns during the event window prior to the announcement day. However, post announcement event day window returns are not statistically different from post announcement day comparative or test period returns.

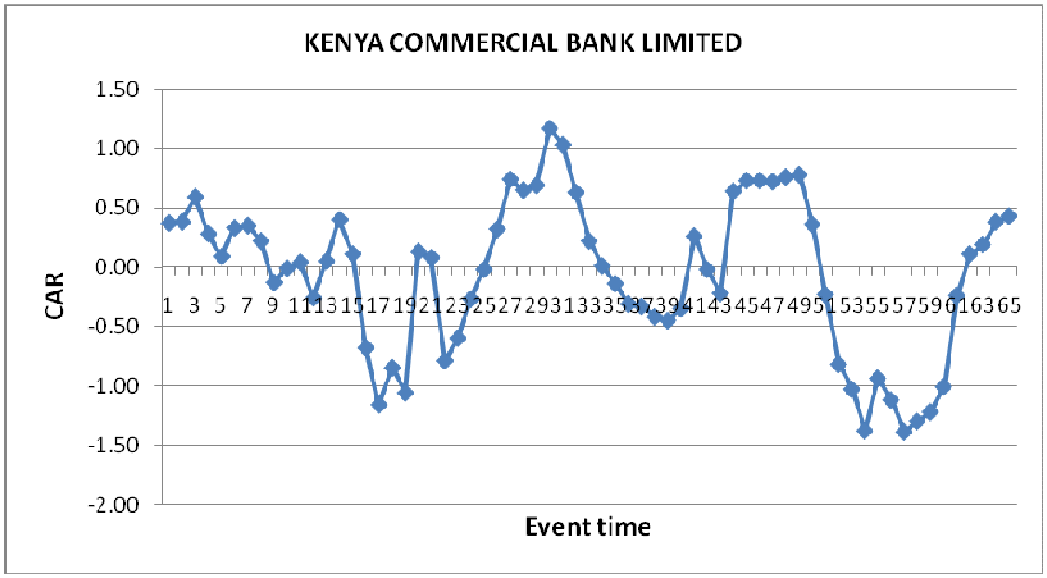

Figure 5: Cumulative Abnormal Returns – Kenya Commercial Bank Ltd

Kenya Commercial Bank CAR diagram shows increasing returns which are highest on the announcement day. T-test results indicate significant abnormal returns in the event period prior to announcement day but insignificant results after announcement day.

Commercial and Allied Sector

Sample companies in the Commercial and Services sector include: Express Kenya Limited (alternative investment market), Kenya Airways Limited and Nation Media group Limited.

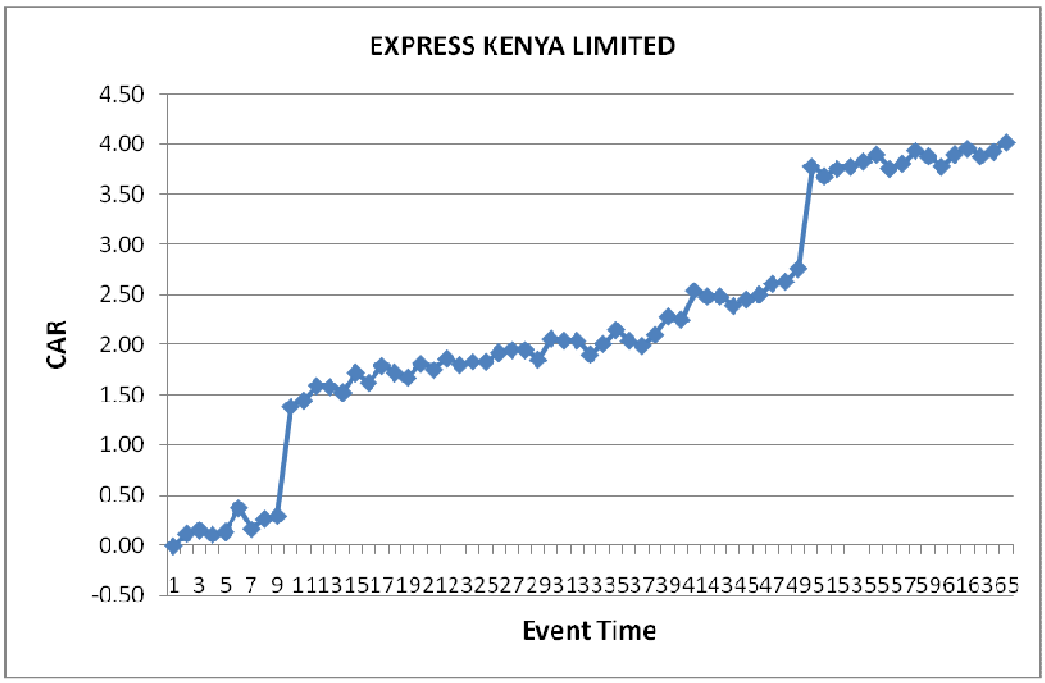

Figure 6: Cumulative Abnormal Returns – Express Kenya Ltd

The Cumulative abnormal returns for Express Kenya Limited show an increasing trend throughout the sample period. T-test statistics indicate statistically significant returns both prior to and after the announcement date.

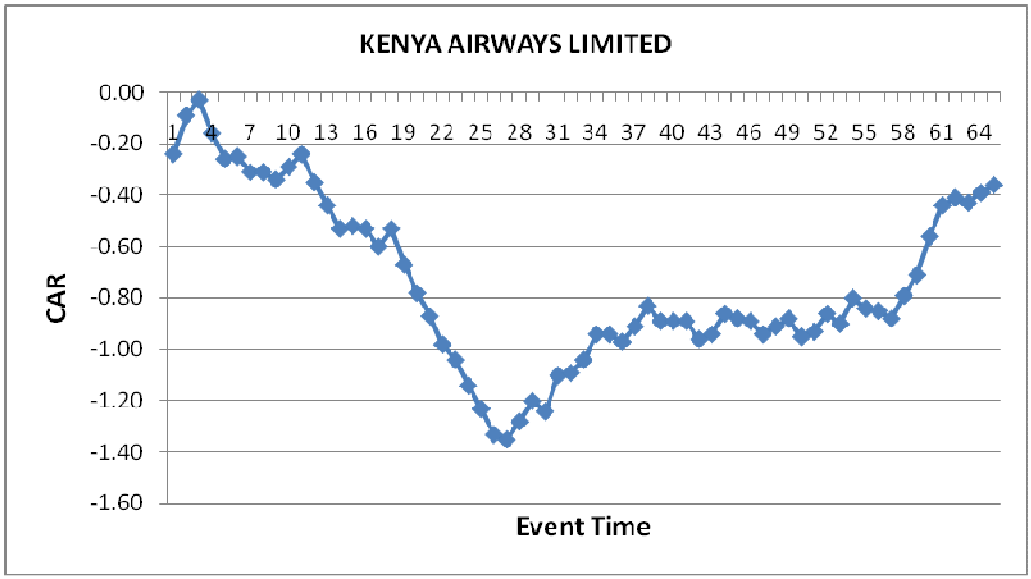

Figure 7: Cumulative Abnormal Returns – Kenya Airways Ltd

Cumulative abnormal returns for Kenya Airways Limited indicate a sharp decline twenty days before the announcement date which change to a rising trend four days

before the announcement day. T-test statistics indicate statistically significant returns both prior to and after the announcement date.

