THE RELATIONSHIP BETWEEN INFLATION AND STOCK PRICES - A CASE STUDY OF THE NAIROBI STOCK EXCHANGE

BY

P. MUNYAKA MUNENE

REG. NO. C50/P/7747/05

A Research Paper Submitted to the School of Economics, In Partial Fulfillment of the Requirements of the Degree of Master of Arts in Economics, University of Nairobi

SEPTEMBER 2007

Declaration

This is my original work and has not been presented for any degree award in any other university.

Signed ..... Date 13/09/07

P. Munyaka Munene

Approval

This research paper has been submitted with our approval as university supervisors;

Signed ..... Date 13/9/07

Prof. L. P. Murcithi

Signed ..... Date 14/9/07

Dr. M. Mbithi

Acknowledgments

My foremost gratitude goes to the almighty God for enabling and guiding me through my academic life. Besides, my appreciation goes to the University of Nairobi, School of Economics for admitting me to undertake a Masters Degree course in Economics. A lot of thanks go to my Supervisors; Professor L. P. Mureithi and Dr. M. Mbithi who relinquished without complain many hours of their time. Their positive criticism, suggestions and prompt comments gave me the impetus to refine and produce quality work. My vote of thanks also goes to the Director, School of Economics, Professor. P. Kimuyu, and the entire staff for their vehemence in upholding the economic discipline.

I am grateful to my employer for the encouragement to pursue higher education and the financial support extended to me. I also thank family members and friends for their immense moral and spiritual support. I particularly wish to thank my dear wife Ann, my children Valary, Victor and Dennis, and other friends who encouraged me to soldier on. Above all, special recognition goes to M.A. Economics, 2006 class, whose discussions enabled me to produce this work. We burned the midnight oil together; they nursed my frustrations and offered company on weekends and holidays as we struggled to beat deadlines.

Table of contents

Dedication

This work is dedicated to my late father and sister, Henry Munene and Cecilia.

Abstract

The relationship between stock prices and inflation has intrigued researchers who have attempted to explain how a nominal variable such as inflation should determine a real variable (asset prices). Recent research findings have established the existence of a negative relationship between a negative relationship between stock prices and inflation. These findings contradict the hypothesis by Fisher (1930) who argued that stock prices should be positively related with expected inflation, providing a hedge against rising prices.

This study investigated the relationship between inflation and stock prices at the Nairobi Stock Exchange. The study's objectives were to specify and estimate the functional relationship between inflation and stock prices at the Nairobi Stock Exchange, to asses the validity of the Fisherian hypothesis using the stock prices at the Nairobi Stock Exchange and to draw policy conclusions and recommendations based on the empirical findings

An empirical investigation was conducted using monthly data on selected stocks from a sample of six companies listed at the Nairobi Stock exchange, for the period 2002-2006. The OLS estimation technique was employed to estimate a single equation with the real returns as the dependent variable and explanatory variables as actual inflation, expected inflation and information dummy. A specification associated with error correction modeling (ECM) was applied to capture long-run equilibrium after the variables were differenced to make them stationary.

The study reports a negative relationship between stock returns and expected inflation contrary to Fishers (1930) hypothesis. The study findings however depict a positive relationship between actual inflation and stock prices and the dividend information dummy. The findings of this study shed light on the price discovery process at the Nairobi Stock Exchange indicating that investors fail to factor in the effect of inflation on stocks at the stock exchange. The study recommends increased investor education to remedy this anomaly.

ABBREVIATIONS

NSE- Nairobi Stock Exchange

OLS Ordinary Least Squares

ECM Error Correction Modeling

ECT- Error Correction Term

DDM Dividend Discount Model

CPI - Consumer Price Index

E.A.B.L East African Breweries Limited

ICDC Industrial & Commercial Development Corporation

ATS Automated Trading System

ADF- Augmented Dickey Fuller

DF- Dickey Fuller

US- United States

UK- United Kingdom

CHAPTER ONE
INTRODUCTION

1.1 Background to the study

The critical role that stock markets play in mobilizing and allocating resources in the economy has generated increased research interest the stock market operations. Researchers in developing and developed countries have assessed fundamental aspects of the stock markets to ensure efficiency in their operations. Of much interest has been the price discovery process and the information reflected in the prices of stocks at the stock exchange. An important issue is the question as to whether stock markets reflect certain economic fundamentals in allocating capital and determining share prices (Lowies and Geyser, 2001).

Of enduring interest to academics, investment professionals and monetary policy makers has been the empirical relationship between inflation and stock prices (Wei, 2006). The observed negative relationship between common stock returns and various measures of expected and unexpected inflation during the post-World War II period is troublesome because it appears to contradict Fisher's (1930) hypothesis, which states that nominal asset returns move one-for-one with the expected inflation so that real stock returns are determined by real factors independent of the rate of inflation. According to Fisher (1930), assets, which represent claims to physical or real assets, such as stocks, should offer a hedge against inflation. Fisher (1930) argued that asset values should be positively related with expected inflation, providing a hedge against rising prices. If the implied positive relationship between stock prices and the inflation does not hold, stock investors will be vulnerable to inflation.

Wei (2006), points out that subsequent models used by practitioners in equity valuation such as the 'Fed Model' are based on the understanding that stock yields are highly positively correlated with inflation. He however, argues that despite the success of such models, it is difficult to justify theoretically why the dividend yields, a real variable, should co vary with a nominal variable such as inflation.

The primary role of a stock exchange is to provide a market where financial instruments can be traded in a regulated environment without constraint. A stock market is a vital part of any economic system in which ownership can be bought or sold. A stock exchange and its presence in an economic system can be justified by its major function of channeling savings into investments. It converts investments into cash, thus supplying market liquidity and helps in evaluating and managing securities.

The Stock Exchange is a market that deals in the exchange of securities issued by publicly quoted companies, corporate bodies and the Government. The Stock Exchange plays critical role in the process by mobilizing domestic savings thereby bringing and facilitating reallocation of financial resources from dormant to active economic activities. Through trading at the stock exchange, long-term investments are made liquid, as the transfer of securities between shareholders is facilitated. Further, trading in equities at the stock exchange creates investment opportunities, enabling investors to diversify risk and also encourages local ownership of companies. It makes it easy for companies to raise extra finance essential for expansion and development. A stock market also enhances the inflow of international capital, and is a useful tool for privatization programmes.

The major role that the stock exchange has played, and continues to play in many economies is that it promotes a culture of thrift, or saving. The very fact that institutions exist where savers can safely invest their money and in addition earn a return is an incentive to people to consume less and save more. Secondly, the stock exchange assists in the transfer of savings to investment in productive enterprises as an alternative to keeping the savings idle.

Inflation is the persistent rise in aggregate level of prices of goods and services in an economy (Morris and Morris, 1999). Repetitive price increases erode the purchasing power of money and other financial assets with fixed values creating serious economic distortions and uncertainty. Adrangi et al (2000) points out that some portion of inflation

rate of inflation will be anticipated by economic agents and capital markets. However the unanticipated portion of inflation may surprise equity markets and affect real returns.

1.1.1 Nairobi Stock Exchange

The Nairobi Stock Exchange (NSE), which was formed in 1954 as a voluntary organization of stockbrokers, is now one of the most active stock markets in Africa. The NSE has played a role in increasing investor confidence by modernizing its infrastructure. At the dawn of independence, stock market activity slumped due to uncertainty about the future of independent Kenya. However, after three years of calm and economic growth, confidence in the market was rekindled and the exchange handled a number of highly over-subscribed public issues. The growth was, however, halted when the oil crisis of 1972 introduced inflationary pressures on the economy which depressed share prices. A 35% capital gains tax introduced in 1975 (suspended since 1985) inflicted further losses to the exchange.

In the 1980s the Kenyan Government realized the need to design and implement policy reforms to foster sustainable economic development with an efficient and stable financial system. In particular, it set out enhance the role of the private sector in the economy, reduce the demands of public enterprises on the exchequer, rationalize the operations of the public enterprise sector to broaden the base of ownership and enhance capital markets in the formation of a regulatory body "the Capital Market Authority" in 1989, to assist in the creation of an environment conducive to the growth and development of the country's capital markets. Today, the number of stock brokers has grown steadily to twenty firms from six at its inception in 1954.

The NSE is poised to play an increasing role in the Kenyan economy, especially in the privatization of state-owned enterprises. In 2006, the NSE installed the Automated Trading System (ATS) which has eliminated inefficiencies in allocation of shares and delays in the transfer of securities, hence enabling better price discovery on the stock market.

Close to five categories of dividends are declared by firms listed on NSE. These include final, interim, bonus and special dividends. Final dividends are paid at the end of the financial year. They are usually announced by the company directors at the annual general meeting. Shareholders have the option of voting to accept or to reduce them, but they cannot increase them. Interim dividends are the form of dividends that are declared and distributed before the company's annual earnings have been calculated, they are often distributed quarterly They are usually smaller than final dividends.

Glen et al. (1995) and Ramcharran (2001) in their empirical survey found that the patterns of dividend payout policies vary across firms. This is a true reflection of the dividend policy practices of firms listed on NSE as indicated in table 1. There are firms that only [illegible] final dividends [illegible]he end of the fina[illegible]al year. While th[illegible] are others end up only paying interim dividends at the end of the financial year. Others still pay both final and interim dividends during the same year. However, it can be noted that final dividends are the most declared dividends as compared to interim dividends or both This is because unlike final dividends, the award of other forms of dividends depends on the performance of the firm during the previous financial year (*NSE handbook 2004*)

Table 1 shows dividend policy trend of NSE listed firms over a period of 8 years (1997-2004) It can be observed that more than 50 percent of firms declared final dividends on an annual basis over this whole period. On average, 35 percent of the firms did not pay dividends every year for this same period. Along side final dividends, the figures show that less than 50 percent of firms listed on NSE paid interim dividend over this period This validates the fact that most of the firms prioritise final dividends as compared to interim dividends or both because the declaration of interim (or both final and interim) depends on the profits margins of the firm.

