THE EFFECT OF SELECTED MACROECONOMIC VARIABLES ON STOCK MARKET RETURNS OF THE MALAWI STOCK EXCHANGE

STEVE MAKATCHAYA

D63/64680/2013

A RESEARCH PROJECT SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR MASTER OF SCIENCE DEGREE IN FINANCE OF THE UNIVERSITY OF NAIROBI

OCTOBER 2014

DECLARATION

This research project is my own work and has not been presented for a degree in any other University. Any other author's work has been clearly acknowledged.

Signed…… Date……

Steve Makatchaya

D63/64680/2013

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

Signed…….. Date……

Mr. Herick O. Ondigo
Lecturer
Department of Finance and Accounting
University of Nairobi

ACKNOWLEDGEMENTS

I am most grateful to Mr. Herick Ondigo and Mr. Cyrus Iraya for their guidance and helpful comments at various stages of this paper. Their guidance was like a lighthouse giving me direction and enabled me to sail through the challenging waters of writing this project.

My appreciation also goes to the Department of Finance and Accounting of the University of Nairobi for dedicated and supportive lecturers, as well as to the Human Resources Department of the Malawi Government and my employers, Reserve Bank of Malawi, for the full scholarship which made it possible for me to pursue the Master of Science degree in Finance.

I would also like to express my sincere appreciation to all my classmates and colleagues for their words of encouragement as we worked through the course.

Lastly and most important, my heartfelt gratitude to God, and God bless you all.

DEDICATION

This project is dedicated to my family members for their love and sacrifice. Their support has catapulted me to this achievement in my life.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

APT – Arbitrage Pricing Theory

ARCH – Autoregressive conditionally heteroscedastic model

CAPM – Capital Asset Pricing Model

CLRM – Classical Linear Regression Models

CRSP – Centre for Research in Security Prices

EMH – Efficient Market Hypothesis

GARCH- Generalised autoregressive conditionally heteroscedastic model

GDP – Gross Domestic Product

JSE – Johannesburg Stock Exchange (JSE)

MSE – Malawi Stock Exchange

NSE – Nairobi Stock Exchange

OLS – Ordinary Least Squares

PV – Present Value

SP – Share Price

US – United States of America

WACC – Weighted Average Cost of Capital

ABSTRACT

Financial theories posit that stock prices are influenced by a number of macroeconomic variables such as interest rates and exchange rates. For instance, economic theory postulates that stock prices and interest rates are inversely related and that fluctuations in exchange rates cause movements in stock market returns. These theories are based on the view that stock prices represent the present value of discounted future cash flows and therefore any events affecting a firm's cash flows should be reflected in the firm's stock price. The objective of the study was to investigate the effect of selected macroeconomic variables on the market returns of the Malawi Stock Exchange. After noting the inadequacy of the Ordinary Least Squares (OLS) regression framework, a GARCH (1, 1) model was employed in analysing the data. GARCH models usually work well in instances where data is characterised by 'volatility clustering'. Weekly data for the variables was used. Findings from the study confirmed that the macroeconomic variables of interest rates and exchange rates have an impact on the market returns of the MSE. Interest rates and exchange rates affected both the market mean returns as well as the volatility of such returns on the MSE. In line with these findings, some of the policy recommendations were that policy makers should seek to implement policies that do not adversely affect investors and other economic agents. Strategies should be put in place to achieve desired fiscal and monetary objectives without unduly influencing stock prices on the MSE. The study also found that the high average interest rates are indicative of high budget deficits which have a crowding out effect on the private sector. The fiscal and monetary authorities should aim at implementing effective debt management strategies aimed at lowering interest rates, controlling inflation and stimulating private sector investment and Malawi's economic growth.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Brigham (2010) notes that in a market based financial system, investors establish stock prices by buying and selling shares. This process enables management to receive feedback about its performance thus the stock price is effectively used to grade management. However, such a system is dependent on a free flow of accurate information. Such information, amongst many others, includes fluctuations in interest rates and exchange rates.