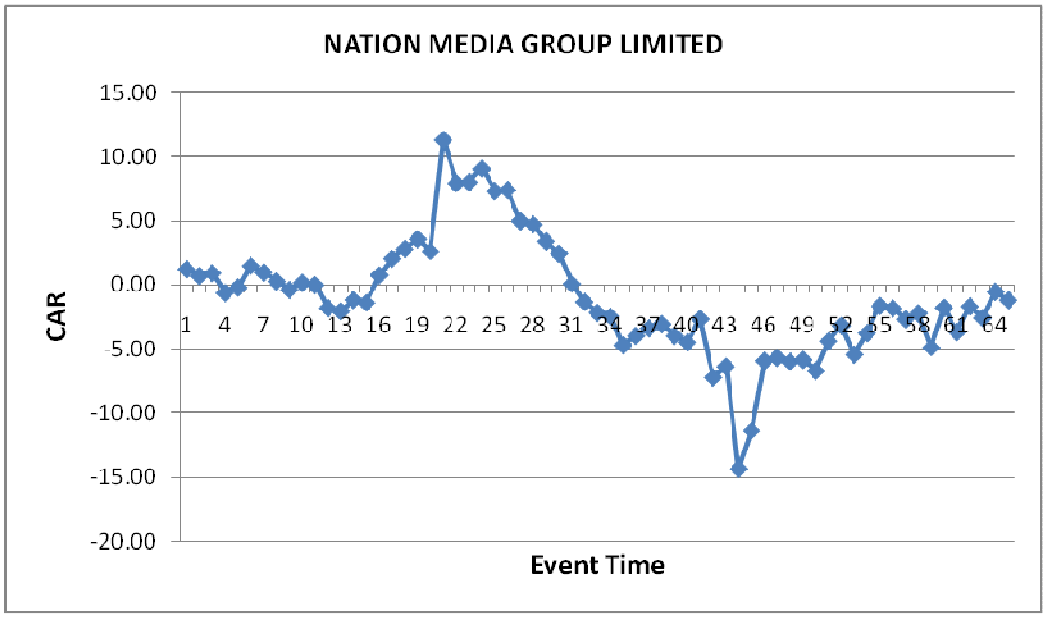

Figure 8: Cumulative Abnormal Returns – Nation Media Group Ltd

The CAR diagram for Nation Media Group Limited shows declining trend around the event window period both prior to and after the announcement day. T-test statistics indicate CARs for the event window period are not significant both prior to and after the announcement day.

Construction and Allied

The sample companies under the Construction and Allied sector include Athi River Mining Company Limited, Bamburi Cement Limited and East African Cables Limited.

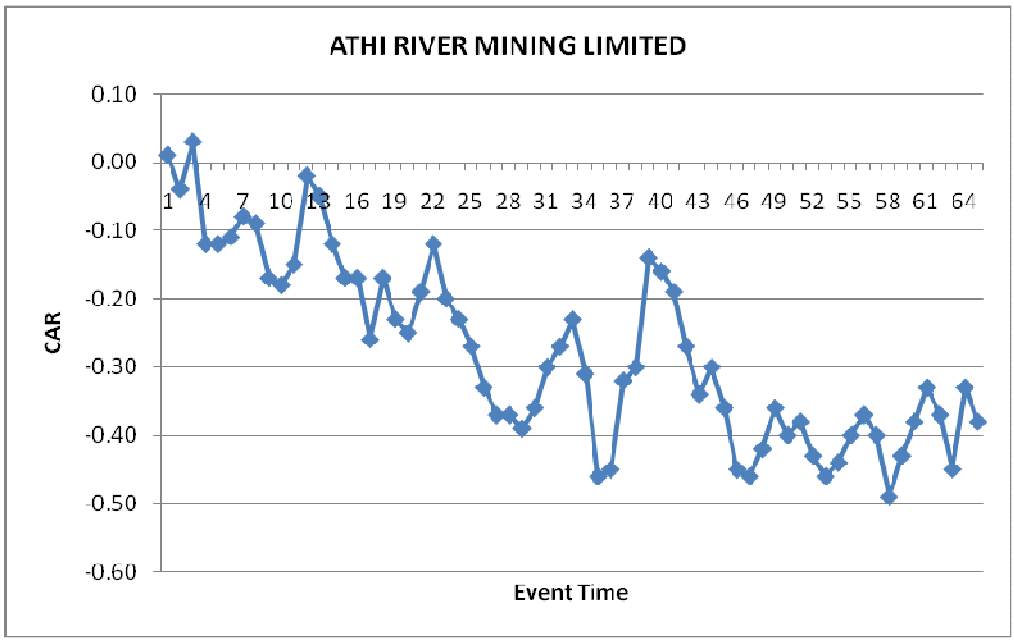

Figure 9: Cumulative Abnormal Returns – Athi River Mining Ltd

Athi River Mining Company Limited CAR diagram shows a general falling trend during the period. However there is a slight rise before announcement day which fall sharply by the end of the post announcement day event window. T-test statistics are statistically significant prior to the announcement date but not after the announcement date.

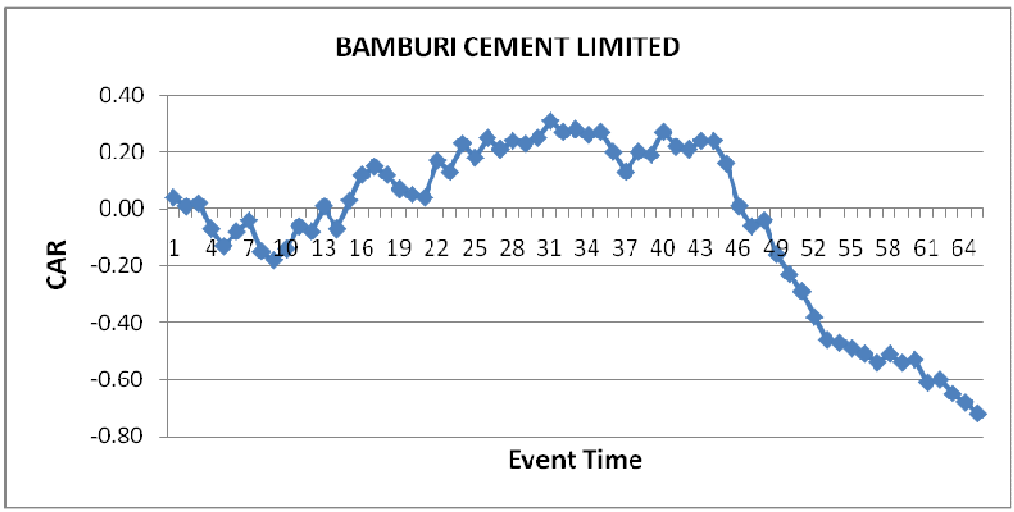

Figure 10: Cumulative Abnormal Returns – Bamburi Cement Ltd

CAR diagram for Bamburi Cement show rising trend which falls sixteen days after the announcement day. T-test statistics indicate statistically significant results both prior to and after the announcement day.