Table: 1 Dividend payment trend of NSE listed firms, 1997-2004

Year	No. of firms that paid final dividends	% of firms that paid final dividends	No. of firms that paid interim dividends	% of firms that paid interim dividends
1997	37	79	22	47
1998	35	74	21	45
1999	31	66	22	47
2000	29	62	15	32
2001	25	53	14	30
2002	29	60	12	25
2003	29	60	9	19
2004	31	65	16	33

Source. NSE. 2004

Additionally, there is changing dividend payment practices over time. This supports Lama and French (2001) who argue that the pattern of corporate dividend practice varies over time and across firms. From table 1, figures show that the number of firms that paid final dividends during the years 1997, 1998, 1999, 2000 and 2001 was 79, 74, 66, 62 and 53 respectively. Additionally, this trend is almost the similar in the way interim dividends were also declared. It can be observed that firms that declared interim dividends during the years 1997,1998,1999, 2000 and 2001 was 47, 45, 47, 32 and 30 respectively. Generally, this suggests a reducing trend in terms of the number of firms that paid final as well as interim dividends.

Looking at the dividend payment policy of the listed firms in Kenya, we observe that there is a reducing trend in terms of the number of firms that pay final as well as interim dividends over time. This has an implication concerning the relation between agency and transaction costs and dividend policy. According to Easterbrook (1984) firms reduce dividend payment in order to avoid being forced to go to the capital market to raise additional finance due to reduced retained earnings. This is because raising funds from the capital market is associated with costs known as transaction costs which are identified by Easterbrook (1984) as investigation and monitoring by actors on the capital market.

This means that with time most firms use their retained earnings to invest instead of externally sourcing funds to associates costs such as interests payable.

The effects of dividend policy are quite evident on the prospects of the firms that are listed on NSE. Looking at the data from 2000 to 2004 in table 3 below, it can be observed that most firms share prices increased whenever they announced payments of dividend to shareholders. A firm like EABL, for example, has maintained a relatively higher share prices because of its ability to pay divided regularly. Higher share prices improved the public perception about the firm's performance, which leads to higher chances of securing external funds. Overall, such firms experience a rapid growth. Looking at the table 3 below it is observed that in 2004, the share prices of EABL always increased by a certain percentage whenever divided was announced. This is in line with the theoretical arguments that there is a positive relationship between dividend announcement and share prices.

Table 3: EABL average share prices before and after dividend payment announcement

Year	Status	Rate	Declared date	Books close	Payment Date	Average[1] prices	Average[2] prices
2000	Interim	10.00	25.7.200	23.08.00	1.09.00	65.50	80.00
	Final	10	16.2.01	02.04.01	2.04.01	76.5	79.5
2001	Interim	10	30.7.01	15.08.01	31.08.01	81.5	82.5
2002	Interim	50.00	12.3.02	15.4.02	30.04.02	78.00	80.50
	Final	180.00	02.09.02	15.11.02	19.12.02	86.00	135.00
2003	Interim	60.00	24.2.03	14.04.03	30.04.03	135.00	210.00
	Final	240.00	01.9.03	16.10.03	14.11.03	299.00	442.00
2004	Interim	37.50	13.2.04	10.03.04	31.03.04	499.00	480.00
	Final	142.50	27.08.04	06.10.04	22.10.04	467.00	116.00[3]
	Bonus	1 for 5	07.08.04	06.10.04	22.10.04	467.00	116.00

Source: Author's compilations, 2007

[1] These are average prices for listed EABL equity the previous month prior to the announcements of the dividends

[2] These are average prices for listed EABL equity the FOLLOWING month after the announcements of the dividends

[3] There was a drastic fall in prices because of the share split where EABL was able to also list on Uganda Stock Exchange

1.2 Statement of the problem

In the Kenyan economy, the activities at the Nairobi Stock Exchange have gained importance in the last few years. The local equity markets have been opened up to direct investment both by domestic investors and foreign investors. At the same time, several Kenyan companies have been listed at the NSE. Kenya has also experienced different macroeconomic conditions in the past including periods of high inflation and low economic growth. However, at the NSE, like in other emerging markets, potentially important relationships between macroeconomic variables and stock prices in emerging equity markets have not been studied, perhaps due to the data paucity (Adrangi *et al*, 2000). The varying levels of inflation recorded in the past could have had an effect on the operations of the NSE. The exact nature and magnitude of the effect is however not known. By examining the effect of inflation on stock prices at the NSE, this study seeks to provide information that is of importance to the policy makers and the general public on the effect of macroeconomic factors on the operations of the stock exchange. This information is vital for institution of private and public policies aimed at strengthening the operation of the NSE.

The Nairobi stock exchange has been experiencing a boom in the recent past. There has been an increase in the volumes traded, with the stock market registering increased activity especially with initial public offers. The rapid growth at the NSE has been subject of debate amongst the scholars, politicians and the general public. There have been statements reported in the media questioning the phenomenal growth of the NSE in the past three years, and more specifically the rapid appreciation of stock prices of quoted companies. In the Daily Nation November 23rd 2006 Press statement by the chairman of NSE, Mr. Mbaru explains that the stock market and its index are the mirror of what is happening in the rest of the economy. He attributes the phenomenal growth of the NSE to the high growth rate registered by the Kenya economy in the last three years and the changing international perception of Kenya as a secure investment destination. In the past three years, share prices have appreciated to the extent that the NSE market index has increased from around 2,000 to over 5,000 points.

Recent research has emerged with new evidence of a negative relationship between stock prices and inflation. This finding is in contradiction of Fisher (1930) who argued that stock prices should be positively related with expected inflation, providing a hedge against rising prices. This relationship has intrigued researchers who have attempted to explain how a nominal variable such as inflation should determine a real variable (asset prices). The proxy hypothesis, inflation illusion and effect of taxation on stock returns have been given as possible explanations for the negative relationship between inflation and stock price. However, the findings on the validity of the Fisher hypothesis have been found to vary in different economies depending on the existing macro-economic conditions.

1.3 Objectives of the stud

The main objective of this study is to conduct an empirical investigation aimed at establishing the relationship between inflation and stock prices at the Nairobi Stock Exchange. The specific objectives of the study are:-

i. To specify and estimate the functional relationship between inflation and stock prices at the Nairobi Stock Exchange.
ii. To usses the validity of the Fisherian hypothesis using the stock prices at the Nairobi stock exchange
iii. Draw policy conclusions and recommendations from the empirical findings

1.4 Significance of the study

The study contributes to the literature in several ways. First, the findings of this investigation are important for portfolio managers and economic policy makers. Identification of factors influencing pricing of stocks at emerging stock markets such as the Nairobi stock exchange is essential to the institution of public and private policies geared towards improving the stability and efficiency of the stock market. The study is useful for the capital markets authority, the Nairobi stock exchange, the Central Bank of Kenya and other policy making bodies to create an appropriate environment in order to enhance the operations of the stock market. The findings of this study are also important

to investors and other market participants at the Nairobi stock exchange as it provides information on stock prices - a key consideration in all investment decisions.

This study belongs to an expanding literature on the influence of the macro-economy on the stock market. The study provides literature from an upcoming stock market in a developing country on the interaction between inflation and stock prices. Most of the studies conducted in this area have been carried out in developed countries leaving a huge literature gap for developing countries.

1.5 Organization of the study

The remainder of the study is organized as follows. Chapter two reviews both the empirical and theoretical literature on the issue under investigation. Chapter three discusses the methodology adopted by the study. This includes the conceptual framework, specification of the model relevant to the study, the measurement of the variables, the sources of data used in the study, and the limitations of the study. Chapter four present the empirical analysis and interpretation of results, while chapter five deals with findings of the study and policy recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

In this chapter a review of both the empirical and theoretical literature relevant to this study is undertaken. The review covers the relationship between changes in the level of inflation and stock prices, the explanations behind the relationship and results of studies on the effect of inflation on stock prices in developed and emerging markets

2.2 Theoretical Literature Review

A number of alternative hypotheses have been advanced in the literature to explain the negative relation between inflation and stock prices and/or stock returns. These alternatives include (i) a correlation between expected inflation and expected real economic growth (the "proxy hypothesis" suggested by Fama, 1981), (ii) the hypothesis that investors may irrationally discount real cash flows using nominal interest rates (Modigliani and Cohn, 1979); (iii) changes in the expected return and risk aversion (the equity risk premium) and (iv), the inflation non-neutralities tax code which distorts the accounting profits (Feldstein, 1980).

The positive correlation between stock prices and inflation has mainly been explained using three hypotheses. The first hypotheses is based on the argument that inflation, or the monetary authorities responses to inflation damages the real economy, in particular the profitability of the corporate sector. Consequently, the growth rate of dividends declines in response to inflation driving up the dividend yield. The second explanation is that inflation makes investors more risk averse, driving up equity premium, and thus the real discount rate (Brandt and Wang, 2003). The third explanation is given by Modigliani and Cohn (1979), who assert that the correlation between stock prices and inflation is as a result of inflation illusion. They argue that stock market investors fail to understand the effect of inflation on nominal dividend growth rates and extrapolate historical nominal growth rate even in periods of changing inflation. From the rational investors' perspective, stock prices are undervalued when inflation is high and over valued when it is low.

The "proxy hypothesis" suggested by Fama (1981) claims that the negative stock return inflation relation is spurious. The anomalous stock return-inflation relation is in fact induced by a negative relation between inflation and real activity. Fama's hypothesis predicts that rising inflation rates reduce real economic activity and demand for money. Geske and Roll (1983) proposes a "reverse causality" explanation and argue that a reduction in real activity leads to an increase in fiscal deficits. Since the Federal Reserve Bank monetizes a portion of fiscal deficits, the money supply increases, which in turn increases inflation.

