THE RELATIONSHIP BETWEEN MACROECONOMIC VARIABLES AND SHARES' PERFORMANCE AT THE NAIROBI SECURITIES EXCHANGE

By

Samuel Anthony Kamau Nduta

REG: X51/79766/2015

SUPERVISOR

Ms. Susan A. Ayako

A RESEARCH REPORT SUBMITTED IN PARTIAL

FULFILLMENT FOR THE AWARD OF MASTER OF ECONOMICS AND POLICY MANAGEMENT

SCHOOL OF ECONOMICS

UNIVERSITY OF NAIROBI

November, 2016

DECLARATION

This research report is my own work and it has not been submitted for any degree or examination in any other university.

Signature: …… DATE.....

Samuel Anthony Kamau Nduta

X51/79766/2015.

This research report has been submitted with approval by the university supervisor.

Signature: …… DATE: ……

Ms. Susan A. Ayako

SCHOOL OF ECONOMICS

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LIST OF ABBREVIATIONS

ADF	-	Augmented Dickey Fuller
APT	-	Arbitrage Price Theory
ARDL	-	Autoregressive Distributed Lag
CAPM	-	Capital Asset Pricing Model
CBK	-	Central Bank of Kenya
CBR	-	Central Bank Rate
DW	-	Durbin Watson Test
DDM	-	Dividend Discount Model
ECM	-	Error Correction Model
FTSE	-	Financial Times Exchange
Govt	-	Government
IRF	-	Impulse Response Function
KES	-	Kenya Shilling
KNBS	-	Kenya National Bureau of Statistics
M1	-	Is the currency in circulation less cash in banks plus all demand deposits
M2	-	Is sum of M1, quasi money in banks and quasi money in non-bank institutions
M3	-	Includes M2 plus the foreign currency deposits
MFM	-	Multi-Factor Model
NSE	-	Nairobi Securities Exchange
OLS	-	Ordinary Least Squares
T-bill	-	Treasury bill rate
TGARCH		-Threshold Generalized Autoregressive Conditional Heteroscedasticity
USD	-	United States Dollar
VAR	-	Vector Auto Regressive
VIF	-	Variance Inflation Factor

ABSTRACT

The aim of this research was investigating the relationship between the MEV of exchange rate, 91 day T-bill rate, monetary stock (M2) and the lending rate on shares' performance at the NSE. OLS regression technique was used to establish the relationship of the MEV on the FTSE NSE 15 index performance. The theoretical framework that was considered to inform the selection of the MEV was based on the Multi-Factor Model. Empirical results of the regression model revealed that the MEV of exchange rate and the lending rate were significant in explaining the variations in shares' performance while the other selected MEV were found to be insignificant. This study reviewed the period from November 2011 to May 2016 by using published monthly time series observations of the variables.

CHAPTER ONE

INTRODUCTION

1.1 Background

In 2011, the Nairobi Securities Exchange (NSE) launched two share indices in conjunction with Financial Times Exchange (FTSE) Group. The FTSE NSE indices series were developed to depict the performance of listed companies at the NSE, giving current and potential investors with an all-round and complementing set of indices with which to gauge the performance of the main capital and industry sectors of the Kenyan Capital Market (Nairobi Securities Exchange, 2016). The FTSE NSE 15 index is made up of NSE 15 largest shares by market capitalization while the FTSE NSE 25 comprises of the NSE 25 largest shares by share liquidity.

The composition of the FTSE NSE Kenya 15 Index is as follows:

Industry	**Number of observations**	**Weights (%)**
Oil and Gas	1	2
Basic materials	1	2.08
Industrial	0	0
Consumer goods	1	21.02
Consumer services	0	0
Telecommunications	1	20.86
Utilities	2	5.8
Financials	9	48.25
Total	**15**	**100**

Table 1.1 FTSE NSE Kenya15 (2016) composition. Source:www.ftserussell.com

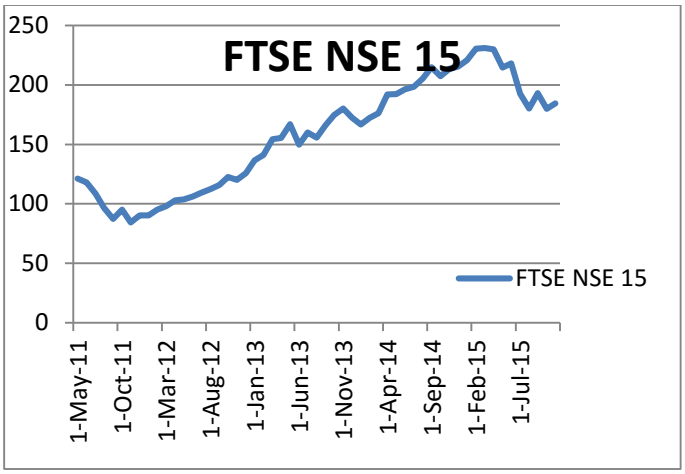


Figure 1. FTSE NSE 15 price levels. Source: www.nse.co.ke

Figure 1 shows the performance of the FTSE NSE 15 index. The FTSE NSE 15 Index started as of May 2011, its historical data runs back to January 2008 and the constituent shares are reviewed every other 6 months .i.e. June and December (Nairobi Securities Exchange, 2016).

The topic of the relationship between MEV and share performance has year after year stemmed up debate among researchers due to different conclusions. In theory, MEV are considered to affect performance of shares and over time, the observation of effects of MEV on share performance has varied from study to study in unrelated capital and share markets. Conclusions of the literature point to an adequate influence existing between MEV indicators and share performance in the advanced economies studied (Tangjitprom, 2012).

Since the FTSE NSE 15 index started in May 2011, the same year resulted in unpredictable movements in MEV and an observed decline in the performance of the FTSE 15 index. Increasing interest rate and inflationary pressures in 2011 together with a depreciation of the domestic currency are conditions that may have affected the performance of the share market. Over the course of 2014 to 2015, similar unpredictable movements in MEV were experienced with inflationary pressures, rising interest rate and depreciation of the domestic currency occurring leading to consecutive Monetary Policy

Committee (MPC) meetings by CBK to increase the CBR in order to curb inflationary pressures and stabilize the depreciation of the domestic currency (Central Bank of Kenya, 2016). An observation of the index in figure 1, shows a coinciding decline in performance in the periods the Kenyan economy experienced these unpredictable movements in MEV.

Performance of the share market is measured by observations of share market growth and market size. Market capitalization as a performance criteria for company shares' is of interest to an investor since large market value shares' exhibit less volatile share price movement and have consistent, stable dividend payments (Masila, 2010).

The NSE introduced foreign targeted indices by tracking shares based on market capitalization and share liquidity with a view of bringing foreign investors to invest and participate in the Kenyan capital markets. The FTSE index series provides an acceptable and direct way for existing or potential investors and stakeholders to assess, evaluate and attain access to the Kenyan capital markets (Nairobi Securities Exchange, 2016).