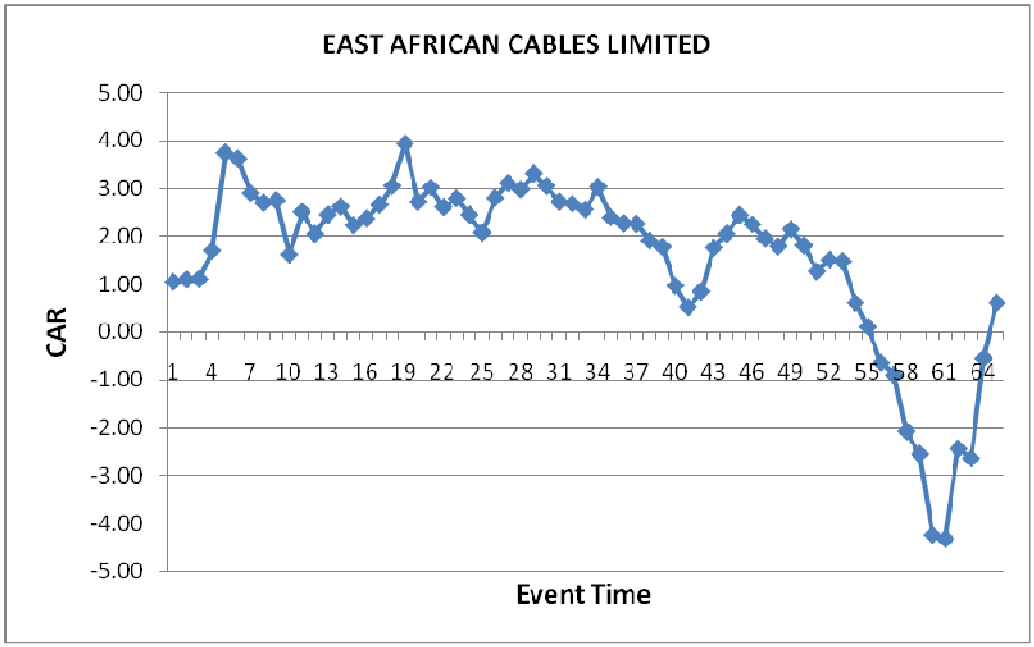

Figure 11: Cumulative Abnormal Returns – East African Cables Ltd

The CAR diagram for East African Cables Limited shows positive returns which fall slightly seven days after the announcement day. T-test results are statistically significant after the announcement date only.

Energy and Petroleum

Sample companies in the Energy and Petroleum sector include Kengen and Kenya Power Limited.

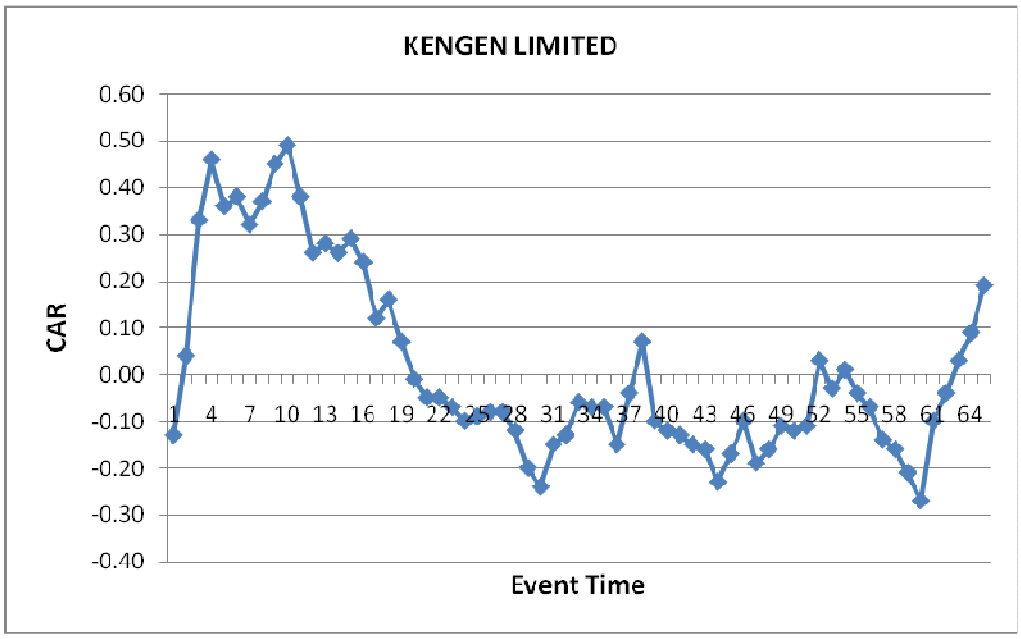

Figure 12: Cumulative Abnormal Returns – Kengen Ltd

The CAR diagram for Kengen Limited shows a falling trend with CARs around the event window being negative. T-test results indicate significant difference between the event window period and the comparative prior to announcement but no significant difference after the event day announcement.

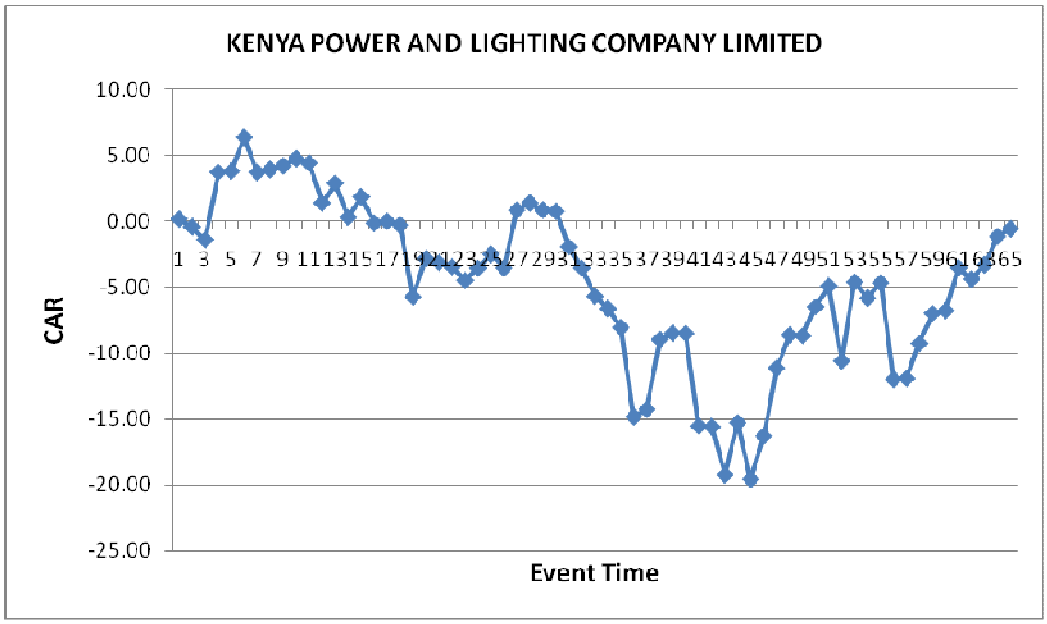

Figure 13: Cumulative Abnormal Returns – Kenya Power and Lighting Company (Kenya Power) Ltd

The CAR diagram for Kenya Power Limited show falling returns during the sample period. Returns start falling sharply on the announcement day. T-test results are not significant both prior to and after the announcement date.