Modigliani and Cohn (1979) suggest that investors collectively suffer from money illusion and commit two errors in valuing equities: they use a nominal rate to discount real cash flows (and fail to adjust nominal growth rate of dividends) and they fail to recognize the capital gain that accrues to the equity holders of firms with fixed dollar liabilities in the presence of inflation.

The evidence of a negative relationship between stock prices and inflation has intrigued researchers over the past two decades. Furthermore, there is some evidence that the negative relationship between inflation and stock returns in developed markets results from a so called "proxy hypothesis" (Fama, 1965). According to the proxy hypothesis, the negative relationship between stock returns and the inflation reflects the deleterious effects of the inflation on the real economic activity. There is evidence to show that equities in industrialized economies have failed to maintain their value during periods of high inflation. For example, during the rapid inflation years of 1970s, U.S. stocks prices did not keep pace with general price levels.

There exists a large body of literature documenting the predictability of stock returns from past information. A number of financial variables have been found to be useful in predicting future stock returns. These include the dividend-price ratio, the price-earning ratio, the dividend payout ratio, the term and default spreads on bonds (Fama and French, 1989), recent changes in short-term interest rates, the equity share in total new

equity and debt issues, the level of consumption relative to income and wealth and the aggregate stock market volatility in conjunction with these consumption-asset-labor deviations (Guo, 2006)

2.3 Empirical literature review

Several studies have investigated the negative relationship between equity returns and inflation in the U.S. and other industrialized economies. For example, Lintner (1975), Fama and Schwert (1977), Fama (1981, 1982), Geske and Roll (1983), find evidence that stock returns are negatively affected by both expected and unexpected inflation. In the U.S. Serletis (1993) and Thornton (1993) investigate a related issue of stock prices and money supply in the U.S. and UK. Fama (1981) and Geske and Roll (1983) offer an explanation for the negative relationship between stock returns and inflation, through a hypothesized chain of macroeconomic linkages, based on the money demand and the quantity theory of money. This explanation may be summarized as: (i) contrary to the suggestion of the Phillips curve, there is a negative relationship between inflation and real economic activity; and (ii) stock returns are directly related to the real economic activity.

Based on (i) and (ii), Fama, Geske, and Roll hypothesis predicts that rising inflation rates reduce real economic activity and demand for money. A reduction in economic activity negatively affects the future corporate profits and stock prices. The resulting negative relationship between the stock returns and inflation is referred to as the "proxy effect," in the sense that it reflects the detrimental consequence of inflation on real economic activity. Fama argues that the proxy effect vanishes when real activity does not fall because of inflation.

Ram and Spencer (1983) discuss the negative relationship between stock returns and inflation and offer an explanation for this phenomenon. Their empirical tests based on an augmented Fisher- Phillips relationship; show that some of Fama's findings may be reversed. The Phillips curve shows the relationship between a measure of real economic activity, such as the rate of growth of real output or unemployment, and a nominal variable, such as the inflation rate. Thus, according to the Phillips curve, higher rates of

unemployment are associated with lower inflation rates and vice versa. It is documented that the Phillips curve shifts to the right as inflationary expectations are formed. The shift occurs as demand for higher nominal wages reduce employment at any given inflation rate. That is, higher inflation rates may be associated with lower real economic activity because of the inflationary spiral. An alternative explanation for the same phenomenon may be derived from the Keynesian view. Higher rates of inflation may stunt new investments, thus reducing both the aggregate demand and aggregate supply. Therefore, the real output may fall. The positive relationship between the real economic activity and real stock returns is more obvious and plausible. The increased real economic activity is likely to contribute to increased profitability and, thus, rising stock prices. Based on the above explanations, it is reasonable to assume that inflation and real economic activities may be considered exogenous, and real equity returns endogenous variables in empirical models for this study.

In analyzing the Fisher hypothesis, Boudoukh and Richardson (1993) investigate the relation between stock returns and inflation at both short (1 year) and long (5 year) horizons using long-term annual US and UK data, and establish that at the 1-year horizon nominal stock returns and inflation are approximately uncorrelated, while at the 5-year horizon the Fisher equation holds. Other early studies focused on the negative relationship between inflation and the level of real stock prices, as reflected in dividend-price ratio and price-earning ratio (Feldstein, 1980). More recently, Ritter and Warr (2002), Sharpe (2002) and Campbell and Vuolteenaho (2004) confirmed this negative relation

Adrangi et al (2000) investigate the relationship between inflation, output and stock prices in Brazil. They report a negative relationship between stock prices and inflation in Brazil. They explain that the real stock returns may be adversely affected by inflation because inflationary pressures may threaten future corporate profits and nominal discount rates rise under inflationary pressures, reducing current value of profits, and thus stock returns. They also find long-term evidence for the proxy hypothesis in Brazil

2.4 Overview of literature review

Extensive research has been conducted to examine the relationship between inflation and stock prices. Studies have further examined the validity of the Fisher hypothesis. It is however noted that much of the work has focused on stock markets in developed countries leaving a huge literature gap on developing countries which this study sought to fill.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter presents the methodology employed to examine the effect of changes in the level of inflation on stock prices at the Nairobi Stock Exchange (NSE). A theoretical framework for the study is first outlined followed by the specification of the empirical model. The variables used in the study are explained, including sources of data and diagnostic tests to be employed on the data.

3.1 Theoretical Framework

The relationship between stock prices and inflation is illustrated in the context of a dividend discount model (DDM). According to the DDM model, investors will set the price of a stock (S_t) at time t, to a point where the expected return on the stock is equal to the required rate of return. Assuming a world with no inflation and a company is expected to generate a real cash flow of C per period in perpetuity. Also, assuming that the firm pays out all free cash as dividend, the current price of a stock P_0 can be calculated by dividing the dividend (D) by the required rate of return (k_r) as follows:

$$P_0 = D/k_r \qquad (3.1)$$

An increase in the expected inflation brings about two major changes; the cash flows of the company may change as the general inflation acts on both revenues and expenses. Also the discount rate will change to the nominal rate (k_n) defined as:

$$k_n = (1+k_r)(1+I) \qquad (3.1.1)$$

Where,

k_r is the real rate of return given that expected inflation (I) is at some positive value. If the cash flows grow at a constant growth rate (g), the nominal price (P_n) can be obtained as follows:

$$P_n = D/k_n \quad g \qquad (3.2)$$

CHAPTER THREE
METHODOLOGY

3.1 Introduction

This chapter presents the methodology employed to examine the effect of changes in the level of inflation on stock prices at the Nairobi Stock Exchange (NSE). A theoretical framework for the study is first outlined followed by the specification of the empirical model. The variables used in the study are explained, including sources of data and diagnostic tests to be employed on the data.

3.1 Theoretical Framework

The relationship between stock prices and inflation is illustrated in the context of a dividend discount model (DDM). According to the DDM model, investors will set the price of a stock (S_t) at time t, to a point where the expected return on the stock is equal to the required rate of return. Assuming a world with no inflation and a company is expected to generate a real cash flow of D per period in perpetuity. Also, assuming that the firm pays out all free cash as dividend, the current price of a stock P_0 can be calculated by dividing the dividend (D) by the required rate of return (k_r) as follows:

$$P_0 = D/k_r \tag{3.1}$$

An increase in the expected inflation brings about two major changes; the cash flows of the company may change as the general inflation acts on both revenues and expenses. Also the discount rate will change to the nominal rate (k_n) defined as:

$$k_n = (1+k_r)(1+I) \tag{3.1.1}$$

Where;

k_r is the real rate of return given that expected inflation (I) is at some positive value. If the cash flows grow at a constant growth rate (g), the nominal price (P_n) can be obtained as follows:

$$P_n = D/k_n - g \tag{3.2}$$

The discount rate depends on the level of inflation, demand pressure and risk. The negative relationship between inflation and stock price arises from the fact that, as the required rate of return (k_i) increases, the price of the stock decreases. Since k_i is the denominator in the above equation, any increase in the denominator will decrease the current price.

Equity is hedge against inflation if $P_0 = P_n$ or

$$D/k_e = D_1/k_e - g \qquad (3.3)$$

In order to conclude that equity is an inflation hedge, the following assumptions must be made:

- Nominal cash flows must be equal to real cash flows multiplied by the inflation growth factor
- The real interest rate must be independent of expected inflation

The prediction that equity will act as an inflation hedge is what constitutes the Fisher effect. The Fisher effect expresses the nominal rate of interest (r) as the sum of real rate of interest plus the inflation rate:

$$1 + r = (1 + R)(1 + I)$$
$$r = R + I + RI \qquad (3.4)$$

Where,

R - is the real rate of interest

I - is the rate of inflation per annum expected to prevail over the life of the security

RI is the multiplicative component which is assumed to be small and which can therefore be ignored. The equation above then changes to

$$r = R + I \qquad (3.4.1)$$

Generally, the Fisher Effect states a nominal rate of interest has embedded an inflation premium sufficient to compensate investors.

3.2 Empirical Model

This study investigates the relationship between real returns and inflation in Kenya for the sample period: in order to asses the validity of the Fisherian hypothesis at the NSE This study employs a model used by Fama and Schwert (1977) to test the Fisherian hypothesis at the NSE. The model is formulated on the assumption that stock markets are efficient and that real returns and inflation rate vary independently of each other. The empirical test of the Fisherian hypothesis is accomplished by estimating the equation below:

$$R_t - INF_t = \alpha + \beta(EINF_t / \Omega_{t-1}) + \varepsilon_t \qquad (3.5)$$

Where

$R_t - INF_t$ - is the real return, (the difference between the nominal return R_t and the inflation rate INF_t)

$EINF_t$ - is the expected inflation,

Ω_{t-1} - is the information set available at the time period t-1,

ε - is the error term assumed to be randomly and normally distributed with zero mean and constant standard deviation.