1.2 Statement of the Problem

The shares' market is an important institution which determines and indicates the performance of the economy. The nature and state of the shares' market is of concern to the government, investors and generally all the stake holders. As an economic institution, the shares' market has a role of improving the effectiveness of capital generation and allocation. Thus, the entire development of the economy is affected by how well the market of shares is performing (Ashaolu and Ogunmuyiwa, 2011).

Emerging share markets like the NSE, are not integrated with the global capital markets. Thus, it is debated that domestic risk factors such as MEV, rather than global risk factors are the main origin of share performance variation in these markets (Masila, 2010). However, events that affect the entire global financial environment like the credit crunch, do have an effect on the shares' markets in Kenya (Ouma and Muriu, 2014).

Existing studies have mainly tried to explain the systematic risk factors that may affect a shares' portfolio by focusing on the two main indices at the NSE, namely the NSE 20 share index and the NSE all-share index (NASI). Since the introduction of the foreign-investor targeted indices, the effect of systematic risk factors on a shares' portfolio based on the new FTSE NSE indices have not been analyzed.

The period since the FTSE NSE indices started resulted in year after year of advancement and growth in the index performance. In 2015, investors at the NSE had to bear with negative returns at 25% which corresponded with unpredictable volatility of MEV (Central Bank of Kenya, 2016). This study on the effect of domestic MEV on the shares' index performance at the NSE aimed to add knowledge to the existing current literature in Kenya.

1.3 Research Question

The general research question was whether a relationship existed between MEV and shares' performance at the NSE?

1.4 Research Objectives

The objectives for this study was:

i. To determine the relationship between MEV and shares' performance at the NSE.

ii. To infer policy measures and recommendations that could be adopted by regulators, investors and NSE stakeholders.

1.5 Significance of the Study

Existing and potential foreign investors who participate in the Kenyan capital markets, ordinarily choose their shares' portfolio based on FTSE NSE share indices (Nairobi Securities Exchange, 2016). Policy measures that aimed to be recommended from this

study may be useful for enabling favourable macroeconomic conditions for capital generation from international investors into the Kenyan capital markets.

This study aimed to advance knowledge on domestic MEV that may influence a shares' portfolio performance and further aimed to help set the basis under which investors and stakeholders could make informed choices regarding investments in Kenya and at the NSE in particular.

1.6 Scope and Limitations of the Study

The scope of this study was limited to the period in which the FTSE NSE 15 index has been in existence and the period reviewed was from November 2011 to May 2016 which fell between the five year period since its introduction at the NSE and FTSE indices listing.

By relying on the FTSE NSE 15 index as a representative of foreign investor shares' portfolio choice, this study limited itself to one of the several indices at the NSE that are available for an investor to evaluate and participate in the Kenyan capital market.

1.7 Organization of the Research Study

The rest of this research study is organized as follows: Chapter two discusses the relevant theories and literature relating to the research topic, chapter three discusses the theoretical framework and develops the empirical model, chapter four presents the empirical results and finally the summary, conclusion and policy implications are discussed in the final chapter.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter addresses the documented literature on MEV and securities market and is organized as follows: review of theories, a review of empirical studies and the overview from the literature.

2.2 Theoretical Literature Review

This segment reviews theories relevant to the study. They include: Capital asset pricing model, Arbitrage pricing theory, Multi-factor model and the Dividend Discount Model. Further, the systematic risk sources of the MEV are discussed.

2.2.1 Capital Asset Pricing Model

Sharpe (1964), Lintner (1965) and Mossin (1966) developed the initial and widely received asset pricing theory, known as capital asset pricing model (CAPM). The CAPM indicates the association existing in risk and the expected return for a single security as well as a securities portfolio.

The CAPM relationship for a portfolio is as shown:

$$ER_{portfolio} = Rf + \beta_{portfolio} (Rm - Rf) \qquad (2.1)$$

Where: (ER) is the expected return, (Rf) is the risk free rate, (Rm) is the market return and (β) represents the beta of the portfolio.

One criticism from the CAPM is that it only assumes one form of systematic risk which is the market risk. In reality, markets may be efficient but the CAPM does not capture entire systematic risk adequately. This has led to additional variables to the model being included to capture other systematic risk sources resulting in the development of multifactor models (Cochrane, 1998).

2.2.2 Arbitrage Pricing Theory

The arbitrage pricing theory (APT) emerged after CAPM. In the APT, the risk of holding an equity security comes from systematic and non-systematic factors (Roll and Ross, 1980). A portfolio of assets offers diversification for non-systematic risk affecting single assets. However, systematic risk factors are common across all assets and will affect the performance of a portfolio of assets (Ouma and Muriu, 2014). In an efficient market, similar assets cannot sell at different prices, otherwise an arbitrage opportunity would exist (Elly and Oriwo, 2013).

The APT for a portfolio of assets takes the form:

$$\mathbf{R_p = \alpha_p + \sum_{k=1}^{n} Bik\ Fk} \qquad \mathbf{(2.2)}$$

Where: (R_p) represents the return of a portfolio, (F_k) is the systematic risk factor common to all assets in the portfolio, (β_{ik}) is the beta which is the sensitivity of the factor to the portfolio returns.

Having no theoretical guidance on the selection of systematic risk factors, criticisms of APT was that it relied on stylized independent variables to check the effect of systematic risk on asset returns. This inadequacy of using stylized variables was however accepted in the initial study for APT by Roll and Ross in 1980 (Elly and Oriwo, 2013).

2.2.3 Multi-Factor Model

Criticism arising from APT was the inability to make economic interpretation of the results derived from the model and also APT could not specify the systematic risk factors that should be used in its estimation. These inadequacies led to emergence of MFM (Elly and Oriwo, 2013).

In MFM, the systematic risk factors are to be explained by economic theory and checked exogenous against the securities phenomena. MFM can expound on a single security or a

portfolio of securities by establishing a linear relationship to the systematic risk factors specified and estimating the relationship by using time series techniques (Connor, 1996).

MFM for a securities portfolio takes the form:

$$\mathbf{V_p = \alpha_p + \sum_{k=1}^{n} Bik\ Fk} \qquad \mathbf{(2.3)}$$

Where: (Vp) represents the securities phenomena, (Fk) is the systematic risk factors to be identified, (βik) is the beta which is the sensitivity of the factors to the securities phenomena and (α_p) is the intercept.

The intercept of MFM explains the expected performance of the securities phenomena in the model equation identified. The economic theories that will inform the MFM selection of systematic risk factors that affect the shares' performance shall be based on the Dividend Discount Model.

2.2.4 Dividend Discount Model

In the Dividend discount model, valuing a firms' share price is based on the future dividends of the firm, which are discounted to reflect the present value of the share price (Gordon, 1959). The dividend discount model (DDM) is represented by the general equation as follows:

$$\mathbf{P_{share} = \sum_{t=1}^{\infty} \frac{E_t\,(D_i)}{(1+r)^{\,t}}} \qquad \mathbf{(2.4)}$$

Where: (P_{share}) is the present value of a share, $E_t\,(D_i)$ is the expected future dividends at time (t), (r) is the discount rate and (t) is the time.