Manufacturing and Allied

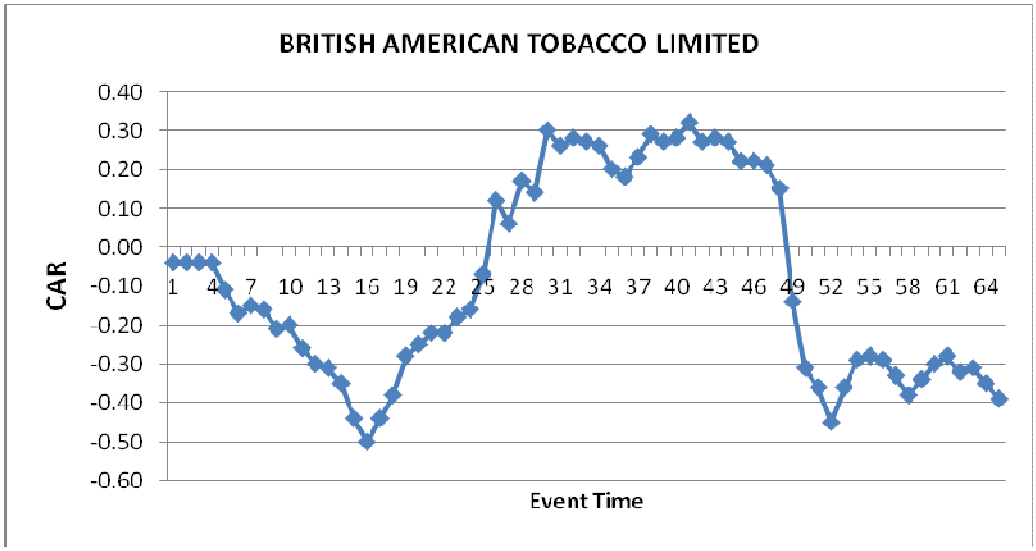

Figure 14: Cumulative Abnormal Returns – British American Tobacco Ltd

The CAR diagram for British American tobacco rises fifteen days before the announcement day before peaking on the announcement day. The CARs then fall sharply twenty days after the announcement day. T-test results indicate statistical difference between the event period returns and the comparative period returns both prior to and after the announcement date.

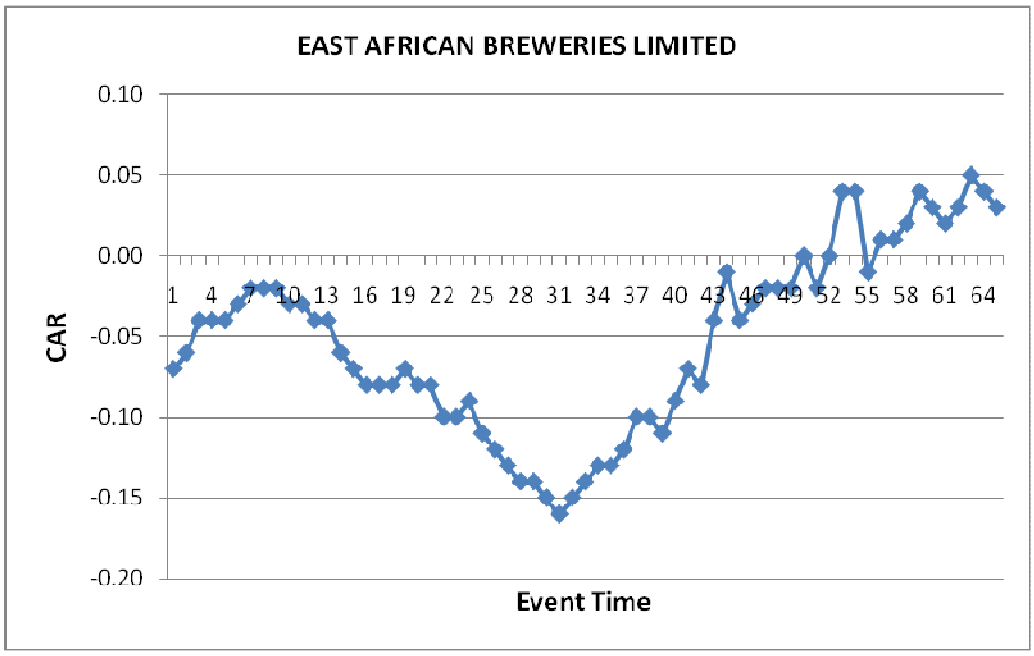

Figure 15: Cumulative Abnormal Returns – East African Breweries Ltd

The CAR diagram for East African Breweries Limited shows falling returns prior to announcement day and rising returns after the announcement day. Like British American Tobacco Limited, t-test results for the Company indicate statistically significant difference between the event window period and the comparative period both prior to and after the announcement date.

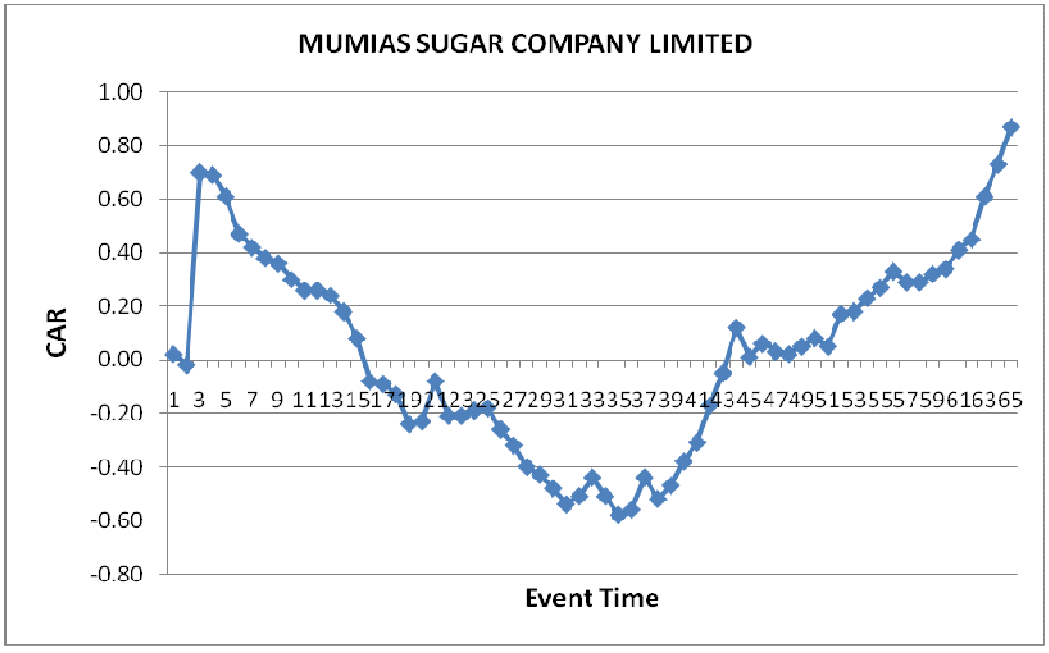

Figure 16: Cumulative Abnormal Returns – Mumias Sugar Company Ltd

Finally, the CAR graph of Mumias Sugar Company Limited shows decreasing CAR prior to announcement date followed by a rising trend in CAR two days after the announcement date. Like the other two sample companies in the sector, t-test results are statistically significant both prior to and after the announcement date.

4.4 Summary and interpretation of the Findings

Sample companies showing statistically significant results both prior to and after the announcement date include Sasini Tea Limited, Barclays Bank of Kenya Limited, Express Kenya Limited, Kenya Airways Limited, Bamburi Limited and the three companies in the Manufacturing and Allied sector (British American Tobacco Company Limited, East African Breweries Limited, and Mumias Sugar Company Limited). CAR diagrams are however varied and provide inconclusive evidence of information content of Treasury bill rates.

The sample Companies showing statistical results prior to announcement day alone include Equity Bank Kenya Limited, Kenya Commercial Bank Limited, Athi River Mining Company Limited and Kengen Limited. CAR diagrams, though indicating a downward trend in returns, do not provide conclusive evidence of information content of Treasury bill rates.

East African Cables Limited is the only company showing significant statistical returns after the announcement day. The CAR diagram indicates a steep decrease in returns twenty three days after the announcement day. This may be what explains the significant abnormal returns occurring in the post announcement day comparative period.