Basing on the understanding that equities and bonds are claims against real assets and are often considered a potential hedge against unexpected as well as expected inflation Adrangi et al (2000) propose the following extension of equation (3.5), which includes the unexpected inflation rate, which is viewed as a more appropriate formulation of the Fisherian hypothesis:

$$R_t - INF_t = \alpha + \beta_1(EINF_t / \Omega_{t-1}) + \beta_2(UINF_t / \Omega_{t-1}) + \varepsilon_t \qquad (3.5.1)$$

Since it is difficult to measure information, this study uses dummy variable to capture information content of stock dividends. Stock dividend announcement is interpreted by investors as a management signaling device and that higher announcement means higher share prices.

Our equation 3.5.1 is modified as below;

$$Re = \alpha + \beta_1 EINFL + \beta_2 UINFL + \beta_3 \Omega + \varepsilon \quad (3.5.2)$$

Where:

Re – Real stock returns (Nominal returns less inflation),

UINF - is unexpected inflation obtained by subtracting expected inflation from the prevailing level of inflation (INF-EINF). Basing on the Fama and Schwert (1977) framework, equities are a hedge against expected inflation if $\beta_1 = 0$ and a perfect hedge against expected and unexpected inflation if $\beta_1 = \beta_2 = 0$, which would support the Fisherian hypothesis.

If there exists a negative relationship between the real stock returns and any component of inflation, it may be related to the proxy hypothesis.

Ω –information dummy (announcement of dividend payments by listed companies) taking the values 1 if the company announces dividend payment and 0 if otherwise.

3.3 Estimation techniques

Equation (3.5.2) was estimated using ordinary least squares (OLS) estimation method. Before estimation, diagnostic test was conducted on the time series variables. A specification associated with error correction modeling (ECM) was applied By using co integration and error correction model, the study establishes both the short run and long run equilibrium. The appropriate tests for stationarity of all the variables were performed to avoid spurious regression results. Variables not stationary at levels were differenced to achieve their stationarity. Cointegration test for series with higher order of integration were performed.

3.3.1 Unit root tests

Economic time series data may exhibit a trend or unit root(s) over time. A time series is stationary if its mean and variance do not vary systematically over time (Gujarati, 2003). A stationary stochastic process implies that the underlying stochastic process that generated the series is invariant with time. The results that come from an econometric analysis when using non-stationary series are ambiguous (Phillips 1986). Granger and Newbold (1974) ascertained that non-stationary time series produce "spurious regression" results where results may suggest statistically significant relationships when in reality there are no meaningful relationships between the variables.

In the presence of unit root one may detrend the series or difference the data to remove the non-stationary (deterministic) trend in it. However, this may lead to a loss of some vital long-run information contained in the data or it may only partially solve the problem (Harris, 1995). A way around this shortfall is differencing which was proposed by Dickey and Fuller (1981). This is known as the Augmented Dickey-Fuller (ADF) test. It tests for the existence of systematic and linear relationships between past and present values of variables. The Dickey-Fuller and the ADF are applied to regressions run in the following forms:

$$\Delta Y_t = \beta_1 + \beta_2 T + \delta Y_{t-1} + \varepsilon_t \qquad \text{(DF regression)}$$

$$\Delta Y_t = \beta_1 + \beta_2 T + \delta Y_{t-1} + \sum \Lambda Y_{t-i} + \varepsilon_t \qquad \text{(ADF regression)}$$

Where T is the time trend variable and ε_t is the error term which is independently and identically distributed. In each equation the null hypothesis is that $\delta = 0$, that is, there exists a unit root in Y_t. The acceptance of the null hypothesis confirms the presence of unit root. This study adopts the last equation above considering that it takes into account both the stochastic trend and constant rather than just assuming that there exists a stationary trend. Furthermore since the data generating process for the model is unknown

the use of this equation ensures that the deterministic components present are taken care of as much as possible.

3.3.2 Cointegration Analysis

According to Engle and Granger (1987), a linear combination of two or more non-stationary series may yield a stationary series. If such a linear combination exists, then the non-stationary series are said to be cointegrated. This means that the non-stationary series move closely together over time, and the difference between them is stable. The resultant linear combination is called a cointegrating equation, and it may be interpreted as a long-run relationship between the variables

Following the work of Engle and Granger (1987) the cointegrating regression is specified as follows;

$$x_t = \alpha_0 + \alpha_1 z_t + \varepsilon_t$$

The residual of the equation $\varepsilon_t = (x_t - \alpha_0 - \alpha_1 z_t)$ is simply the I(1) series. If the residuals from the linear combination of non-stationary series are themselves stationary, then it is accepted that the I(1) series is co integrated and the residuals taken from the co integrating regression as valid which are then built into an error correction model (ECM). An ECM is a restricted autoregression that has co integration restrictions built into the specification, so that it can be used for co integrated non-stationary time series. It restricts the long-run behaviour of the endogenous variables to converge to their co integrating relationships, at the same time allowing for short-run dynamics. The cointegrating term is known as the error correcting term and it shows the speed with which short-term deviations are corrected gradually towards the long-run equilibrium. A multivariate cointegration technique will be used to test for co integration among the series Johansen (1988) and applied in Johansen and Juselius (1990)

3.3.3 Diagnostic tests

Diagnostic tests are typically used as a means of indicating model inadequacy or failure. For example, in the case of a linear regression model which is estimated by OLS, a series of diagnostic tests could be used to indicate whether any of the assumptions required for

OLS to be the best linear unbiased estimator (BLUE) appear to be violated. These assumptions include a serially uncorrelated and homoscedastic error term, absence of correlation between the error term and the regressors and correct specification of the model. Applied econometric work can be viewed as consisting of a number of steps, including specification of the model(s), estimation and model evaluation. Diagnostic testing plays an important role in the model evaluation stage of econometric studies (Otto, 1994). This study carried out various diagnostic tests including AR for autocorrelation residuals, the White test for Heteroscedastic errors, normality test for the distribution of the residuals and the Ramsey Reset test for the regression specification.

3.4 Data type and source

Time series data was used for analysis. The data consisted of monthly observations of stock prices for a sample of listed companies at the NSE. A total of six listed companies from three sectors in the Main Investment Segment of the NSE were included in the sample. Two firms were randomly selected from each sector. Kenya Airways and Car & General (K) Ltd were selected in the Commercial and Services sector, Barclays Bank and I.C.D.C. Investment Company represented the Finance and Investment sector, while British American Tobacco (K) Ltd and East African Breweries limited represented the Industrial and Allied sector. Due to insufficient data, firms from the agricultural sector were excluded from this study. The data on prices of stocks were obtained from Nairobi Stock Exchange. Data on inflation was captured using the consumer price index (CPI). Data on inflation and economic activity were obtained from the annual economic surveys at the Central Bureau of Statistics. The study covers monthly observations for a sample period ranging from year 2002 to 2006.

3.5 Data analysis

Before embarking on complex data analysis, descriptive statistics of all the variables were done to examine the trends in the data. This was followed by a linear regression in order to establish the relationship between the dependent variable and independent variables. Data analysis was carried out using the E-Views econometric software.

CHAPTER FOUR
EMPIRICAL FINDINGS

4.1 Introduction

This chapter presents the analysis and the empirical results of the study. The chapter commences with the trending the variables and descriptive statistics, which gives the normality tests of the series among other statistics. Time series properties of the variables then follow. Finally, regression results and diagnostic tests respectively are presented.

4.2 Trends in the Variables

Before discussing time series properties of the variables, their trends were first analyzed Figure 1 below graphs the average real returns from shares of eight companies used in the analysis. The graph shows that the real returns have been resonating around the zero line over the study period