The DDM equation above points to how the share price is affected positively by future cash-flows of the firm (numerator), and negatively by the discount rate (denominator). Systematic risk sources that may affect the shares' price are channeled through either the future cash-flows of the firm or the discount rate. The MEV that have a systematic risk effect on the shares' price are discussed as below:

2.2.4.1. Interest Rates

The rate of interest represents the cost of capital for a firm. The lending rate represents the rate of interest a firm pays for accessing capital from the domestic commercial institutions. An increase in the cost of capital will result in a decrease in the price of a share reflected by the discount rate in the DDM (Gordon, 1959).

From the investor point of view, the cost of capital is the required rate of return that is demanded by the market (Gordon, 1959). Bonds represent a risk free rate of earning interest as an alternative for taking on risk, thus an increase in bond interest will affect negatively the price of shares (Anokye and Tweneboah, 2008).

2.2.4.2 Monetary Stock

Monetary stock refers to the stock of money and its liquid components as measured and captured by M3 defined. In the review of monetary policy theory, Sellin (2001) states the positive effect of monetary stock changes on the share price through the future earnings of companies. An increase in monetary stock signals an increase in economic activity which is interpreted as a sign by the companies in the economy to increase future production output levels. This anticipations from an increase in monetary stock results in expectations of higher future earnings and cash flows for companies by investors (Sellin, 2001).

2.2.4.3 Exchange Rate

From the classical economic theory, Dornbusch and Fischer (1980) point to a negative relationship existing between asset market performance and the exchange rate behavior. When the exchange rate appreciates using the direct quote perspective, it is expected that there will be a reduction in the competitiveness of exports which affects the balance of trade position. The reduction in the real output of the country has an effect of declining current and future cash-flows of its companies due to international competition and transaction losses which arise from settling of transactions in foreign currency terms (Muthike and Sakwa, 2012).

2.2.4.4 Inflation

The percentage change of the price level over a one-year period is what is referred to as inflation (Central Bank of Kenya, 2016). The link between shares' price and the level of inflation in the economy is alluded to by the Fisher's hypothesis in 1930. As stated by Fisher, a share represents a claim on the assets of a company and since the claims are against the future earnings of the company, shares' may serve as a hedge against inflation (Mutuku and Ng'eny, 2014).

(Fama and Schwert, 1977), point out an observation of a negative relationship existing in the long run between share price and the inflation rate in the economy. They argue that high inflation rate expectations in the economy will dampen the future real economic growth rate and the earnings of the companies. Expectation of higher inflation rate coincides with a similar anticipated increase in the interest rate. This anticipated change in the interest rate has a negative effect on the shares' price through the discount rate (Mbulawa, 2015).

2.3 Empirical Literature Review

This segment discusses the recent literature on MEV and securities performance and points out the data analysis approach adopted, findings and the conclusions of the research conducted.

In Asia, Hamdan (2014) studied the effect of interest rate on stock market prices in an effort to make a model to capture this relationship. Regression, correlation and descriptive analysis were run to find out the effect of interest rate on stock market prices in Pakistan. His findings were that interest rate had a statistical negative effect on the stock market. High interest rate lowered the efficiency of the stock market, mainly because investors were getting higher returns without taking any risk. Thus, for a better economy, he recommended the ruling state should lower interest rates so that the economy of Pakistan improves.

Tangjitprom (2012) reviewed a number of papers on the effect of MEV and stock prices. In the study, macroeconomic variables used differed across the studies reviewed and he further classified the MEV according to the categories reflecting the general economic conditions, interest rate and monetary policy, price level and international activities. Results from the various studies reviewed were found to be mixed and the conclusion was that MEV could be used to explain stock prices and also stock prices could be used to explain MEV.

Anokye and Tweneboah, (2008) studied the effect of MEV namely inward foreign direct investments, T- bill rate, inflation, crude oil prices, and the exchange rates on stock prices in Ghana. They used the Databank stock index as the dependent variable to represent the stock market and specified a VAR framework for estimation purpose. They concluded that values of lagged variables of interest rates and inflation had a negative influence on the stock index prices while the other variables included had a weak influence on price changes of the stock index.

Mbulawa, (2015) studied the impact of inflation rate on the stock prices in Zimbabwe. The period reviewed was from 1980 to 2008 using yearly data observations. The study employed VAR framework and VECM analysis. Conclusions from the study was that the stock prices in Zimbabwe provided a perfect hedge against inflation for investors holding long positions over the short and medium term periods.

In the Kenyan literature, Elly and Oriwo, (2013) studied the relationship of MEV and the NSE All share index prices for the period of 2008 to 2012. They further sought to determine whether movements in MEV could be used as a predictor of future NSE All Share Index using monthly data. The MFM was specified and they used regression method specifically autoregressive distributed lag method (ARDL) for estimation. Lending rates were excluded from the final regression model since tests showed high correlation with the 91 day T-bill. The conclusions of the study suggested that 91 day T-bill had a statistically negative effect on the NSE All share index while inflation had a weak positive relation.

Kirui, Wawire and Onono (2014) studied MEV, volatility and stock market returns at the NSE in Kenya. The MEV used included: exchange rate (KES/USD), 91 day T-bill, inflation (CPI), GDP, money supply (M2) and stock market (NSE 20) return were estimated by using the market model. The study used quarterly time series data from 2000 to 2012, Engle-Granger two step method was applied in testing the co-integrating relation existing in the MEV and NSE returns. TGARCH model was used to express the leverage results and volatility persisting at the NSE. The study reported a statistically negative influence of exchange rates on NSE returns and that other MEV were not sufficient in explaining NSE returns. The effect of changes in MEV on volatility of NSE returns showed that the effect of news was not uniform and that there existed leverage results. The study concluded that bad news about changes in MEV had a larger influence on volatility of NSE returns than good news of the same extent.

Mutuku and Ng'eny, (2014) studied the dynamic relationship of MEV on the NSE 20 index prices in Kenya using quarterly observations from 1997 to 2010. The study specified a VAR model framework and used VECM analysis for estimation. Variables for the study were (GDP), interest rate (91 day T-bill), inflation (CPI) and exchange rate (KES/USD).The findings were that inflation (CPI) had negative effect on equity shares' market and the shares' market was concluded not to be a perfect hedge against inflation, while GDP, exchange rate and the interest rate had positive influence on the performance of the NSE 20 index.

Ouma and Muriu, (2014) studied the impact of MEV on NSE 20 index returns in Kenya using monthly observations from 2003 to 2013. The study used OLS technique to test the variables impact on returns by specifying a multifactor model. The findings of the study were that significant impact existed in the variables of inflation (CPI), money supply (M2) and exchange rate (KES/USD). 91 day T-bill had no significant influence while exchange rate exhibited a negative relation to the returns of the NSE 20 share index in Kenya.

2.4 Overview of Literature

Tangjitprom, (2012) pointed out that despite studies on the relationship among share markets and various MEV having varying conclusions, majority of the studies agreed on the existence of sufficient relations among MEV and share movements. MEV are common but from the studies conducted, it is difficult to generalize the findings since similar MEV have varying impact in different exchanges. These varying findings and outcomes are due to different market characteristics, economic and non-economic factors and also different periods reviewed.