A stock exchange also plays other important roles like providing a ready market for sale and purchase of securities. In this role, the exchange provides assurance to investors that their security can be converted to cash whenever they want. However, valuation of shares on a stock exchange is in itself not an easy task. In as much as the stock exchange provides a price discovery mechanism, sound investment decisions are based on a number of factors. Finance literature generally postulates that there are at least three factors that drive stock prices and these factors are economic, market and firm specific factors. Madura (2008) argues that the economic factors include the impact of economic growth rates of an economy, interest rates and exchange rates.

1.1.1 Macroeconomic Variables

The time value of money is one of the most important concepts in finance. Put simply, the value of an investment should reflect the present value of its future streams of income

or cash flows. The rate of interest can be defined as the opportunity cost of money. Howells (2008) defines an interest rate as a payment from borrowers to lenders which compensates the lenders for parting with funds for a period of time and at some risk. However, in any economy there can be various interest rates at any one time which serve different purposes; for example an interest rate on savings to compensate savers, a different rate on mortgages to reward financial institutions for lending out funds and even various rates on government securities such as long term bonds and Treasury bills.

In valuations of financial securities, the risk free interest rate (usually proxied by the Treasury bill rate) is one of the components used in discounting future cash flows to the present. Madura (2008) observes that one of the most prominent economic forces driving stock market prices (which are one type of financial securities) is the risk-free interest rate. Investors, when given a choice of risk-free Treasury securities or stocks, only purchase stocks if they are appropriately priced to reflect a premium over the risk free rate. He further observed that although the relationship between interest rates and stock prices is not constant over time, most of the largest declines in stock prices occurred when interest rates increased substantially.

The exchange rate is one other important piece of information which investors use in valuing investments as it represents the purchasing power of currencies across countries. Mishkin (2004) defines an exchange rate as the price of one currency in terms of another currency. He further explains that there two kinds of exchange rate transactions; spot transactions which involve the immediate (two-day) exchange of bank deposits and

forward transactions which involve the exchange of bank deposits at some specified date in future. Spot exchange rates are the rates of exchange used in the spot transactions while forward exchange rates are used for the forward transactions. Spot transactions are the predominant ones and therefore any references to exchange rates in this paper will refer to spot exchange rates.

Mishkin (2004) observes that foreign exchange rates are very volatile due to the role of expectations. Expectations affect the expected return on deposits, expectations about the price level, inflation, trade barriers, productivity, import demand, export demand and the money supply. Since expectations on all these variables change with just about every bit of news that appears, he concludes that it is not therefore surprising that exchange rates are volatile.

1.1.2 Stock Market Returns

Fischer and Jordan (1995) explain that return is the motivating force and principal reward in the process of investing and it is the key method available to investors in comparing alternative investments. Investors primarily invest in the stock market to make a return either in form of dividends or capital gains. Capital gains are a result of the appreciation of the share price from the time an investor bought them.

Investors usually use a stock index to judge the overall performance of companies listed on a stock exchange. A good stock index should be able to capture the fluctuations of well diversified and highly liquid stocks. Sha and Thomas (2000) explain that index

movements should therefore reflect the changing expectations of the stock market about future dividends of the corporate sector. A stock index being a barometer of the overall exchange should ideally include the stocks of companies that have a significant market capitalization such that any major change in the index is reflected in the index (Cowles Commission, 1939).

1.1.3 Effect of Macroeconomic Variables on Stock Market Returns

Interest rates affect stock prices through either the monetary policy transmission mechanism or the valuation approach. Mishkin (2004) discusses the view that interest rates are the transmission mechanism through which monetary policy affects stock prices. When the supply of money increases through an expansive monetary policy, participants in an economy find that they have more money to spend. The stock market is one place they can spend their money, increasing the demand for stocks and thus increasing the prices of stocks. On the other hand, when money supply declines thus increasing interest rates, investors find that they have less money to spend. The stock market is one place where they can spend less money, decreasing demand for stocks and thus lowering the price of stocks.

The valuation approach is based on the view that stock prices reflect the present value of future streams of income. When interest rates rise, they increase the cost of capital making future cash flows less valuable thus depressing stock prices. Conversely, when interest rates fall the cost of capital is reduced thus increasing the present value of future cash flows thus translating into higher stock prices.