Standard Chartered Bank Limited, Nation Media Group Limited and Kenya Power Company Limited show insignificant statistical differences both prior to and after the announcement day. They are among the companies with the highest volatility both prior to and after the announcement period as shown in their CAR diagrams.

CHAPTER FIVE

5.0 SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary

The purpose of this study is to find out whether stock prices adjust to information on changes in Treasury Bill Rate instantaneously. This is a study on market efficiency. According to the Efficient Market hypothesis, market prices fully reflect all available information. The study is interested in testing the semi-strong market efficiency where prices reflect all historical and current information about a stock price. Changes in the ninety day or three-month treasury bill rates are used as events in the study.

Treasury bill rates have a large impact on the shilling and interest rate environment. Changes in Treasury bill rates affect the price at which funds are availed to institutions and individuals since they guide banks in setting their base rates for determining the cost of borrowing. If the price of funds for institutions increases, earnings and cashflows are reduced since more money has to be directed towards paying the cost of funds. Interest levels may determine whether a firm records a profit or loss or if it will remain solvent.

Not much research has been conducted on the information content of Treasury bill rates. This study has used the three month Treasury bill rates since banks and other financial institutions rely on them while pricing their financial instruments. Studies on official central bank interest rates such as discount rate changes have found that they have a statistically significant effect on market interest rates and on stock prices.

Locally, studies on various events such as on accounting information (Ondigo, 1995), stock dividends (Mbugua, 2004), (Kiptoo 2006), rights issue (Njoroge, 2003), CEO change announcements (Ondieki, 2011), seasoned equity issue (Mumbua, 2011) and stock splits (Leisen, 2012) indicate mixed results on the information content of the events studied.

5.2 Conclusions

Results from this study indicate that eight of the sixteen companies in the sample have significant differences between event window period and comparative or test periods both prior to and after the announcement of a change in Treasury bill rates. The firms include from various sectors such as Agriculture, Banking, Commercial, Construction and Manufacturing all of which are sensitive to changes in economic factors such as interest rates, inflation and exchange rates. (CBK, 2013).

Companies which indicate statistically significant differences prior to announcement day include Equity Bank Kenya Limited, Kenya Commercial Bank Limited Athi River Mining Company Limited and Kengen Limited. The companies are also within sectors sensitive to changes in economic variables. CAR diagrams for the sample indicate companies with decreasing returns except for Kenya Commercial Bank which had a high volatility.

East African Cables Limited indicated statistically significant differences between post announcement event window and the test or comparative period. The CAR diagram indicates a sharp decrease in returns from the twenty third day after the announcement date. This explains the significant difference in the period returns as the company was also among the highly volatile companies after the announcement date.

Standard Chartered Bank Limited, Nation Media Group Limited and Kenya Power Company Limited showed insignificant statistical differences both prior to and after the announcement day. They are among the companies with the highest volatility both prior to and after the announcement period as shown in their CAR diagrams.

Given that sixty percent of the events under study were for decreases in Treasury bill rates, the overall effect would have been increasing returns. However the forty percent events which were increases in the Treasury bill rate were large and may the influenced the general downward trend of stock prices during the sample period.

5.3 Policy Recommendations

Treasury bill rates are influenced by the Central Bank of a country which is deemed to be knowledgeable of the economic and financial direction of a country. Influence on Treasury bill rates is normally through setting the amount of funds to be raised in the market and the maximum amount for competing and non-competing bids. Treasury bill rates and discount rates are established by the administrative action of a public body having special information and competence to judge whether expansion of bank credit and money is consistent with the economy's overall cash needs for transactions and liquidity.

Policy recommendations on Treasury bill rates that may affect information efficiency of the capital market include improving public debt management so that key objectives such as cost and risk management, developing and maintaining an efficient market for Government securities and ensuring sustainable debt levels are achieved. (Mutoko R, 2006).

Improving co-ordination between monetary and fiscal policies and effective debt structuring and risk management to prevent large volumes of short-term or floating rate debt making the country susceptible to contagion and financial risk.

Roles, responsibilities and objectives of financial agencies responsible for debt management should be clarified. The Ministry of Finance and Central Bank should separate debt management, policy advice, undertaking primary debt issues, secondary market arrangements, depository facilities and clearing and settlement arrangements for trade in government securities should be publicly disclosed. Objectives for debt management should be clearly defined and measures of cost and risk that are adopted should be publicly disclosed.

Institutional frameworks should be strengthened to improve the indirect monetary transmission mechanism through restructuring the banking sector to enhance competitiveness and strengthening the legal and regulatory infrastructure framework to ensure effective enforcement of financial contracts. (Ngugi, 2003).

5.4 Limitations of the study

The effectiveness of the event study methodology depends on strong assumptions. By violating these assumptions, the empirical results may be biased and inaccurate and therefore basing the conclusions on them is problematic. This is true especially when examining the possibility of invalid assumptions like stock prices not fully and immediately reflecting information due to market inefficiency. Events may also be anticipated or unforeseen co-existing events could have an effect on the sample stocks and lead to biased stock returns.

It is also not easy to precisely determine the estimation period since the length of the estimation period is subject to a tradeoff between improved estimation accuracy and potential parameter shifts. The estimation period is also difficult to control due to other confounding effects if long test or event windows are selected.

Choice of the estimation model and market index to calculate market adjusted returns can also create differences in long term performance results. If the expected return is incorrectly estimated, other factors that are not properly controlled could lead to biased information in the event study results. (Thitima, 2000).

Thin trading over the estimation and test period is one of the problems encountered in this study. This mainly affected small stocks such as Express Kenya Limited.

Calendar time clustering of events is another problem in the research. This occurs when test periods and event dates of sample stocks are clustered in the same calendar time period. An example is when the announcement date in late March and June when several companies are also releasing their earnings announcements and dividend results. Test periods of the stocks overlap in calendar time, and a problem of cross-correlation in abnormal returns could exist.

The sample considered the average monthly ninety day Treasury bill announcements for determining the announcement dates due to the close range of announced weekly results.

There were data gaps in the stock market daily equity prices purchased from the Nairobi Securities Exchange database. For example, the study considered only ten periods instead of the planned fourteen periods due to lack of daily stock returns for four periods. Data for the tenth period was highly scattered and may have influenced the overall results since it was not flowing on a daily basis for comparison purposes.

5.5 Suggestions for further studies

The study can be repeated using better data quality and for extended periods such as ten years to test the information content of Treasury bill rate change announcements. More sample firms can also be included and the test can be carried out on other financial instruments such as market interest rates and exchange rates to determine the information content of Treasury bill rate change announcements.

The study can also replicated using different economic models, different tenors of Treasury bill rates and other official Central Bank rates such as the Central Bank's discount rate, repo rate or the interbank rate.

Finally, the study can also be carried out using other stock indices and in other countries to determine the efficiency with which the Securities and financial market responds to changes in economic parameters such as interest rates and exchange rates.