Majority of African countries are susceptible but adaptable to both internal and external shocks hence MEV are anticipated to influence African investment performance (Kirui, Wawire and Onono, 2014). In Africa, Kenya is one of the emerging economies and its share market performance is reliant on the character of the domestic MEV. These variables are considered to be causes of share performance volatility and may lead to share market crisis (Odhiambo, 2012).

The NSE has a total of 6 indices, namely NSE 20 index, NSE 25 index, FTSE NSE 15 index, FTSE NSE 25 index, FTSE NSE Govt. Bond index, and the NSE all share index (NASI) (Nairobi Securities Exchange, 2016). Review of the Kenyan literature shows that majority of the studies use primarily the NSE 20 share index and the NASI in trying to explain the effect of systematic risk factors on the shares' market performance. The FTSE indices series which are foreign targeted indices have not been documented in any of the reviews in the literature in Kenya. The gap that this study will seek to fill is on the effect of domestic MEV on the FTSE NSE 15 index performance.

For the remaining part of this research, we specified a model for the price of the FTSE NSE 15 index against the MEV discussed using the MFM. This study relied on the work of (Elly and Oriwo, 2013) who used the MFM to model for a share index price and in addition, the research methodology borrowed from the work of (Kirui, Wawire and Onono, 2014) and (Ouma and Muriu, 2014) in informing the variables selection and the estimation procedure.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter addresses the methodology to be used to achieve the objectives set out in chapter one. The first section is the research design while the second section addresses the conceptual framework adopted in the study. The last section presents the empirical framework, a summary of the variables considered and the estimation procedure for this study.

3.2 Research Design

Data used for this study was monthly published time series data. Monthly data for the interest rates and nominal exchange rate was obtained from CBK monthly publications, inflation data and monetary stock were sourced from KNBS leading indicators monthly publications, while the FTSE NSE 15 share index prices data was sourced from the FTSE Russel website database. The data span was from November 2011 to May 2016 since for this period, the complete dataset was available.

3.3 Conceptual Framework

From the literature reviewed, the methodology to be adopted by this study was based on the Multi-factor model (MFM). The MFM assumes that the asset performance are explained by movements in the macroeconomic risk factors through their effect on either the future cash-flows of the asset or the discount rate. This is simplified in the equation (3.1) below where:

$$SP = f(MS, INF, ER, IR) \qquad (3.1)$$

The equation (3.1) implies that the shares' index performance (SP), is a function of the monetary stock (MS), inflation (INF), exchange rate (ER) and the interest rates (IR).

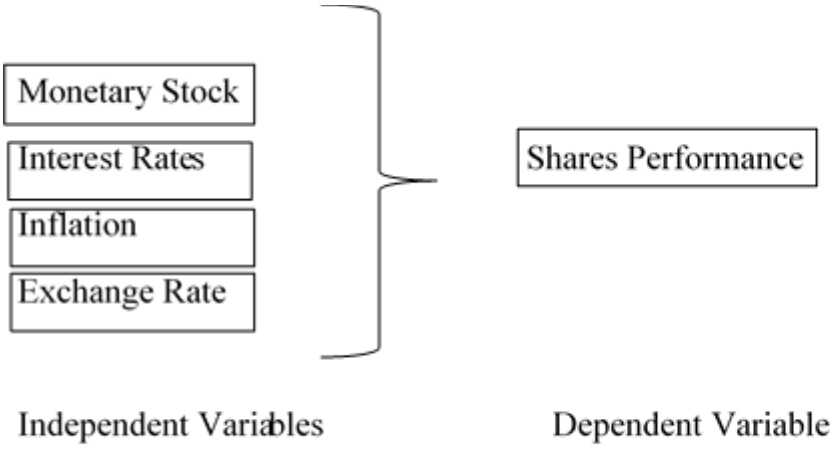


Figure 3.1 : Conceptual Framework

3.4 Empirical Framework

From equation (3.1) above, the shares' index performance (SP) was represented by the FTSE NSE 15 index where a linear relationship was established against the specified systematic risk factors. Since all the factors identified for the model specification are measured and reported in different magnitudes, the factors were transformed into their natural logarithm to harmonize for estimation purpose.

A log linear relationship for the equation model to be estimated was specified in a manner similar to the model used by (Kirui, Wawire and Onono, 2014) and (Ouma and Muriu, 2014) as follows:

$$\mathbf{SP_t = \beta_0 + \beta_1 Ln(MS) + \beta_2 Ln(INF) + \beta_3 Ln(ER) + \beta_4 Ln(TBR) + \beta_5 Ln(LR) + \varepsilon_t} \quad \mathbf{(3.2)}$$

Where: $SP_t = Ln \{(P_t - P_{t-1}) / P_{t-1}\}$.

(P_t) and (P_{t-1}) represents the current closing price and previous period closing price of the FTSE NSE 15 index respectively, while (Ln) is the natural logarithm, (β_i) are the coefficient estimates of respective factors in the model and (ε_t) is a random variable uncorrelated with the MEV and having zero mean. The factors are: monetary stock (MS), inflation (INF), exchange rate (ER), T- bill rate (TBR) and the lending rate (LR).

The factors identified in equation 3.2 above were proxied by indicators of the macroeconomic activity in Kenya for estimation. The monetary stock aggregate for this study was taken as M2 defined. M2 was most suitable as it reports all the liquid measures of money as opposed to M3 defined which captures less liquid measures of money.

A summary of the all the variables as indicated in the model equation 3.2 are as shown in the table below:

Table 3.4: Summary of Variables

Type	Factor Proxy	Description	Expected sign
Inflation	Consumer Price Index (CPI)	Is the persistent increase in general prices of goods and services.	Negative
Interest Rates	Lending rate (LR) 91 day T-bill (TBR)	Is the cost of capital or the required rate of return for capital.	Negative
Monetary aggregate	Monetary stock liquidity (M2)	Is the money demand liquidity measure.	Positive
Exchange Rate	Nominal exchange rate (ER)	KES per unit of USD.	Negative

Source: Author

3.4.1 Estimation Procedure

Ordinary Least Squares (OLS) method of regression analysis was used to estimate the empirical model in equation (3.2). Further, diagnostic tests of serial correlation, heteroskedasticity and normality of the residuals were estimated. Analysis of the time series variables of the model equation (3.2) was be done by carrying out the tests of unit root, co-integration and multicollinearity as follows:

3.4.1.1.1 Stationarity Test

The time series variables were examined for non-stationarity (unit root) using the Augmented Dickey Fuller (ADF) test. To determine the type of test under the ADF, scatter plots were used to describe the trend properties. The time series variable of this study that were found to be integrated were differenced according to their degree of integration to achieve stationarity (Zivot and Wang, 2002).

3.4.1.1.2 Co-integration Test

From the unit root tests of the time series variables, co-integrating relationship was examined by using the Johansen test. Since co-integration was not present, regression was done using the vector autoregressive method for the final regression model estimation (Engle and Granger, 1987).