The impact of exchange rates on stock market performance depends on the nature of the companies listed on the market and the structure of the economy. Depreciation of currency is expected to be good news to exporters as earnings are translated into more units of the domestic currency while at the same time it is bad news for importers as it increases the cost of goods and services. Malawi being an import dependent economy, it is expected that a depreciation of the currency will have a negative impact on the economy through inducing inflation and thus depressing stock prices while an appreciation should have the effect of dampening inflation and improving economic prospects thus leading to a rise in share prices.

1.1.4 Malawi Stock Exchange

The Malawi Stock Exchange (MSE), a member of the African Securities Exchange Association (ASEAN), was inaugurated in March 1995 and opened for business for the first time on 11 November 1996 when the first company, the National Insurance Company, was listed.

As of 30 June 2014, the MSE had 14 listed companies from different industries including banking, telecommunications and manufacturing. Most of the companies listed on the Exchange did so through an Initial Public Offering (IPO) of shares to the public.The MSE is mainly dominated by financial institutions with four banks. One of the manufacturing companies, Packaging Industries Limited, was delisted after the owners decided to take it private in 2011.

Investors have made considerable gains on the MSE over the years. The MASI (Malawi Stock Exchange Index) has grown from an initial value of 100 in November 1996 to 13,042 as at 30 June 2013 reflecting the considerable gains investors have made over the years. In fact according to an Africa Strictly Business.com reporter (2013), the MSE was the best performing stock exchange in Africa with a return of 71.0 percent in US dollar terms as at 30 November 2013.

1.2 Research Problem

Financial theories posit that stock prices are related to various macroeconomic variables such as interest rates and exchange rates. The dividend valuation model postulates that stock prices and interest rates are inversely related. A rise in interest rates reduces the present value of future dividends which should depress stock prices and conversely a fall in interest rates improves the present value of future dividends resulting into increased stock prices *ceteris paribus*. The 'flow through model' on the interaction between stock prices and exchange rates hypothesises that movements in exchange rates cause fluctuations in stock prices. Clearly, both the dividend discount model and the flow through model are based on the macroeconomic view that stock prices merely represent the present value of discounted future cash flows and therefore any events that affect a firm's cash flow will be reflected in the firm's stock price if the market is efficient.

Globally, numerous scholars have drawn mixed conclusions from empirical studies of the effects of the macroeconomic variables of interest rates and exchange rates on stock market performance. Adjasi and Biekpe (2006) examined the relationship between

interest rates and stock market returns for seven African countries and noted that there are long run relationships between these variables. Ajayi (1998) after examining the relationship between exchange rates and stock prices among developed and developing countries concluded that the patterns of causality between stock prices and exchange rates were mixed due to the structural differences between the currency and stock markets of developed and developing countries. Markets in developed economies are deep and integrated while stock prices in developing markets tend to display weaker macroeconomic linkages.

Madura (2008) observes that although the efficient market hypothesis states that stock prices are informationally efficient, stock markets in developing markets may be inefficient because of the relatively small number of analysts and portfolio managers who monitor these markets. He notes that some of these markets are relatively new and small and may not be as efficient as stock markets in developed markets. Thus stocks may be undervalued, a possibility that attracts foreign investors to such markets.

The Malawi Stock Exchange is relatively new, small and only opened to equity trading as recently as 1996. Darrat and Dickens (1999) argue that interest rates lead stock returns. Interest rates and foreign exchange rates may therefore serve as effective signals of future prospects for companies on the Malawi Stock Exchange as investors generally construct portfolios in line with expected economic conditions; selling off shares before an economy goes into a recession or buying shares before an economy goes into a boom.

This study is therefore designed to examine the effect of interest rates and exchange rate on the market returns of the Malawi Stock Exchange.

1.3 Objectives of the Study

The general objective of this research was to determine the effect of selected macroeconomic variables on market returns of the Malawi Stock Exchange.