Figure1: Trend of average real returns from selected stocks

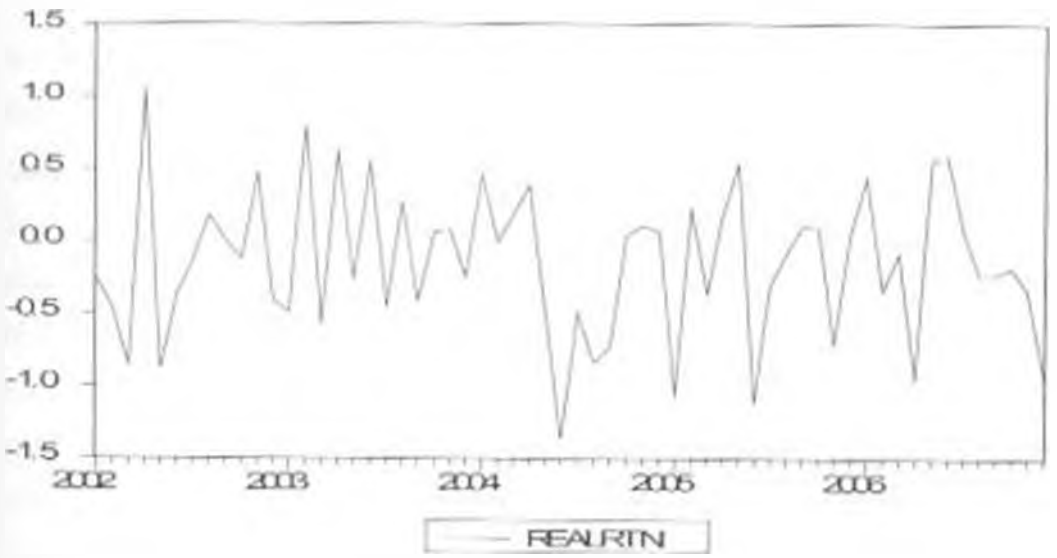
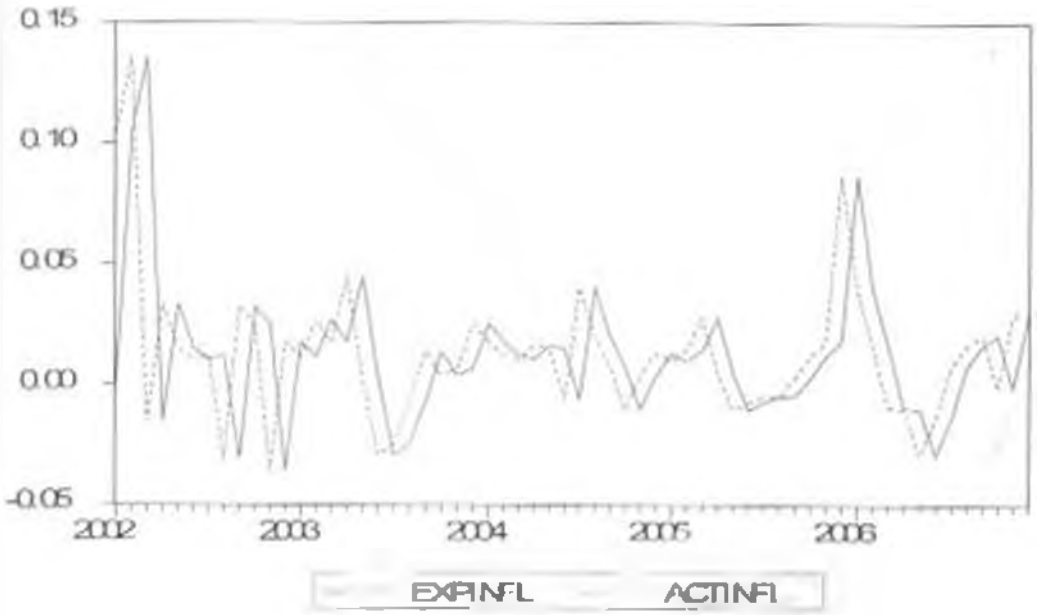


Figure 2 below graphs both the expected and actual rates of inflation. It is important to note that the actual rate of inflation in each period, say t, is just the expected rate of inflation the previous period, say t-1 Like the real returns from shares, the graph shows inflation rates has been oscillating around the zero line.

Figure 2: Trend of expected and actual rates of inflation



4.3 Descriptive statistics

Before embarking on the details of empirical tests, it's important to examine whether the data exhibits normality. Most economic data is skewed (non-normal), possibly due to the fact that economic data has a clear floor but no definite ceiling. It could also be due to the presence of outliers. The Jarque-bera statistics test is used to test normality of the series. It utilizes the mean based coefficients of skewness and kurtosis to check normality of variables used. Skewness is the tilt in the distribution and should be within the -2 and +2 range for normally distributed series. Kurtosis put simply is the peakedness of a distribution and should be within -3 and +3 range when data is normally distributed. Normality test uses the null hypothesis of normality against the alternative hypothesis of non-normality. If the probability value is less than Jarque-Bera chi-square at the 5% level of significance, the null hypothesis is not rejected. Table 4.1 below gives the summary of the descriptive statistics of the data used in this study.

Table 4.1: Summary of descriptive statistics

	Real returns	Actual inflation	Expected inflation
Mean	-0.1468	0.0129	0.0124
Median	-0.1308	0.0120	0.0116
Maximum	1.0396	0.1357	0.1357
Minimum	-1.3705	-0.0363	-0.0363
Std. Dev.	0.5100	0.0290	0.0289
Skewness	-0.1224	1.8155	1.8698
Kurtosis	2.6955	8.6147	8.7875
Jarque-Bera	0.3817	111.7721	118.7002
Probability	0.8263	0.0000*	0.0000*
Observations	60	60	60

Note **Reject hypothesis of normality at 1% level*

The normality test showed that real returns from shares are normally distributed while both actual and expected inflation are not normally distributed. The descriptive statistics above provide a guide on which of the equation is more able to yield better results and highlight on possible problems to encounter (Otto, 1994). However there is need to supplement the statistics by more incisive quantitative analysis such as the correlation matrix.

The correlation matrix is an important indicator that tests the linear relationship between the explanatory variables. The matrix also helps to determine the strength of the variables in the model, that is, which variable best explains the relationship between inflation and stock prices. This is important since it helps in deciding which variable(s) to drop from the equation. Table 4.2 presents the correlation matrix of the variables in levels.

Table 4.2: Correlation matrix at levels

	Real returns	Actual inflation	Expected inflation
Real returns	1		
Actual inflation	-0.0652	1	
Expected inflation	-0.2045	0.2789	1

The table above shows that both actual and expected inflation are negatively correlated with real returns. However, this correlation is very low as indicated in the table above

These results are a contradiction of Fisher (1930) who argued that stock prices should be positively related with expected inflation, thereby providing a hedge against rising prices.

4.4 Time series properties

Non-stationarity of time series data has often been regarded as a problem in empirical analysis. Working with non-stationary variables leads to spurious regression results from which further inference is meaningless. The first step was therefore to test for stationarity of the variables. Augmented Dickey-Fuller (ADF) tests were used to test for stationarity of the series. The results of the test for all the series are presented in the Table 4.3

Table 4.3 Unit root tests

VARIABLE	ADF (2)	CRITICAL VALUE 1%	CRITICAL VALUE 5%	ORDER OF INTEGRATION
Real returns	-7.4475	-2.6040	-1.9464	I(1)
Actual inflation	-6.1237	-3.5478	-2.9127	I(0)
Expected inflation	-4.1060	3.5478	-2.9127	I(0)

The tests show that real return is stationary after first differencing while both actual and expected inflation are stationary at levels. The next step after finding out the order of integration was to establish whether the non-stationary variables at levels are cointegrated. Differencing of variables to achieve stationarity leads to loss of long-run properties. The concept of cointegration implies that if there is a long-run relationship between two or more non-stationary variables, deviations from this long run path are stationary. To establish this, the Engel-Granger two step procedure was used. This was done by generating residuals from the long-run equation of the non-stationary variables, which were then tested using the ADF test. The result of cointegrating regression are given below in Table 4.4

Table 4.4: Cointegrating regression

Variable	Coefficient	t-Statistic
Constant	-0.2757***	-1.7932
Actual inflation	2.9927***	1.9018
Expected inflation	-2.3203	-1.2105
Information dummy	0.5208**	2.4492
Adjusted R-squared		0.6908
Akaike info criterion		2.3009
Schwarz criterion		2.4430
D-Watson statistics		2.0556
F-statistics		2.2714
Pro (F-statistics)		0.0336**

*Note ** significance at 5% *** significance at 10%*

The cointegrating regression was performed to find out whether the variables had a long-run relationship. Both actual and expected rate of inflation and information dummy were regressed on real returns. The coefficients of expected inflation had a negative sign while the information dummy had a positive sign. The coefficient of actual inflation variable had a positive sign. The actual inflation coefficient was found to be statistically significant. The coefficient of information dummy had the expected positive sign which was found to be statistically significant. This implies that stock dividend announcement is interpreted by investors as a management signaling device and that higher announcement means higher share prices.

Although the coefficient of expected inflation has negative sign as expected it was statistically insignificant. This means that in long-run expected inflation doesn't affect investors' decision to invest in shares, rather, they use actual inflation to make long-term shares investment decision.

The coefficients of determination (R^2) was high (0.6908), meaning that the power of the variables; expected inflation, actual inflation and information dummy to explain changes real returns from shares is high. F-statistics were found to be statistically significant at 10% level implying all variables expected inflation, actual inflation and information dummy affect real returns.

To check whether the variables were cointegrated, residuals from the above cointegration regression were derived.

The long-run relationship between stock prices and inflation is thus:

Real returns = -0.2757 - 2.9927*Actual inflation - 2.3203*Expected inflation + 0.5298*Information dummy

And the error correction term (ECT) is expressed as;

Error correction term = 1*Real returns + 0.2757 - 2.9927*Actual inflation + 2.3203*Expected inflation - 0.5298*Information dummy

The table 4.5 below reports the stationarity test for the residuals of the co-integrating regression.

Table 4.5: Unit root test of the error correction term

ADF Test	-4.4623	1% Critical Value	-3.5572
		5% Critical Value	-2.9167
		10% Critical Value	-2.5958

The residuals were found to be stationary at both 1% 5% and 10% levels of significance. The residuals became the error correction term and consequently, an error correction formulation was adopted.

4.5 Error Correction Modeling

After accepting cointegration, the next step was to re-specify equation (3.5.2) to include the error correction term. This term captured the long run relationship. It reflected attempts to correct deviations from the long run equilibrium and its coefficient is

interpreted as the speed of adjustment or the amount of disequilibrium transmitted each period to stock prices. The results of the error correction model are presented in Table 4.6 below;

Table 4.6: Error correction model

Variable	Coefficient	t-Statistic
Constant	-0.2503***	-1.7822
Actual inflation	2.6083***	1.8245
Expected inflation	-3.5271	-1.099
Information dummy	0.5180**	2.6283
Error correction term (-1)	-0.7130*	-4.2372
Adjusted R-squared		0.6086
Akaike info criterion		2.031
Schwarz criterion		2.2124
D-Watson statistics		2.1103
F-statistics		7.3106
Pro (F-statistics)		0.000*

Note: * significance at 1%, ** Significance at 5%, *** Significance at 10%

The error collection modeling was applied to capture the short-run relationship between real return and inflation; both actual and expected, and information dummy. The regression was performed by regressing both actual and expected rate of inflation and information dummy on real returns incorporating the lagged error correction term. The coefficients of expected inflation and information dummy had the expected sign while coefficient of actual inflation had a wrong sign. Despite actual inflation coefficient having negative sign, it was statistically significant. The coefficient of information dummy had the expected sign and it was statistically significant. This implies that stock dividend announcement is interpreted by investors as a management signaling device and that higher announcement means higher share prices.