3.4.1.1.3 Multicollinearity Test

The explanatory variables specified in equation (3.2) were examined for collinearity using the Variance inflation factor (VIF). Collinearity of the systematic risk factors specified in the model was resolved by excluding the highly correlated explanatory variables from the regression equation specified (Williams, 2015).

To achieve the objectives of the study, analysis was done on the signs and value of the estimated coefficients obtained in the data operations and the estimation procedures.

CHAPTER FOUR

EMPIRICAL RESULTS

4.1 Introduction

In this section, the empirical results of the estimation tests are presented. Further, the results are analyzed, interpreted and discussed to show their significance and conclusions are drawn on their importance to the study.

4.2 Estimation Procedure Results

This study employed the OLS regression analysis technique to achieve the objectives set out in chapter one. The results are discussed and presented as below.

4.2.1 Descriptive Statistics

A summary of the time series variables in the model equation (3.2) specified in chapter three is given in the table 4.2.1 below. The dependent variable was the FTSE NSE 15 index price while the explanatory variables were inflation (CPI), deflated monetary stock (M2), exchange rate (KES/USD), lending rate and the T-bill rate (91-day).

Table 4.2.1: Descriptive Statistics

Variables	Number	Mean	Standard Deviation	Minimum	Maximum
FTSE closing price	55	166.097	41.99654	84.11	230.97
Inflation level (CPI)	55	146.799	12.04308	129.91	167.99
Monetary stock (M2) deflated	55	11818.6	1339.171	9415.563	13647.48
Exchange rate	55	90.2598	6.689553	82.9708	105.3
Lending rate	55	17.5294	1.491232	15.26	20.34
91-day Treasury bill rate	55	10.558	3.469868	5.92	21.65

Source: Own computation

4.2.2 Multicollinearity Test Results

The problem of collinearity among the explanatory variables results in the coefficient estimates from OLS regression to be unreliable. To check for collinearity, the VIF test was employed on the log level values of the explanatory variables and the results are as shown below:

Table 4.2.2: Multicollinearity Test Results

Variable	VIF	1/VIF	Conclusion
INF	17.98	0.055603	Highly Correlated
ER	6.43	0.155480	Not Correlated
MS*	5.76	0.173541	Not correlated
LR	3.07	0.325572	Not correlated
TBR	1.96	0.510040	Not correlated
Mean VIF	7.04	-	-

Source: Own computation *deflated M2

From the results of the VIF test in table 4.2.2 above, a VIF value of closer to one is ideal to signify that correlation was not a problem. A VIF value of greater than 10 signifies high correlation. The time series variable of inflation was found to have a high correlation with the other explanatory variables and as a result, the inflation variable was dropped from this study.

4.2.3 Stationarity Results

In OLS regression method, the assumptions that are made for the time series variables are that they are stationary over time with a mean of zero and constant variance. The null hypothesis of a time series variable having a unit root (non-stationary) was checked on their level form as well as on their first differences in logarithmic terms by using the ADF test.

Scatter plots were used (see appendix) on the log level variables to determine the variable characteristic for the ADF test to be conducted. The results are in table 4.2.3 below:

Table 4.2.3: Unit Root Test Results

Variable	**Log Level Form**		**Log First Difference**		**Conclusion**
	t-stat	**c- stat (5%)**	**t-stat**	**c-stat (5%)**	
SP	-8.659	-2.927	-	-	SP is I(0)
MS	-2.494	-3.497	-5.584	-2.928	MS is I(1)
ER	-1.918	-3.497	-7.548	-2.928	ER is I(1)
LR	-0.060	-3.497	-9.088	-2.928	LR is I(1)
TBR	-2.710	-2.927	-6.888	-2.928	TBR is I(1)

Source: Own computation

In the ADF test, the t-stat was compared with the c-stat at 5% significance level. A t-stat value greater than c-stat value infers we reject the null hypothesis of the variable having a unit root. The results from table 4.2.3 indicate that the lending rate, 91 day T-bill rate, deflated monetary stock (M2) and the exchange rate variables are all integrated of order one while the dependent variable of shares' performance was integrated of order zero.

The first difference values of the explanatory variables were found to be stationary. By using the time series variables in their stationary form, the assumptions for OLS regression estimation are not violated.

4.2.4 Co-integration Results

Co-integrating relationship for the time series variables used in this study was checked by using the Johansen co-integration test. The results of the co-integration test are as shown in table 4.2.4 below:

Table 4.2.4: Johansen Test Results

Trend: Constant Number of observation = 53 Sample: 2011m12 - 2016m05 lags = 1					
		Trace Statistic Model		**Max Statistic Model**	
Maximum rank	Parms	**Trace statistic**	(5%) c-value	**Max statistic**	(5%) c-value
0	5	216.7909	68.52	82.1074	33.46
1	14	134.6835	47.21	53.1013	27.07
2	21	81.5822	29.68	37.3882	20.97
3	26	44.1940	15.41	23.3417	14.07
4	29	20.8523	3.76	20.8523	3.76
5	30				

Source: Own computation

The null hypothesis is that there was no co-integration while the alternative hypothesis is that there exists co-integration. The results from the trace statistics indicates no co-integrating relationship exists for all the co-integrating rank values given. The null hypothesis of no co-integrating relationship was further confirmed by the max statistic model values.

Since a co-integrating relationship does not exist, we proceed to estimate the vector autoregressive regression model for the specified model equation.

4.3 Diagnostic Tests

In order to check the adequacy of the model used to determine the relationship of shares' performance and the explanatory variables of exchange rate, lending rate, monetary stock (M2) and the 91 day T- bill rate, diagnostic tests were done on the residuals and are reported as they follow below:

4.3.1 Serial Correlation Test Results

The regression model results for serial correlation was checked by using the Durbin Watson test Statistic. A (D-W) statistic value close to 2 indicates no serial correlation, which was confirmed by checking against the significance levels offered in D-W tables for the lower and upper bound values. The results are as shown in table 4.3.1 below:

Table 4.3.1: Serial Correlation Results

D-W test statistic (5, 54) = 2.264233		
At 5% level of significance (Tables)	dL =1.378	dU =1.721
At 1% level of significance (Tables)	dL =1.206	dU =1.537
H_0: no serial correlation Conclusion: No serial correlation of the residuals		

Source: Own computation dL = lower bound dU = upper bound

In the table 4.3.1, the (D-W) statistic of 2.26 was greater than the lower and upper bound values at the 5% significance level. Thus, we cannot reject the null hypothesis of no serial correlation of the residuals which was desirable.

4.3.2 Heteroskedasticity Test Results

To check for heteroskedasticity, White test was used. White test was appropriate since it relaxes the assumptions of the residuals being normally distributed. The results are as shown in the table 4.3.2 below.