1.3.1 Specific Objectives of the Study

The specific objectives of the study were;

i. To investigate the effect of interest rates on the market returns of the Malawi Stock Exchange;
ii. To investigate the effect of exchange rates on the market returns of the Malawi Stock Exchange

1.4 Value of the Study

This study will provide vital information to investors interested in the Malawi Stock Exchange. While financial theories generally posit that stock prices are inversely related to interest rates and that exchange rate changes can increase or depress stock prices, some empirical studies conclude that there is a disconnect between stock prices and the macroeconomic variables of interest rates and exchange rates. This study will therefore shed more light to investors on the effect of interest rates and exchange rates in the specific context of the Malawi Stock Exchange. Investors will then be better informed when making decisions.

Portfolio managers generally earn money through construction of investment portfolios which aim at an extracting the highest potential investment reward but with minimum risk. This study will therefore aid them in their risk mitigation strategies as it will provide them with better information on the impact of exchange rates and interest rates on stock prices. The portfolio managers can utilize this information in developing appropriate performance benchmarks and constructing portfolios which earn optimal returns while at the same time reducing risk.

Policy makers within the Malawi Government and the Reserve Bank of Malawi can use the findings of the study to better align fiscal and monetary policies. The findings from this study will highlight how asset prices in the Malawi economy respond to both the fiscal and monetary policies. This will help officials in crafting policies and appropriate responses that sustain economic development while at the same time attracting foreign investment and deepening the financial services industry in Malawi.

This study shall also provide information to members of academia and potential scholars on the effect of Treasury bill rates and exchange rates on the performance of the Malawi Stock Exchange. The study will also identify and provide areas for further study by future scholars on existing knowledge gaps in the knowledge of the Malawi financial services industry.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter will attempt to provide an overview of general theories linking the performance of a stock exchange to interest rates and exchange rates, outline several determinants of stock market returns and discuss some empirical studies made in the area of stock exchange performance, exchange rates and interest rates.

2.2 Review of Theories

This sub topic will look into general theories relating the performance of the stock exchange to mainly the macroeconomic factors of exchange rates and interest rates. The review will therefore concentrate on explaining such relationships although such theories may also discuss other financial issues in more detail.

2.2.1 Flow Oriented Models

Flow oriented models were developed by Dornbush and Fisher (1980). These models postulate that fluctuations in exchange rates cause movements in share prices. The theory is based on the economic view that since stock prices represent the discounted present value of a firm's expected future cash flows, it should follow that any changes (including foreign exchange rates) that affect a firm's cash flow will be reflected in that firm's share price if the market is efficient as suggested by the Efficient Market Hypothesis. One of the earliest studies of how exchange rates affected stock prices was according to whether a firm was a multinational or domestic in nature (Frank and Young, 1972). Changes in

the value of the exchange rate alter the value of the multinational's foreign operations, showing up a profit or loss on its books which would affect the share price.

2.2.2 Portfolio Balance Models

Portfolio balance models or "stock oriented" models developed by Branson (1977) unpack an opposite view to flow models, that is, movements in stock prices cause changes in exchange rates via capital account transactions. Portfolio balance models postulate a negative relationship between stock markets and exchange rates and that causation runs from stock markets to exchange rates. Investors actions in buying or selling domestic securities in foreign currency (either by foreign investors or domestic residents moving funds from offshore into domestic equities) in response to domestic price movements (either increase or decrease) cause fluctuations in exchange rates in the currency markets.

Eiteman, Stonehill & Moffett (2004) explain that the extent to which stock oriented models actually explain real world stock and currency market reactions is also dependent upon issues such as stock market liquidity and segmentation. As an example, illiquid markets make it difficult and less likely/ or less timely for investors to buy and sell stock, while segmented markets entail imperfections, such as government constraints on investment, high transactions costs and large foreign currency risks, each of which may hinder or discourage foreign investment .