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APPENDIX A: LIST OF NSE 20 STOCK INDEX COMPANIES INCLUDED IN THE SAMPLE

STOCK	ABBREVIATION
1. ARTHI RIVER MINING	ARM
2. BAMBURI CEMENT	BAMB
3. BARCLAYS BANK OF KENYA	BBK
4. BRITISH AMERICAN TOBACCO	BAT
5. EAST AFRICAN BREWERIES	EABL
6. EAST AFRICAN CABLES	CABL
7. EQUITY BANK	EQTY
8. EXPRESS KENYA	EXP
9. KENGEN	KEGN
10. KENYA AIRWAYS	KQ
11. KENYA COMMERCIAL BANK	KCB
12. KENYA POWER AND LIGHTING CO LTD	KPLC
13. MUMIAS SUGAR COMPANY LTD	MSG
14. NATION MEDIA GROUP	NMG
15. SASINI TEA	SASN
16. STANDARD CHARTERED BANK	SCB

Rea Vipingo, Centum Investment Co. Ltd, Safaricom and CMC Holdings Ltd are excluded from the list as they did not meet the requirements for inclusion in the sample.

APPENDIX B: TREASURY BILL RATE CHANGES USED AS EVENTS DURING THE PERIOD

TREASURY BILL RATES 2007-2013

Year	Month	91-Day Tbill	change from previous month	
2007	AUG	7.3	-0.78	1
	DEC	6.87	0.65	2
2008	NOV	8.39	-0.64	3
2009	FEB	7.55	0.91	4
2010	APR	5.17	0.81	5
	JUN	2.98	1.23	6
2011	MAY	5.35	-2.09	7
	OCT	14.8	-2.87	8
2012	JAN	20.56	-2.26	9
	APR	16.01	1.79	10
	MAY	11.18	4.83	11
2013	MAR	9.88	-1.5	12
	MAY	9.46	0.92	13
	AUG	10.03	-4.11	14

Source: Central Bank of Kenya

APPENDIX C: NAIROBI SECURITIES EXCHANGE STOCK CLASSIFICATION (PEER CLASSIFICATION FROM AUGUST 2011)

AGRICULTURAL
1. Eaagads Ltd Ord 1.25 **AIMS**
2. Kakuzi Ltd Ord.5.00
3. Kapchorua Tea Co. Ltd Ord Ord 5.00 **AIMS**
4. The Limuru Tea Co. Ltd Ord 20.00 **AIMS**
5. Rea Vipingo Plantations Ltd Ord 5.00
6. Sasini Ltd Ord 1.00
7. Williamson Tea Kenya Ltd Ord 5.00 **AIMS**
AUTOMOBILES & ACCESSORIES
8. Car & General (K) Ltd Ord 5.00
9. CMC Holdings Ltd Ord 0.50
10. Marshalls (E.A.) Ltd Ord 5.00
11. Sameer Africa Ltd Ord 5.00
BANKING
12. Barclays Bank of Kenya Ltd Ord 0.50
13. CFC Stanbic of Kenya Holdings Ltd ord.5.00
14. Diamond Trust Bank Kenya Ltd Ord 4.00
15. Equity Bank Ltd Ord 0.50
16. Housing Finance Co.Kenya Ltd Ord 5.00
17. Kenya Commercial Bank Ltd Ord 1.00
18. National Bank of Kenya Ltd Ord 5.00
19. NIC Bank Ltd Ord 5.00
20. Standard Chartered Bank Kenya Ltd Ord 5.00
21. The Co-operative Bank of Kenya Ltd Ord 1.00
COMMERCIAL AND SERVICES
22. Express Kenya Ltd Ord 5.00 **AIMS**
23. Hutchings Biemer Ltd Ord 5.00
24. Kenya Airways Ltd Ord 5.00

25. Kenya Airways Ltd
26. Nation Media Group Ltd Ord. 2.50
27. Scangroup Ltd Ord 1.00
28. Standard Group Ltd Ord 5.00
29. TPS Eastern Africa Ltd Ord 1.00
30. Uchumi Supermarket Ltd Ord 5.00
CONSTRUCTION & ALLIED
31. Athi River Mining Ord 5.00
32. Bamburi Cement Ltd Ord 5.00
33. Crown Berger Kenya Ltd Ord 5.00
34. E.A.Cables Ltd Ord 0.50
35. E.A.Portland Cement Co. Ltd Ord 5.00
ENERGY & PETROLEUM
36. KenGen Co. Ltd Ord. 2.50
37. KenolKobil Ltd Ord 0.05
38. Kenya Power & Lighting Co Ltd Ord 2.50
39. Total Kenya Ltd Ord 5.00
INSURANCE
40. British-American Investments Co.(Kenya)Ltd Ord 0.10
41. CFC Insurance Holdings Ltd ord.1.00
42. Jubilee Holdings Ltd Ord 5.00
43. Kenya Re Insurance Corporation Ltd Ord 2.50
44. Pan Africa Insurance Holdings Ltd Ord 5.00
INVESTMENT
45. Centum Investment Co Ltd Ord 0.50
46. City Trust Ltd Ord 5.00 **AIMS**
47. Olympia Capital Holdings Ltd Ord 5.00
48. Trans-Century Ltd Ord 0.50 **AIMS**
MANUFACTURING & ALLIED
49. A.Baumann & Co Ltd Ord 5.00 **AIMS**

50. B.O.C Kenya Ltd Ord 5.00
51. British American Tobacco Kenya Ltd Ord 10.00
52. Carbacid Investments Ltd Ord 5.00
53. East African Breweries Ltd Ord 2.00
54. Eveready East Africa Ltd Ord.1.00
55. Kenya Orchards Ltd Ord 5.00 **AIMS**
56. Mumias Sugar Co. Ltd Ord 2.00
57. Unga Group Ltd Ord 5.00
TELECOMMUNICATION & TECHNOLOGY
58. AccessKenya Group Ltd Ord. 1.00
59. Safaricom Ltd Ord 0.05

APPENDIX D: STATISTICAL FINDINGS

TABLE D1: SASINI TEA LTD

t-Test: Two-Sample Assuming Unequal Variances 0.05 **BEFORE ANNOUCEMENT**

Unequal Sample Sizes

	Data1	*Data2*	
Mean	-0.04739	-0.0256	
Variance	0.000874	6.8E-06	
Observations	28	5	
Hypothesized Mean Difference	0		
Df	29		
t Stat	-3.818		
P(T<=t) two-tail	0.001		Reject Null Hypothesis because p < 0.05 (Means are Different)
T Critical Two-tail	2.045		

t-Test: Two-Sample Assuming Unequal Variances 0.05 **AFTER ANNOUNCEMENT**

Unequal Sample Sizes

	Data1	*Data2*	
Mean	-0.01964	-0.032	
Variance	0.000311	1.75E-05	
Observations	28	5	
Hypothesized Mean Difference	0		
Df	27		
t Stat	3.234		
P(T<=t) two-tail	0.003		Reject Null Hypothesis because p < 0.05 (Means are Different)
T Critical Two-tail	2.052		

TABLE D2: BARCLAYS BANK OF KENYA LTD

t-Test: Two-Sample Assuming Unequal Variances 0.05 **BEFORE ANNOUCEMENT**

Unequal Sample Sizes

	Data1	*Data2*	
Mean	0.018857	-0.0044	
Variance	0.000151	1.18E-05	
Observations	28	5	
Hypothesized Mean Difference	0		
Df	24		
t Stat	8.351		
P(T<=t) two-tail	0.000		Reject Null Hypothesis because p < 0.05 (Means are Different)
T Critical Two-tail	2.064		

t-Test: Two-Sample Assuming Unequal Variances Unequal Sample Sizes	□	0.05	**AFTER ANNOUNCEMENT**
	Data1	*Data2*	
Mean	-0.03061	-0.013	
Variance	0.000141	0.0000175	
Observations	28	5	
Hypothesized Mean Difference	0		
Df	18		
t Stat	-6.028		
P(T<=t) two-tail	0.000		Reject Null Hypothesis because p < 0.05 (Means are Different)
T Critical Two-tail	2.101		