Table 4.3.2: Heteroskedasticity Results

White test for heteroskedasticity H_0: homoskedasticity Ha: heteroskedasticity			
Test	chi2	Df	Prob> chi2
Heteroskedasticity	10.65	14	0.7129
Conclusion: We cannot reject the null hypothesis of homoskedasticity			

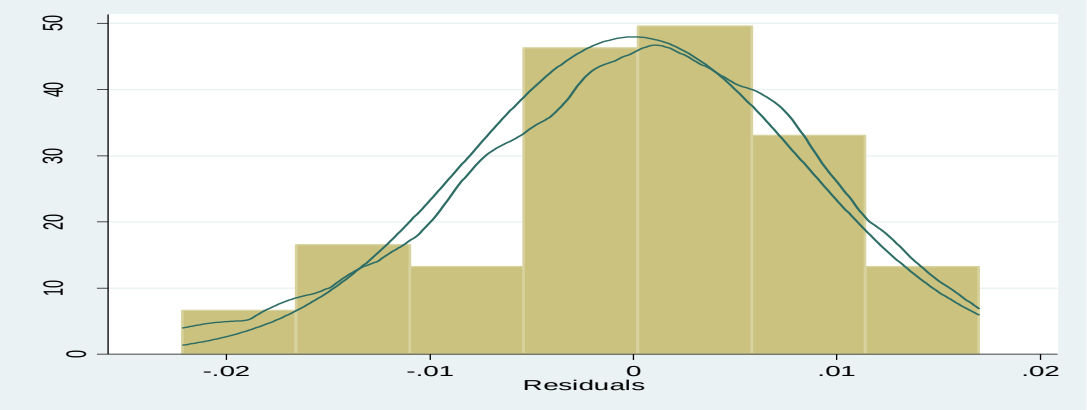
Source: Own computation

The results of heteroskedasticity test from table 4.3.2 indicate a p-value of 0.7129 and hence we cannot reject the null hypothesis of homoskedasticity at the 5% significance level which was appropriate for this study.

4.3.3 Normality Results

Normal distribution test of the residuals was checked to determine whether the residuals participate in the conclusions of the OLS regression by using the Shapiro Wilk test. A graphical distribution of the residuals is presented in the graph 1 below:

Graph 4.1: Distribution of Residuals



Source: Own computation

Table 4.3.3: Test for Normality

Shapiro Wilk test					
Variable	**Observations**	**W**	**V**	**z**	**Prob>z**
residuals	54	0.98405	0.797	-0.485	0.68622

Source: Own computation

From graph 1, the residuals seem to follow the normal distribution path. The results of the Shapiro Wilk test in the table 4.3.3 above confirm the results from graph 1. The p-value of 0.63 was found to be insignificant at the 5% level and thus, we cannot reject the null hypothesis of the residuals having a normal distribution.

4.4 Regression Results

To achieve the objectives of this study, regression was done on the values of shares' performance against the log differenced values of the explanatory variables of exchange rate (KES/USD), lending rate, T-bill rate (91-day) and the deflated monetary stock (M2). Co-integration test in section 4.2.4 conclude existence of no co-integrating relationship and thus a vector autoregressive model was estimated in the final regression results. The regression results are as indicated in the table 4.4.1 below:

Table 4.4.1: Regression Results

Dependent variable: Shares' Performance	**Observations= 53**
R^2 = 0.2360	**AIC = -26.05791**
p-value = 0.0059	**HQIC= -25.62903**
Sample: 2012M01 to 2016M05	**SBIC = -24.94265**
Lags=1/1	

Variables	Co-efficient	t- statistic	P-value	Conclusion at 5% significance value
Constant	0.0036192	3.14	0.002	Positive and significant
Exchange rate	-0.24797	-3.31	0.001	Negative and significant
Monetary stock M2	-0.138275	-0.45	0.652	Negative and insignificant
Lending rate	-0.1163536	-2.79	0.005	Negative and significant
91 day T-bill	-0.0090892	-1.48	0.138	Negative and insignificant

Source: Own computation

From the table 4.4.1, the R^2 value of 0.236 and a p-value of 0.0056 indicates that the overall regression model was significant. The regression result was that 24% of the variations in the shares' performance are explained by the explanatory variables of exchange rate (KES/USD), deflated monetary stock (M2), T-bill rate (91-day) and the lending rate.

4.5 Discussion of Results

The results from table 4.4.1 are analyzed and discussed in this section. Previous findings in the literature are also compared to the findings for this study.

The shares' performance variable was affected negatively by the first lag differenced value of exchange rate (KES/USD). The relationship was found to be negative and significant at the 5% level, and shows that a one percent increase in the exchange rate will result in a 0.248 percent decrease in the shares' performance. The results are consistent with the study by Kirui, Wawire and Onono, (2014), and Ouma and Muriu, (2014) and contradicts the findings of a positive significant relationship by Mutuku and Ngeny' (2014).

The first lag differenced variable of deflated monetary stock (M2) was found to have an insignificant negative relationship to the value of shares' performance at the 5% significance level. The hypothesized relationship for the monetary stock (M2) aggregate was a significant positive relationship to the shares performance. This positive but insignificant relationship of the monetary stock aggregate (M2) was also evidenced by Ouma and Muriu, (2014).

The first lag differenced variable of T-bill rate was found to have a negative insignificant relationship to the shares performance. The negative insignificant finding was also evidenced by the studies conducted by Kirui, Wawire and Onono, (2014) and Ouma and Muriu, (2014) who found no evidence of a significant relationship of the 91 day T-bill rate on the shares' performance in Kenya.

The first lag differenced variable of the lending rate was found to have a negative significant relationship to the value of shares' performance. The relationship was significant at the 5% significance level and indicates that a one percent increase in the lending rate results in a 0.116 percent decrease in the shares' performance. This finding was similar to the results by Hamdan, (2014) who found a significant negative relationship of the interest rate on stock performance in Pakistan.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND POLICY IMPLICATIONS

5.1 Introduction

This chapter presents a summary of the study and the policy recommendations based on the empirical results of the study. This chapter comprises of three sections namely, summary and conclusions of the study, policy implications and recommendations, and the areas for further research.

5.2 Summary and Conclusions

The main objective of this study was to determine the relationship between MEV and shares' performance (FTSE NSE 15 index) at the NSE. From the empirical results, there exists significant negative relationship between shares' performance and the MEV of exchange rate (KES/USD) and the lending rate. The MEV of inflation was found to be highly correlated with the other explanatory variables and was dropped from the final regression results. The MEV of the 91 day T-bill rate and the deflated monetary stock aggregate (M2) were found to have an insignificant relationship to the shares' performance over the period of the study.

The results indicate that the major capital and industry sectors in Kenya are affected significantly by the two MEV of exchange rate and the lending rate. The conclusion from the results are that the exchange rate behavior and the lending rate environment are important to the expectations that are formed by investors who participate in the Kenya capital markets and specifically the investors of large market capitalized shares.

5.3 Policy Implications and Recommendations

The policy implications that arise from this study are:

The government through the CBK should ensure and put in place appropriate policy measures that stabilize the exchange rate behavior in the economy. The finding of a significant negative relationship indicates that investors are sensitive to the domestic currency movements and a stable exchange rate environment would enhance investor confidence in investing at the NSE.