Although the coefficient of expected inflation had a negative sign as expected it was statistically insignificant. This cannot be interpreted as if it does not affect real returns from shares. It means that in short-run expected inflation doesn't affect investors' decision to invest in shares, rather, they use actual inflation to make short-term investment decisions in stocks. The coefficients of determination (R^2) was high (0.6086), meaning that the power of the variables; expected inflation, actual inflation and information dummy to explain changes in real returns from shares is high. F-statistics is statistically significant at 10% level implying all variables- expected inflation, actual inflation and information dummy affects real returns. The coefficient of lagged error correction term (ECT), 0.7130 is stable and statistically significant. This indicates a speed of adjustment of 71.3 % from actual growth in the previous year to equilibrium rate of real returns on shares

4.6 Diagnostic Tests

Before embarking on the discussion of the regression results, the error correction model was subjected to number of diagnostic tests in order to evaluate its validity. These were: the LM-autocorrelation, which supplement the DW-statistics, the ARCH (Autoregressive conditional heteroscedasticity) which detects the problem of heteroscedasticity, the Jaque-bera test for normality of the residuals and the RESET test for specification of the regression. In addition to the above tests, CUSUM test was done. The results obtained revealed that the parameters were stable and model could be used for forecasting at the 5% level. Apart from Jarque-Berra normality test, which is distributed as chi-square statistics, the rest of the diagnostic tests utilized the F-statistics distribution. A summary of these tests is included in table 4.7 below:

Table 4.7: Diagnostic Tests

Ramsey RESET Test:			
F-statistic	1.0438	Probability	0.3118
Log likelihood ratio	1.1570	Probability	0.2820

White Heteroskedasticity Test:			
F-statistic	0.3768	Probability	0.9113
Obs*R-squared	2.9172	Probability	0.8925

ARCH Test:			
F-statistic	0.0150	Probability	0.9027
Obs*R-squared	0.0156	Probability	0.9003

Breusch-Godfrey Serial Correlation LM Test			
F-statistic	0.7254	Probability	0.4940
Obs*R-squared	1.8649	Probability	0.3935

Normality test uses the null hypothesis of normality against the alternative hypothesis of non-normality. If the probability value is less than Jarque-Bera chi-square at the 5% level of significance, the null hypothesis is not rejected. The Ramsey RESET Test for model specification, ARCH Test and White Heteroscedasticity Test for constant variance of residuals and Breusch-Godfrey Serial Correlation LM Test for serially correlated residuals uses the null hypothesis of good fit (specification), homoscedasticity, and non-autocorrelated against the alternative hypothesis of model mis-specification, heteroscedasticity, and autocorrelated respectively. If the probability value is less than F-statistics at the 5% level of significance, the null hypothesis is not rejected. The diagnostic test outcomes were satisfactory.

4.7 Discussion of the results

All the variables considered in the determination of real returns in NSE were as hypothesized except actual inflation. Table 4.4 summarizes the results of the impacts of the main variables based on equation 3.5.2 which was specified as the "best" model on the grounds of both theory and goodness of fit. In particular, they report the partial effects for the independent variables on the dependent variables, as well as the relationships for the two. The results also further confirm the above observation based on the partial effects that all variables except the expected inflation exhibit considerable impacts on the real returns from stocks.

In addition, on the basis of adjusted R-squared and F-statistics the estimated equation displayed better fit. Thus, on both theoretical and econometric grounds, the equation was well specified.

The findings of this study indicate a negative relationship between stock returns and expected inflation contrary to Fishers (1930) hypothesis, which states that nominal asset returns move one-for-one with the expected inflation so that real stock returns are determined by real factors independently of the rate of inflation. Fisher (1930) argued that asset values should be positively related with expected inflation, providing a hedge against rising prices. If the implied positive relationship between stock prices and the inflation does not hold, stock investors will be vulnerable to inflation. These findings are in line with recent research findings such as Bulmer (1975), Fama and Schwert (1977), Fama (1981, 1982), Geske and Roll (1983), who find evidence that stock returns are negatively affected by both expected and unexpected inflation in the U.S.

Thus, the negative stock return-inflation relation can also reflect changes in the expected return and risk aversion (Boucher, 2004). The "proxy hypothesis" suggested by Fama (1981) claims that the negative stock return inflation relation is spurious. The anomalous stock return-inflation relation is in fact induced by a negative relation between inflation and real activity. Fama's hypothesis predicts that rising inflation rates reduce real economic activity and demand for money. Geske and Roll (1983) proposes a "reverse causality" explanation and argue that a reduction in real activity leads to an increase in fiscal deficits. Since the Federal Reserve Bank monetizes a portion of fiscal deficits, the money supply increases, which in turn increases inflation.

CHAPTER FIVE

CONCLUSIONS AND POLICY IMPLICATIONS

5.1 Summary

In the recent past, the phenomenal growth and increased activity at the Nairobi Stock Exchange have generated greater interest among researchers, government agencies and the general public. Among issues of much interest have been the effects of macroeconomic variables on the operations of the stock exchange. The present study sought to provide evidence on the empirical relationship between inflation and stock prices at the Nairobi Stock Exchange. The study used five-year pooled data over 2002-2006 for six firms selected from three different market sectors at Nairobi Stock Exchange. The main objectives of the study were to specify and estimate the functional relationship between inflation and stock prices. It also sought to assess the validity of the Fisherian hypothesis, and finally draw policy conclusions and recommendations based on the findings. The study employed the OLS estimation technique to estimate a single equation with the real returns as the dependent variable and explanatory variables as actual inflation, expected inflation and information dummy. A specification associated with error correction modeling (ECM) was applied to capture long-run equilibrium after the variables were differenced to make them stationary. By using cointegration and error correction model, the study established both the short run and long run equilibrium.

The study reports a negative relationship between stock returns and expected inflation contrary to Fishers (1930) hypothesis, which states that nominal asset returns move one-for-one with the expected inflation so that real stock returns are determined by real factors independently of the rate of inflation. Fisher (1930) argued that asset values should be positively related with expected inflation, providing a hedge against rising prices. If the implied positive relationship between stock prices and the inflation does not hold, stock investors will be vulnerable to inflation. These findings are in line with recent research findings such as Lintner (1975), Fama and Schwert (1977), Fama (1981, 1982), Geske and Roll (1983), who find evidence that stock returns are negatively affected by both expected and unexpected inflation in the U.S.

The study however finds a positive relationship between actual inflation and stock prices and the dividend information dummy. These findings reveal that information announcement of dividends raises stock prices for the shares of the listed companies.

5.2 Conclusions

The study reported the partial effects for the independent variables on the dependent variable and relationships between these variables. The results confirm the above observation based on the partial effects of all variables except the expected inflation exhibit considerable impacts on the real share. Both in the short-run and long run models, the coefficients of expected inflation and information dummy had the correct sign, however expected inflation coefficient was not statistically significant. Though coefficient of actual inflation had incorrect sign, it was significant.

Using the "best" model on the basis of theory and goodness of fit, the study found that the expected inflation exerts a negative effect on the share prices at the Nairobi Stock Exchange. Despite the usual caveat associated with econometric studies such as the present one, the finding in the current study suggested that there is negative relationship between expected inflation and real returns from share.

5.3 Policy implications

The results from this study present a number of policy implications that could guide government policy on the operations of the stock market and the financial sector at large. The results of the study show that stock prices at the Nairobi Stock Exchange are negatively related to expected inflation, and therefore do not provide a perfect hedge against inflation in contradiction to Fishers (1930) hypothesis. This observation points to the type of investors at the Nairobi Stock Exchange, and the information available to investors at the stock market. This calls for efforts directed to increasing information available to investors and investor education on investing in the stock exchange.

Looking at historical trends, Kenya has in the past been characterized by high levels of inflation. This could have had a negative effect on the stock returns thereby impacting

negatively on investors participation at the Nairobi Stock Exchange. The findings of this study therefore informs the monetary and fiscal policy agents on the need to effectively manage inflation in the country at a level conducive for the growth of investment in the stock market.

The findings of this study also shed light on the price discovery mechanism at the Nairobi stock Exchange. It is important that efforts are directed to ensure an efficient price discovery mechanism that will ensure stock prices arrived at reflect the market fundamentals. This can be done by increasing the information available to investors through investor education on the operations of the stock exchange.

5.4 Areas for further research

This study focused on the relationship between stock prices and inflation at the Nairobi Stock Exchange in order to test the validity of the Fisherian hypothesis. The investigation of this relationship was carried out based on the assumption that the stock market is efficient. However little is known on the degree of efficiency of the price discovery process at the Nairobi Stock Exchange. It is important that a study is conducted on efficiency levels of stock exchange basing on the efficient market hypothesis

This study reports a negative relationship between inflation and stock prices at the Nairobi Stock Exchange. Various theories have been put forward to explain the negative relationship between stock prices and inflation reported in recent research findings. These explanations include among others a correlation between expected inflation and expected real economic growth (the "proxy hypothesis"), the hypothesis that investors may irrationally discount real cash flows using nominal interest rates; changes in the expected return and risk aversion (i.e. the equity risk premium) and the inflation non-neutralities tax code which distorts the accounting profits. It is important that research is carried out to asses the validity of these hypotheses in the Kenyan context in order to obtain an explanation of the findings of this study.

5.4 Limitations of the study

A major limitation of the study is the problem concerning the data in the Kenyan economy, which lacks relevance and reliability. Different data sources give different data for the same variable. To maintain consistency, the study relied on data published by the Government agencies and press.