TABLE D3: EQUITY BANK

t-Test: Two-Sample Assuming Unequal Variances Unequal Sample Sizes	□	0.05	**BEFORE ANNOUCEMENT**
	Data1	*Data2*	
Mean	-2.34004	-3.2664	
Variance	1.382929	0.120192	
Observations	28	5	
Hypothesized Mean Difference	0		
df	22		
t Stat	3.419		
P(T<=t) two-tail	0.002		Reject Null Hypothesis because p < 0.05 (Means are Different)
T Critical Two-tail	2.074		

t-Test: Two-Sample Assuming Unequal Variances Unequal Sample Sizes	□	0.05	**AFTER ANNOUNCEMENT**
	Data1	*Data2*	
Mean	-2.50279	-2.377	
Variance	16.22122	0.059013	
Observations	28	5	
Hypothesized Mean Difference	0		
df	28		
t Stat	-0.164		
P(T<=t) two-tail	0.871		Cannot Reject Null Hypothesis because p > 0.05 (Means are the same)
T Critical Two-tail	2.048		

TABLE D4: KENYA COMMERCIAL BANK

t-Test: Two-Sample Assuming Unequal Variances Unequal Sample Sizes	□	0.05	**BEFORE ANNOUCEMENT**
	Data1	*Data2*	

Mean	-0.0025	0.0748	
Variance	0.00261	0.001384	
Observations	28	5	
Hypothesized Mean Difference	0		
df	7		
t Stat	-4.018		
P(T<=t) two-tail	0.005		Reject Null Hypothesis because p < 0.05 (Means are Different)
T Critical Two-tail	2.365		

t-Test: Two-Sample Assuming Unequal Variances Unequal Sample Sizes	□	0.05	**AFTER ANNOUNCEMENT**
	Data1	*Data2*	
Mean	-0.02161	-0.011	
Variance	0.005561	0.000532	
Observations	28	5	
Hypothesized Mean Difference	0		
df	21		
t Stat	-0.607		
P(T<=t) two-tail	0.550		Cannot Reject Null Hypothesis because p > 0.05 (Means are the same)
T Critical Two-tail	2.080		

TABLE D5: STANDARD CHARTERED BANK LTD

t-Test: Two-Sample Assuming Unequal Variances Unequal Sample Sizes	□	0.05	**BEFORE ANNOUNCEMENT**
	Data1	*Data2*	
Mean	0.027036	0.0546	
Variance	0.106994	0.037053	
Observations	28	5	
Hypothesized Mean Difference	0		
df	8		
t Stat	-0.260		
P(T<=t) two-tail	0.801		Cannot Reject Null Hypothesis because p > 0.05 (Means are the same)
T Critical Two-tail	2.306		

t-Test: Two-Sample Assuming Unequal Variances Unequal Sample Sizes	a	0.05	**AFTER ANNOUNCEMENT**
	Data1	*Data2*	
Mean	0.008321	0.1028	
Variance	0.118206	0.210999	
Observations	28	5	
Hypothesized Mean Difference	0		
df	4		

t Stat	-0.439	
P(T<=t) two-tail	0.684	Cannot Reject Null Hypothesis because p > 0.05 (Means are the same)
T Critical Two-tail	2.776	

TABLE D6: EXPRESS KENYA LTD

t-Test: Two-Sample Assuming Unequal Variances Unequal Sample Sizes	□	0.05	**BEFORE ANNOUCEMENT**
	Data1	*Data2*	
Mean	0.122464	0.1978	
Variance	0.005651	9.22E-05	
Observations	28	5	
Hypothesized Mean Difference	0		
df	30		
t Stat	-5.076		
P(T<=t) two-tail	0.000		Reject Null Hypothesis because p < 0.05 (Means are Different)
T Critical Two-tail	2.042		

t-Test: Two-Sample Assuming Unequal Variances Unequal Sample Sizes	□	0.05	**AFTER ANNOUNCEMENT**
	Data1	*Data2*	
Mean	0.325214	0.2018	
Variance	0.005112	8.17E-05	
Observations	28	5	
Hypothesized Mean Difference	0		
Df	30		
t Stat	8.751		
P(T<=t) two-tail	0.000		Reject Null Hypothesis because p < 0.05 (Means are Different)
T Critical Two-tail	2.042		

TABLE D7: KENYA AIRWAYS LTD

t-Test: Two-Sample Assuming Unequal Variances Unequal Sample Sizes	□	0.05	**BEFORE ANNOUCEMENT**
	Data1	*Data2*	
Mean	-0.05961	-0.1134	
Variance	0.001634	6.88E-05	
Observations	28	5	
Hypothesized Mean Difference	0		
df	29		
t Stat	6.335		
P(T<=t) two-tail	0.000		Reject Null Hypothesis because p < 0.05 (Means are Different)
T Critical Two-tail	2.045		

t-Test: Two-Sample Assuming Unequal Variances Unequal Sample Sizes	□	0.05	**AFTER ANNOUNCEMENT**

	Data1	*Data2*	
Mean	-0.07807	-0.096	
Variance	0.00038	2.45E-05	
Observations	28	5	
Hypothesized Mean Difference	0		
df	26		
t Stat	4.172		
P(T<=t) two-tail	0.000		Reject Null Hypothesis because p < 0.05 (Means are Different)
T Critical Two-tail	2.056		

TABLE D8: NATION MEDIA GROUP LTD

t-Test: Two-Sample Assuming Unequal Variances Unequal Sample Sizes	□	0.05	**BEFORE ANNOUCEMENT**

	Data1	*Data2*	
Mean	0.254214	0.0498	
Variance	0.135146	0.05731	
Observations	28	5	
Hypothesized Mean Difference	0		
df	7		
t Stat	1.602		
P(T<=t) two-tail	0.153		Cannot Reject Null Hypothesis because p > 0.05 (Means are the same)
T Critical Two-tail	2.365		

t-Test: Two-Sample Assuming Unequal Variances Unequal Sample Sizes	□	0.05	**AFTER ANNOUNCEMENT**

	Data1	*Data2*	
Mean	-0.44543	-0.3324	
Variance	0.091501	0.010993	
Observations	28	5	
Hypothesized Mean Difference	0		
df	18		
t Stat	-1.529		
P(T<=t) two-tail	0.144		Cannot Reject Null Hypothesis because p > 0.05 (Means are the same)
T Critical Two-tail	2.101		

TABLE D9: ATHI RIVER MINING COMPANY LTD

t-Test: Two-Sample Assuming Unequal Variances Unequal Sample Sizes		0.05	**BEFORE ANNOUCEMENT**

	Data1	*Data2*	

Mean	-0.01621	-0.031	
Variance	0.000108	4.25E-05	
Observations	28	5	
Hypothesized Mean Difference	0		
Df	8		
t Stat	4.206		
P(T<=t) two-tail	0.003		Reject Null Hypothesis because p < 0.05 (Means are Different)
T Critical Two-tail	2.306		

t-Test: Two-Sample Assuming Unequal Variances Unequal Sample Sizes		0.05	**AFTER ANNOUNCEMENT**
	Data1	*Data2*	
Mean	-0.03639	-0.0354	
Variance	7.91E-05	9.73E-05	
Observations	28	5	
Hypothesized Mean Difference	0		
Df	5		
t Stat	-0.210		
P(T<=t) two-tail	0.842		Cannot Reject Null Hypothesis because p > 0.05 (Means are the same)
T Critical Two-tail	2.571		