An implication of a significant negative relationship of the lending rate to shares' performance could be that investors at the NSE do not finance their investments using borrowed funds and thus choose to offload most of their shares' held to finance their alternative investments or expenditure during high lending rate periods. Policy measures by the government through the CBK should aim to ensure a stable lending rate environment that will foster capital access and generation in the Kenyan capital markets.

The NSE in their efforts to attract foreign investors to participate in the Kenyan capital markets should emphasize on the Kenyan government macroeconomic policy efforts that may lead to a stable macroeconomic environment. The stable macroeconomic conditions may be favourable and beneficial in enabling a suitable investment environment for thriving shares' performance and development of an efficient capital market.

5.4 Areas of Further Research

Further areas of research may be explored by identifying other MEV that may have a significance in affecting the shares' performance in Kenya. Some of the macroeconomic factors may include political un-certainty, terrorism effects, export earnings, regional shares' market indices, bank failures among other factors.

A study could also be done on the FTSE NSE 25 index to have a comparable study relating to the foreign targeted indices in Kenya, while also looking at different periods of study so as to incorporate other important MEV like GDP and current account balance which are not monthly reported phenomena.

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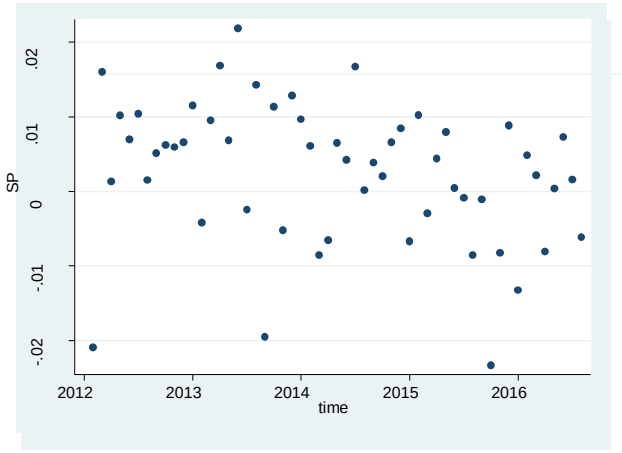
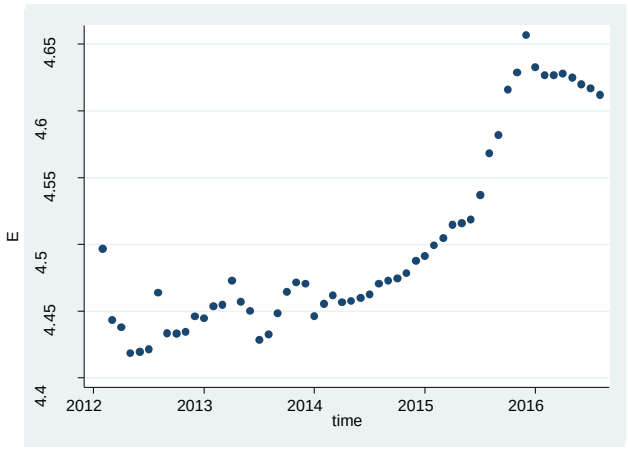
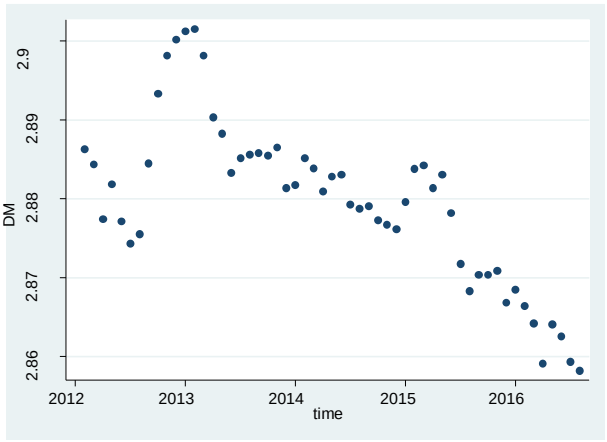
APPENDIX 1: Log Level Scatter Plots (2011m11 to 2016m05)



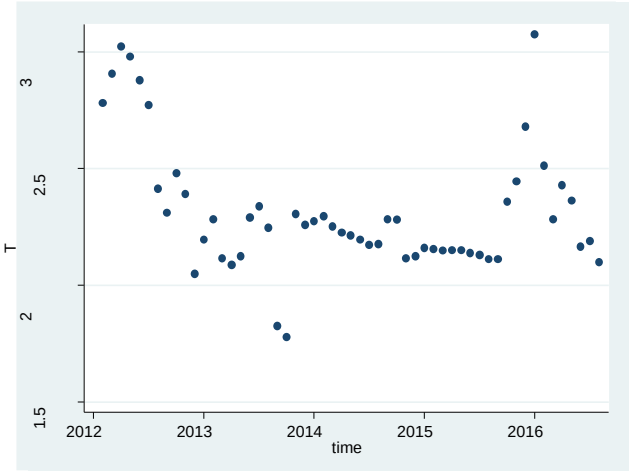
Scatter plot of shares' performance: no trend



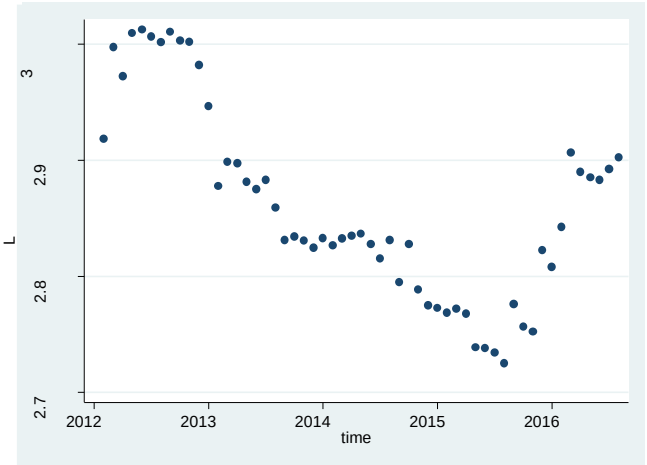
Scatter plot of exchange rate: trend



Scatter plot of deflated monetary stock (M2): trend



Scatter plot of 91 day T-bill: no trend



Scatter plot of lending rate: trend

```
. summarize p c e dfms l t
```

Variable	Obs	Mean	Std. Dev.	Min	Max
p	55	166.0971	41.99654	84.11	230.97
c	55	146.7993	12.04308	129.13	167.99
e	55	90.25985	6.689553	82.9708	105.3
dfms	55	11818.64	1339.171	9415.563	13647.48
l	55	17.52945	1.491232	15.26	20.34
t	55	10.558	3.469868	5.92	21.65

```
. vif
```