The empirical model applied in this study is based on the assumption of an efficient market. However the Nairobi stock exchange like other stock markets in the developing countries has exhibited low levels of efficiency due to un availability of information and low levels of technology used. This limited the conclusions arrived at by this study.

References

Adrangi, B. Chatrath A. and Sanvicente A. (2000), Inflation, Output, and Stock Prices: Evidence from Brazil, Financelab Working Paper 16-2000, IBMEC Sao Paulo.

Bernanke, Ben, Mark Gertler, and Simon Gilchrist, 1999, the Financial Accelerator in a Quantitative Business Cycle Framework, in Handbook of Macroeconomics, ed. by John Taylor and Michael Woodford. North-Holland, pp 1341-1393.

Fama E F (1981), 'Stock Returns, Real, Inflation and Money', American Economic Review, 71(4), 545-565

Fama E F and K R French (1988), 'Dividend yields and expected stock returns' Journal of Financial Economics 22, 3-25

Fama E.F. and K.R. French (2002), 'The Equity Premium' Journal of Finance, 57, 637-659.

Fama, E.F. and K.R. French (2001), "Disappearing Dividends: Changing Firm Characteristics or Lower Propensity to Pay?" *Journal of Financial Economics*, 60, 3-43.

Fama, E F. and K.R French (1989), "Business conditions and expected returns on stocks and bonds," *Journal of Financial Economics*, 25, 23-49.

Fama, E.F. and K.R. French (1988), "Dividend yields and expected stock returns," *Journal of Financial Economics*, 22, 3-25.

Fama, E.F. and G.W. Schwert (1977), "Asset Returns and Inflation," *Journal of Financial Economics*, 5, 115-146.

Firth, M. (1979), "The Relationship between Stock Market Returns and Rates of Inflation," *Journal of Finance*, 34, 743-749.

Fisher, I. (1930), *the Theory of Interest*, Macmillan, New York.

Geske, R. and R. Roll (1983), "The Fiscal and Monetary Linkage between Stock Returns and Inflation," *Journal of Finance*, 38, 1-34

Goetzmann, W.N. and Jorion (1993), "Testing the predictive power of dividend yields," *Journal of Finance*, 48, 663-679.

Goyal, A. and I. Welch (2004), "A Comprehensive Look at the Empirical Performance of Equity Premium Prediction," Working Paper, April

Goyal, A. and I. Welch (2003), "Predicting the equity premium with dividend ratios," *Management Science*, 49(5), 639-654.

Graham, F. C. (1996), "Inflation, Real Stock Returns and Monetary Policy," *Applied Financial Economics*, 6, 29-35.

Graham, B. and D.L. Dodd (1934), *Security Analysis*, first edition, Mc-Graw Hill, New York, NY.

Gultekin, N.B. (1983), "Stock Market Returns and Inflation: Evidence from Other Countries," *Journal of Finance*, 38, 49-65.

Heaton, J. and D. Lucas (1999), "Stock Prices and Fundamentals," in B.S. Bernanke and Rotemberg J.J. (Eds), *NBER Macroeconomics Annual*, 14, London: MIT Press, 213-242.

Hodrick, R.J. (1992) "Dividend yields and expected stock returns: alternative procedures for inference and measurement," *Review of Financial Studies*, 5(3), 357-386.

Hu, X. and T.D. Willett (2000), "The Variability of Inflation and Real Stock Returns," *Applied Financial Economics*, 10(6), 655-665.

Inoue, A. and L. Kilian (2004), "In-sample or out-of-sample tests of predictability: which one should we use?" *Econometric Reviews*, 23(4), 1-32.

Jaffe, J. and G. Mandelker (1976), 'The 'Fisher Effect' for Risky Assets: An Empirical Investigation," *Journal of Finance*, 31, 447-458.

Jagannathan, R., McGrattan E.R. and A. Scherbina (2001), "The Declining U.S. Equity Premium," NBER Working paper 8172.

James, C., S., Koreisha and M. Partch (1985), "A VARMA Analysis of the Causal Relations among Stock Returns, Real Output, and Nominal Interest Rates," *Journal of Finance*, 40, 1375-1384.

Johansen, S. (1988), "Statistical analysis of cointegrating vectors," *Journal of Economic Dynamics and Control*, 12, 231-254.

Johansen, S. and K. Juselius (1992), "Testing Structural Hypotheses in a Multivariate Co integration Analysis of the PPP and the UIP for UK," *Journal of Econometrics*, 53, 211-244

Kaul, G. (1990), "Monetary Regimes and the Relation between Stock Returns and Inflationary Expectations," *Journal of Financial and Quantitative Analysis*, 25(3), 307-321.

Keim, D.B. and R.F. Stambaugh (1986), "Predicting Returns in the Stock and Bond Markets," *Journal of Financial Economics*, 17, 357-390.

Kilian, L. (1999), "Exchange rates and monetary fundamentals: What do we learn from long-horizon regressions?" *Journal of Applied Econometrics*, 14, 491-510.

Kirby C. (1997), "Measuring the predictable variation in stock and bond returns " *Review of Financial Studies*, 10(3), 579-630.

Kothari, S.P and J. Shanken (1997), "Book-to-market, dividend yield, and expected market returns: A time series analysis," *Journal of Financial Economics*, 44, 169-203.

Lamont, O. (1998), "Earnings and Expected Returns," *Journal of Finance*, 53, 1563-1587.

Lee, BS (1992), "Causal Relations Among Stock Returns, Interest Rates, Real Activity and Inflation," *Journal of Finance*, 47, 1591-1603.

Lintner, J. (1975), "Inflation and Security Return," *Journal of Finance*, 30, 259-280.

Modigliani, F. and R.A. Cohn (1979), "Inflation, Rational Valuation and the Market," *Financial Analysts Journal*, 35, 24-44.

Nelson, C. (1976), "Inflation and Rates of Return on Common Stocks," *Journal of Finance*, 31, 471-483.

Phillips, P.C.B and Perron, P. (1988), "Testing for a unit root in time series regression", *Biometrika*, 75, 335-346.

Pindyck, R.S. (1984), "Risk, inflation, and the stock market," *American Economic Review*, 74(3), 335-51.

Sharpe, S.A. (2002), "Reexamining Stock Valuation and Inflation: The Implications of Analysts' Earnings Forecasts," *Review of Economics and Statistics*, 84, 632-48

Appendix 1: Data Set

MONTH	Nominal return	Dividend Information Dummy	Actual Inflation	Expected Inflation	Real Return
1-Jan	-0.1527	0	0.1043	0.0000	-0.25703
February	-0.3324	0	0.1357	0.1043	-0.46807
March	-0.8801	1	-0.0157	0.1357	-0.86597
April	1.0730	1	0.0333	-0.0157	1.039639
May	0.8728	0	0.0152	0.0333	-0.88801
June	0.3637	0	0.0100	0.0152	-0.37367
July	-0.1214	1	0.0122	0.0100	-0.13362
August	0.1437	1	-0.0312	0.0122	0.174888
Sept	0.0382	0	0.0322	-0.0312	0.006016
Oct	-0.1028	0	0.0252	0.0322	-0.12794
Nov	0.4370	1	-0.0363	0.0252	0.47333
Dec	-0.3939	0	0.0178	-0.0363	-0.41166
2-Jan	-0.4812	0	0.0114	0.0178	-0.49258
February	0.8200	1	0.0267	0.0114	0.793368
March	-0.5552	0	0.0175	0.0267	-0.57271
April	0.6685	0	0.0449	0.0175	0.623565
May	-0.2664	0	0.0023	0.0449	-0.26867
June	0.5196	1	-0.0299	0.0023	0.549514
July	-0.4880	1	-0.0248	-0.0299	-0.46314
August	0.2626	0	-0.0068	-0.0248	0.269442
Sept	-0.4096	0	0.0135	-0.0068	-0.42307
Oct	0.0595	1	0.0036	0.0135	0.055925
Nov	0.0809	0	0.0067	0.0036	0.074176
Dec	-0.2279	0	0.0253	0.0067	-0.25313
3-Jan	0.4803	0	0.0180	0.0253	0.462317
February	0.0014	1	0.0124	0.0180	-0.01095
March	0.1908	0	0.0105	0.0124	0.180283
April	0.4057	0	0.0165	0.0105	0.389233
May	-0.4680	1	0.0146	0.0165	-0.48257
June	-1.3763	1	-0.0062	0.0146	-1.37051
July	0.4504	0	0.0404	-0.0062	0.490771
August	0.8205	0	0.0203	0.0404	0.840819
Sept	0.7262	1	0.0078	0.0203	0.734031
Oct	0.0188	1	-0.0103	0.0078	0.029171
Nov	0.1113	0	0.0033	-0.0103	0.108405
Dec	0.0706	0	0.0131	0.0033	0.057552
4-Jan	-1.0721	0	0.0097	0.0131	-1.08202
February	0.2406	1	0.0143	0.0097	0.226302
March	-0.3392	1	0.0280	0.0143	-0.36684
April	0.1874	1	0.0047	0.0280	0.182652
May	0.5286	0	-0.0107	0.0047	0.53924
June	-1.1273	0	-0.0075	-0.0107	-1.11976
July	-0.3035	1	-0.0051	-0.0075	-0.29837
August	-0.0958	1	-0.0046	-0.0051	-0.09123

Sept	0.1027	0	0 0025	-0 0046	0 10021
Oct	0.1037	1	0 0118	0 0025	0 091862
Nov	-0 6987	1	0 0177	0 0118	-0 71636
Dec	0 1331	0	0 0868	0 0177	0.046283
6-Jan	0 4841	0	0.0401	0 0868	0 443965
February	0 3344	0	0 0166	0 0401	-0 35094
March	-0 0919	1	-0 0094	0 0166	-0 08254
April	-0 9709	0	-0 0103	-0 0094	-0 96059
May	0 5291	1	-0 0296	-0 0103	0.558676
June	0 5682	1	-0 0145	-0 0296	0.582674
July	0 0791	0	0 0071	-0 0145	0.072003
August	-0 2229	0	0 0163	0 0071	-0.23921
Sept	-0 2144	1	0 0205	0 0163	-0.2349
Oct	-0 1832	1	0 0016	0.0205	-0 18158
Nov	-0 3156	0	0 0288	-0 0016	-0 34421
Dec	-0 9131	0	0 0298	0 0288	-0 94286