TABLE D10: BAMBURI CEMENT LTD

t-Test: Two-Sample Assuming Unequal Variances Unequal Sample Sizes	□	0.05	**BEFORE ANNOUCEMENT**
	Data1	*Data2*	
Mean	0.003821	0.0268	
Variance	0.000162	9.2E-06	
Observations	28	5	
Hypothesized Mean Difference	0		
Df	27		
t Stat	-8.324		
P(T<=t) two-tail	0.000		Reject Null Hypothesis because p < 0.05 (Means are Different)
T Critical Two-tail	2.052		

t-Test: Two-Sample Assuming Unequal Variances Unequal Sample Sizes	□	0.05	**AFTER ANNOUNCEMENT**
	Data1	*Data2*	
Mean	-0.02404	0.0228	
Variance	0.001211	3.97E-05	
Observations	28	5	
Hypothesized Mean Difference	0		

Df	30		
t Stat	-6.546		
P(T<=t) two-tail	0.000		Reject Null Hypothesis because p < 0.05 (Means are Different)
T Critical Two-tail	2.042		

TABLE D11: EAST AFRICAN CABLES

t-Test: Two-Sample Assuming Unequal Variances Unequal Sample Sizes	□	0.05	**BEFORE ANNOUCEMENT**
	Data1	*Data2*	
Mean	0.252571	0.2864	
Variance	0.005338	0.000951	
Observations	28	5	
Hypothesized Mean Difference	0		
Df	13		
t Stat	-1.733		
P(T<=t) two-tail	0.107		Cannot Reject Null Hypothesis because p > 0.05 (Means are the same)
T Critical Two-tail	2.160		

t-Test: Two-Sample Assuming Unequal Variances Unequal Sample Sizes	□	0.05	**AFTER ANNOUNCEMENT**
	Data1	*Data2*	
Mean	0.026893	0.2502	
Variance	0.04012	0.001018	
Observations	28	5	
Hypothesized Mean Difference	0		
df	30		
t Stat	-5.520		
P(T<=t) two-tail	0.000		Reject Null Hypothesis because p < 0.05 (Means are Different)
T Critical Two-tail	2.042		

TABLE D12: KENGEN LTD

t-Test: Two-Sample Assuming Unequal Variances Unequal Sample Sizes	□	0.05	**BEFORE ANNOUCEMENT**
	Data1	*Data2*	
Mean	0.016	-0.0156	
Variance	0.000436	4.73E-05	
Observations	28	5	
Hypothesized Mean Difference	0		
df	19		
t Stat	6.315		
P(T<=t) two-tail	0.000		Reject Null Hypothesis because p < 0.05 (Means are Different)

T Critical Two-tail	2.093		
t-Test: Two-Sample Assuming Unequal Variances Unequal Sample Sizes	□	0.05	**AFTER ANNOUNCEMENT**
	Data1	*Data2*	
Mean	-0.00889	-0.0078	
Variance	0.000108	1.77E-05	
Observations	28	5	
Hypothesized Mean Difference	0		
df	14		
t Stat	-0.402		
P(T<=t) two-tail	0.694		Cannot Reject Null Hypothesis because p > 0.05 (Means are the same)
T Critical Two-tail	2.145		

TABLE D13: KENYA POWER AND LIGHTING COMPANY LTD (KENYA POWER)

t-Test: Two-Sample Assuming Unequal Variances Unequal Sample Sizes	□	0.05	**BEFORE ANNOUCEMENT**
	Data1	*Data2*	
Mean	0.042893	-0.1924	
Variance	0.105895	0.079534	
Observations	28	5	
Hypothesized Mean Difference	0		
df	6		
t Stat	1.677		
P(T<=t) two-tail	0.145		Cannot Reject Null Hypothesis because p > 0.05 (Means are the same)
T Critical Two-tail	2.447		
t-Test: Two-Sample Assuming Unequal Variances Unequal Sample Sizes	□	0.05	**AFTER ANNOUNCEMENT**
	Data1	*Data2*	
Mean	-0.90432	-0.9908	
Variance	0.265505	0.187848	
Observations	28	5	
Hypothesized Mean Difference	0		
df	6		
t Stat	0.399		
P(T<=t) two-tail	0.704		Cannot Reject Null Hypothesis because p > 0.05 (Means are the same)
T Critical Two-tail	2.447		

TABLE D14: BRITISH AMERICAN TOBACCO

t-Test: Two-Sample Assuming Unequal Variances	□	0.05	**BEFORE ANNOUCEMENT**

Unequal Sample Sizes

	Data1	*Data2*	
Mean	-0.01846	0.025	
Variance	0.00027	4E-05	
Observations	28	5	
Hypothesized Mean Difference	0		
Df	16		
t Stat	-10.343		
P(T<=t) two-tail	0.000		Reject Null Hypothesis because p < 0.05 (Means are Different)
T Critical Two-tail	2.120		

t-Test: Two-Sample Assuming Unequal Variances □ 0.05 **AFTER ANNOUNCEMENT**

Unequal Sample Sizes

	Data1	*Data2*	
Mean	-0.00964	0.0228	
Variance	0.000852	1.47E-05	
Observations	28	5	
Hypothesized Mean Difference	0		
Df	30		
t Stat	-5.617		
P(T<=t) two-tail	0.000		Reject Null Hypothesis because p < 0.05 (Means are Different)
T Critical Two-tail	2.042		

TABLE D15: EAST AFRICAN BREWERIES LTD

t-Test: Two-Sample Assuming Unequal Variances □ 0.05 **BEFORE ANNOUCEMENT**

Unequal Sample Sizes

	Data1	*Data2*	
Mean	-0.00668	-0.0148	
Variance	1.19E-05	7E-07	
Observations	28	5	
Hypothesized Mean Difference	0		
Df	27		
t Stat	10.820		
P(T<=t) two-tail	0.000		Reject Null Hypothesis because p < 0.05 (Means are Different)
T Critical Two-tail	2.052		

t-Test: Two-Sample Assuming Unequal Variances a 0.05 **AFTER ANNOUNCEMENT**

Unequal Sample Sizes

	Data1	Data2
Mean	-0.00107	-0.0124
Variance	2.1E-05	2.3E-06

Observations	28	5	
Hypothesized Mean Difference	0		
Df	19		
t Stat	10.294		
P(T<=t) two-tail	0.000		Reject Null Hypothesis because p < 0.05 (Means are Different)
T Critical Two-tail	2.093		

TABLE D16: MUMIAS SUGAR COMPANY LTD

t-Test: Two-Sample Assuming Unequal Variances Unequal Sample Sizes	□	0.05	**BEFORE ANNOUCEMENT**
	Data1	*Data2*	
Mean	0.008321	-0.048	
Variance	0.001027	2.15E-05	
Observations	28	5	
Hypothesized Mean Difference	0		
df	30		
t Stat	8.798		
P(T<=t) two-tail	0.000		Reject Null Hypothesis because p < 0.05 (Means are Different)
T Critical Two-tail	2.042		

t-Test: Two-Sample Assuming Unequal Variances Unequal Sample Sizes	□	0.05	**AFTER ANNOUNCEMENT**
	Data1	*Data2*	
Mean	0.014321	-0.0506	
Variance	0.001087	4.28E-05	
Observations	28	5	
Hypothesized Mean Difference	0		
df	30		
t Stat	9.432		
P(T<=t) two-tail	0.000		Reject Null Hypothesis because p < 0.05 (Means are Different)
T Critical Two-tail	2.042		