Variable	VIF	1/VIF
C	17.98	0.055603
E	6.43	0.155480
DM	5.76	0.173541
L	3.07	0.325572
T	1.96	0.510040
Mean VIF	7.04	

```
. dfuller SP, lags(0)

Dickey-Fuller test for unit root                   Number of obs   =        54

                                 ------------ Interpolated Dickey-Fuller ------------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic         Value             Value            Value
------------------------------------------------------------------------------
 Z(t)            -8.659           -3.574            -2.927           -2.598
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000
```

```
. dfuller M, trend lags(1)

Augmented Dickey-Fuller test for unit root         Number of obs   =        53

                                 ———— Interpolated Dickey-Fuller ————
               Test         1% Critical       5% Critical      10% Critical
             Statistic           Value             Value             Value
——————————————————————————————————————————————————————————————————————————
 Z(t)          -2.494           -4.143            -3.497            -3.178
——————————————————————————————————————————————————————————————————————————

MacKinnon approximate p-value for Z(t) = 0.3310

. dfuller E, trend lags(1)

Augmented Dickey-Fuller test for unit root         Number of obs   =        53

                                 ———— Interpolated Dickey-Fuller ————
               Test         1% Critical       5% Critical      10% Critical
             Statistic           Value             Value             Value
——————————————————————————————————————————————————————————————————————————
 Z(t)          -1.918           -4.143            -3.497            -3.178
——————————————————————————————————————————————————————————————————————————

MacKinnon approximate p-value for Z(t) = 0.6450


. dfuller L, trend lags(1)

Augmented Dickey-Fuller test for unit root         Number of obs   =        53

                                 ———— Interpolated Dickey-Fuller ————
               Test         1% Critical       5% Critical      10% Critical
             Statistic           Value             Value             Value
——————————————————————————————————————————————————————————————————————————
 Z(t)          -0.060           -4.143            -3.497            -3.178
——————————————————————————————————————————————————————————————————————————

MacKinnon approximate p-value for Z(t) = 0.9936

. dfuller T

Dickey-Fuller test for unit root                   Number of obs   =        54

                                 ———— Interpolated Dickey-Fuller ————
               Test         1% Critical       5% Critical      10% Critical
             Statistic           Value             Value             Value
——————————————————————————————————————————————————————————————————————————
 Z(t)          -2.710           -3.574            -2.927            -2.598
——————————————————————————————————————————————————————————————————————————

MacKinnon approximate p-value for Z(t) = 0.0724
```

```
. dwstat

Durbin-Watson d-statistic(  5,    54) =  2.264233

. swilk res

                    Shapiro-Wilk W test for normal data

    Variable |        Obs       W           V         z       Prob>z
-------------+-------------------------------------------------------
         res |         54    0.98405       0.797    -0.485    0.68622

. estat imtest, white

White's test for Ho: homoskedasticity
         against Ha: unrestricted heteroskedasticity

         chi2(14)     =     10.65
         Prob > chi2  =    0.7129

Cameron & Trivedi's decomposition of IM-test

---------------------------------------------------
              Source |       chi2     df      p
---------------------+-----------------------------
  Heteroskedasticity |      10.65     14    0.7129
            Skewness |       9.04      4    0.0600
            Kurtosis |       0.00      1    0.9466
---------------------+-----------------------------
               Total |      19.70     19    0.4126
---------------------------------------------------

. histogram res, kdensity normal
(bin=7, start=-.02218763, width=.0056002)
```

```
. varsoc SP, maxlag(12) exog(E M L T)
```

Selection-order criteria
Sample: 1961m2 - 1964m8 Number of obs = 43

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	143.801				.000092	-6.45586	-6.38034	-6.25107
1	146.559	5.5156	1	0.019	.000085	-6.53762	-6.447*	-6.29187*
2	146.592	.06633	1	0.797	.000089	-6.49265	-6.38692	-6.20595
3	147.477	1.7699	1	0.183	.00009	-6.4873	-6.36647	-6.15964
4	149.599	4.2432	1	0.039	.000085	-6.53947	-6.40353	-6.17085
5	150.101	1.0041	1	0.316	.000087	-6.51631	-6.36527	-6.10673
6	150.103	.00477	1	0.945	.000092	-6.46991	-6.30376	-6.01937
7	152.167	4.1283	1	0.042	.000088	-6.5194	-6.33815	-6.0279
8	154.104	3.8735*	1	0.049	.000084*	-6.56297*	-6.36662	-6.03052
9	154.553	.89784	1	0.343	.000087	-6.53734	-6.32588	-5.96393
10	155.304	1.503	1	0.220	.000088	-6.52578	-6.29922	-5.91141
11	156.139	1.6693	1	0.196	.00009	-6.51809	-6.27643	-5.86276
12	157.51	2.7421	1	0.098	.000089	-6.53535	-6.27858	-5.83906

Endogenous: SP
Exogenous: E M L T _cons

```
. vecrank SP D.E D.M D.L D.T, trend(constant) lags(1) max
```

Johansen tests for cointegration
Trend: constant Number of obs = 53
Sample: 1960m4 - 1964m8 Lags = 1

maximum rank	parms	LL	eigenvalue	trace statistic	5% critical value
0	5	612.13913	.	216.7909	68.52
1	14	653.19282	0.78758	134.6835	47.21
2	21	679.74349	0.63282	81.5822	29.68
3	26	698.43759	0.50611	44.1940	15.41
4	29	710.10842	0.35623	20.8523	3.76
5	30	720.53459	0.32527		

maximum rank	parms	LL	eigenvalue	max statistic	5% critical value
0	5	612.13913	.	82.1074	33.46
1	14	653.19282	0.78758	53.1013	27.07
2	21	679.74349	0.63282	37.3882	20.97
3	26	698.43759	0.50611	23.3417	14.07
4	29	710.10842	0.35623	20.8523	3.76
5	30	720.53459	0.32527		

```
. var SP d.E d.M d.L d.T, lags(1/1)

Vector autoregression

Sample:  1960m4 - 1964m8                        Number of obs     =        53
Log likelihood =   720.5346                     AIC               =  -26.05791
FPE            =   3.33e-18                     HQIC              =  -25.62903
Det(Sigma_ml)  =   1.07e-18                     SBIC              =  -24.94265

Equation          Parms      RMSE     R-sq      chi2     P>chi2
------------------------------------------------------------------
SP                    6     .008117   0.2360   16.37345   0.0059
D_E                   6      .01394   0.0779   4.475347   0.4832
D_M                   6       .0035   0.1344   8.228582   0.1441
D_L                   6     .023882   0.1169   7.012623   0.2197
D_T                   6     .168177   0.1890   12.35288   0.0303
------------------------------------------------------------------

------------------------------------------------------------------------------
             |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
SP           |
          SP |
         L1. |  -.1623688   .1286228    -1.26   0.207    -.4144648    .0897271
             |
           E |
        LD.  |  -.2479776   .0749836    -3.31   0.001    -.3949428   -.1010124
             |
           M |
        LD.  |  -.1382725   .3070225    -0.45   0.652    -.7400256    .4634807
             |
           L |
        LD.  |  -.1163536   .0417717    -2.79   0.005    -.1982246   -.0344826
             |
           T |
        LD.  |  -.0090892   .0061247    -1.48   0.138    -.0210935    .0029151
             |
       _cons |   .0036192   .0011512     3.14   0.002     .001363    .0058754
```