Appendix II

Monthly nominal returns for the six firms

MONTH	FIRM 1	FIRM 2	FIRM 3	FIRM 4	FIRM 5	FIRM 6	Natural return	Dummy information	Actual inflation	Expected inflation	Real return
2002 January	0.0000	-0.4237	0.0000	0.0000	-0.4926	0.0000	-0.1527	0	0.1043	0.0000	-0.25703
February	0.4739	0.0000	0.0000	-1.4925	-0.9756	0.0000	-0.3324	0	0.1357	0.1043	-0.46807
March	1.4286	-0.4219	-1.6667	0.0000	-0.4954	-1.2876	-0.8917	1	-0.0157	0.1357	-0.86597
April	0.0000	0.8403	1.6393	1.4706	2.4876	0.0000	1.0230	1	0.0333	-0.0157	1.039639
May	0.4695	-0.8475	0.0000	-1.4925	-2.4272	0.0000	-0.8728	0	0.0152	0.0333	-0.88801
June	0.4673	0.0000	-1.6667	-1.4706	0.4878	0.0000	-0.3637	0	0.0100	0.0152	-0.37367
July	0.4695	0.8403	-1.6393	1.4493	-0.4954	-0.4237	-0.3214	1	0.0122	0.0100	-0.13382
August	0.4673	-0.8475	3.2258	-1.4706	0.0000	0.4219	0.1417	1	-0.0312	0.0122	0.174888
Sept	0.4651	0.0000	-1.6667	1.4493	0.4878	0.4237	0.0382	0	0.0322	-0.0312	0.006016
Oct	0.4630	0.0000	-1.6393	1.4706	-0.4954	-0.4255	-0.1028	0	0.0252	0.0322	-0.12794
Nov	0.4651	0.0000	3.2258	-1.4925	0.0000	0.4237	0.4370	1	-0.0363	0.0252	0.47333
Dec	0.4673	0.0000	0.0000	-1.4706	0.0000	-0.4255	-0.3939	0	0.0178	-0.0363	-0.41168
2003/January	0.4651	0.0000	-3.3333	0.0000	0.4878	0.4237	-0.4812	0	0.0114	0.0178	-0.49258
February	0.0000	0.8403	0.3226	0.0000	-0.9662	-0.2766	0.8200	1	0.0267	0.0114	0.793368
March	0.4630	-0.4237	-0.3333	0.0000	0.4954	0.4202	-0.5552	0	0.0175	0.0267	-0.57271
April	0.4608	0.0000	1.6129	1.4493	0.4878	0.0000	0.6685	0	0.0449	0.0175	0.623565
May	0.4630	-0.8439	-1.6393	0.0000	0.0000	0.4219	-0.2664	0	0.0023	0.0449	-0.26867
June	0.4651	0.4184	3.2258	0.0000	-0.4954	0.4237	0.5196	1	-0.0299	0.0023	0.549514

[illegible]	0.4630	0.0000	-3.3333	0.0000	-0.4831	-0.4255	-0.4880	1	-0.0248	-0.0298	-0.46314
August	0.4651	0.4202	1.6129	-1.4706	0.9756	-0.4276	0.2626	0	-0.0068	-0.0248	0.269442
Sept	0.9346	-0.4219	-1.6393	1.4493	-0.4854	-0.4255	[illegible]	0	0.0135	-0.0068	-0.42307
Oct	0.0000	0.8403	0.0000	0.0000	-0.4831	0.0000	[illegible]	1	0.0036	0.0135	0.055925
Nov	0.0000	-0.4237	0.0000	0.0000	0.4854	0.4237	0.6809	0	0.0067	0.0036	0.074176
Dec	0.4630	-0.4219	0.0000	-1.4706	0.4878	-0.4255	-0.2279	0	0.0253	0.0067	-0.25313
2004/January	0.4651	-0.4202	0.0000	2.8986	-0.4854	0.4237	0.4603	0	0.0180	0.0253	0.462317
February	0.4673	0.0000	1.6129	-2.9851	0.4878	0.4255	0.0014	1	0.0124	0.0180	-0.01095
March	0.0000	0.4184	1.6393	0.0000	-0.4854	-0.4274	0.1908	0	0.0105	0.0124	0.180283
April	0.4695	-0.4202	0.0000	2.8986	0.0000	0.4255	0.4657	0	0.0165	0.0105	0.389233
May	0.4673	0.4184	-1.6667	-1.4925	-0.9615	0.4274	-0.4680	1	0.0146	0.0165	-0.48257
June	1.8779	-0.4202	-1.6393	-2.9412	-0.9524	-0.4292	1.3767	1	-0.0062	0.0146	-1.37051
July	1.3825	-0.4184	0.0000	0.0000	-0.4739	-0.4274	-0.4504	0	0.0404	-0.0062	-0.49077
August	5.4546	0.0000	0.0000	1.4286	-0.4717	-0.4255	-0.8205	0	0.0203	0.0404	-0.84081
Sept	0.9621	-0.4167	-1.6129	-1.4493	-0.4695	-1.2712	-0.7262	1	0.0078	0.0203	-0.73403
Oct	1.3044	-0.4149	1.5873	-1.4286	0.0000	1.6736	0.0188	1	-0.0103	0.0078	0.029171
Nov	0.0000	0.4132	1.6129	0.0000	-0.9302	-0.4255	0.1117	0	0.0033	-0.0103	0.108405
Dec	0.0000	0.0000	0.0000	0.0000	0.0000	0.4237	0.0706	0	0.0131	0.0033	0.057552
2005/January	0.8584	0.0000	-3.2787	-1.4085	-0.4630	-0.4255	-1.0723	0	0.0097	0.0131	-1.08202
February	0.4255	0.6639	1.5873	0.0000	0.4651	-0.4274	0.2406	[illegible]	0.0143	0.0097	0.226302
March	0.0000	0.0000	-1.6129	0.0000	0.0000	-0.4202	-0.3389	1	0.0280	0.0143	-0.36684
April	0.0000	0.0000	1.5873	0.0000	-0.4630	0.0000	0.1824	1	0.0047	0.0280	0.182652
[illegible]	1.6949	1.6708	1.6129	-1.3889	0.0000	-0.4184	0.5286	0	-0.0107	0.0047	0.53924
June	1.2931	-1.2744	-3.2787	0.0000	-0.9174	0.0000	-1.1273	0	-0.0075	-0.0107	-1.11976

July	1.2766	-1.2584	1.5873	0.0000	-0.4566	-0.4167	-0.3035	1	-0.0051	-0.0075	-0.29837
August	0.4202	0.4143	0.0000	-1.3699	-0.4546	0.4149	-0.0958	1	-0.0046	-0.0051	-0.09123
Sept	0.4219	0.4160	-1.6129	1.3514	0.4566	-0.4167	0.1027	0	0.0025	-0.0046	0.10021
Oct	0.8475	-0.8354	3.1746	0.0000	-0.4546	-0.4149	0.1037	1	0.0118	0.0025	0.091862
Nov	0.0000	0.0000	-3.2787	-1.3699	0.4566	0.0000	-0.6987	1	0.0177	0.0118	-0.71636
Dec	0.4202	-0.4143	1.5873	0.0000	0.4587	-0.4132	0.1331	0	0.0868	0.0177	0.046283
2006-January	0.4184	0.4125	1.6129	0.0000	0.4608	0.0000	0.4841	0	0.0401	0.0868	0.443965
February	0.4202	0.4143	-3.2787	1.3514	-0.9132	0.0000	-0.3344	0	0.0166	0.0401	-0.35094
March	0.4219	0.4160	3.1746	-4.1096	-0.4546	0.0000	-0.0919	1	-0.0094	0.0166	-0.08254
April	0.8475	-0.8354	-3.2787	0.0000	-0.4525	-0.4115	-0.9709	0	-0.0103	-0.0094	-0.96059
May	0.0000	0.0000	3.1746	0.0000	0.0000	0.0000	0.5291	1	-0.0296	-0.0103	0.558676
June	1.2605	1.2428	0.0000	1.3158	0.0000	-0.4098	0.5682	1	-0.0145	-0.0296	0.582674
July	0.0000	0.0000	0.0000	1.3333	-0.4505	-0.4082	0.0791	0	0.0071	-0.0145	0.072003
August	0.4255	-0.4195	0.0000	-1.3514	0.4525	0.4065	-0.2229	0	0.0163	0.0071	-0.23921
Sept	0.4237	0.4177	-1.6393	0.0000	-0.8969	0.4082	-0.2144	1	0.0205	0.0163	-0.2349
Oct	0.0000	0.0000	-1.6129	1.3333	0.0000	-0.8197	-0.1832	1	-0.0016	0.0205	-0.18158
Nov	1.2766	-1.2584	1.5873	-1.3514	0.0000	0.4065	-0.3154	0	0.0288	-0.0016	-0.34421
Dec	0.4202	0.4143	-1.6129	0.0000	-4.2919	-0.4082	-0.9131	0	0.0298	0.0288	-0.94286

Note:

Firm 1: Kenya Airways

Firm 2: Car & General (K) Ltd

Firm 3: Barclays Bank Ltd

Firm 4: I.C.D.C. Investment Company Ltd

Firm5: British American Tobacco [illegible] Ltd

Firm 6: East African Breweries Ltd