2.2.3 Dividend Discount Model

The theoretical underpinnings of the dividend discount model were developed by Williams (1938). The model explains that if the holding period of a stock is indefinite, the value of that stock simply becomes the present value of an infinite stream of dividends as represented by Williams (1938) original formulae below:

$$V_0 = \sum_{t=1}^{\infty} \frac{D_t}{(1+r)^t} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.. (2.1)$$

Where

V_0= fundamental value

$D_{t\,=}$ dividend at time t

r = required return on equity (discount rate)

Although the model is theoretically correct, it is not easy to apply in practice as it requires an accurate forecast of dividends for many periods, a task which requires a lot of information which may not be available. For this reason, Gordon and Shapiro (1962) refined the model by adding the assumption that dividends increase at a constant rate indefinitely. Ioannis and Kontonikas (2006) adapted the model and showed that if we assume a constant discount rate, the model would be:

$$P_t = E_t \sum_{j=1}^{k} \left(\frac{1}{1+R}\right)^j D_{t+j} + E_t \left(\frac{1}{1+R}\right)^k P_{t+k} \;\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2.2)$$

Where:

D_t represents dividends at time t,

P_t is the stock price which is basically the present value of future dividends

E_t is the conditional expectations operator which is based on information available to market participants at time t

R is the discount rate used to value future dividends, it is an average of rates over time and it changes with the term structure spread, as well as changes in the level of rate.

k is the investor's time horizon (stock holding period)

As the horizon k increases, the second term on the right hand side of the equation (1) reduces to zero, i.e. no rational stock price bubbles:

$$\text{Lim}_{k\to\infty} E_t \left[\frac{1}{1+R}\right]^k P_{t+k} = 0 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (2.3)$$

So we end up with the equation below

$$P_t = E_t \left[\frac{1}{1+R}\right]^j D_{t+j} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (2.4)$$

The equation shows that any variables that affect the discount rate and future cash flow will affect stock price. The discount rate being an average of rates over time changes with both the level of its component rates and the structure spreads across different maturities. Unexpected changes in the discount rate will lead to changes in stock price (Chen, Roll and Ross, 1986).

2.2.4 Capital Asset Pricing Model

This model was developed in the 1960s by Treynor, Sharpe and Lintner. One of the major highlights of the model is the link between the risk free rate and the rate of return on common stocks. The risk free rate is represented by the Treasury bill rate and investors demand a risk premium for investing in stocks. The CAPM Equation is written as

$$E(R_j) = R_f + \beta_j (E(R_m)-R_f) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (2.5)$$

Where

$E(R_j)$ = Expected rate of return of asset j

R_f = Risk free rate – usually the prevailing Treasury bill rate

$E(R_m)$ = Expected rate of return on the market portfolio

β_j = Beta of the asset j – undiversifiable risk of security j

Brearly (2002) observes that the CAPM is a further development of an article written by Markowitz (1952) that drew attention to the practice of portfolio diversification and showed exactly how an investor can reduce the standard deviation of portfolio returns by choosing stocks that do not move exactly together.

2.2.5 Arbitrage Pricing Theory

This theory developed by Ross (1976) is one of the models that relate changes in the share price to underlying macroeconomic factors. It relates the factor risk of an investment to its expected return. It is termed arbitrage pricing theory because it is based

on the principle of no arbitrage. It requires less restrictive assumptions about investor behavior than the CAPM, is more amenable to empirical tests, and in many cases can be applied more easily than CAPM. Brearly (2002) observes that although Ross himself did not identify the macroeconomic factors involved Elton, Gruber &Mei (1994) identified five principal factors that could affect either the cash flows themselves or the rate at which they are discounted. The factors are;

Factor	***Measured by***
Yield spread	Return on long government bonds less on 30-day Treasury bills
Interest rates	Change in Treasury bill return
Exchange rate	Change in value of the dollar relative to a basket of currencies
Real GNP	Change in forecasts of real GNP
Inflation	Change in forecasts of inflation

Elton, Gruber and Mei (1994) also included a sixth factor to capture any remaining pervasive influences on stock markets, the portion of which could not be explained by the first five factors.

2.2.6 Efficient Market Hypothesis

Fama (1970) summarizes the idea of an efficient market as a "market in which prices 'fully reflect' available information." In other words, financial market prices are quite close to their fundamental values and hence do not offer investors high expected returns without exposing them to high risks.

There are three forms of the Efficient Market Hypothesis (EMH). The *weak form* EMH asserts that prices reflect fully the information contained in historical price movements. The *semi strong form* asserts that prices fully reflect all publicly available information. The strong form EMH asserts that prices reflect all information including inside information. Wild and Subramanyam (2009) observe that there has been considerable research on EMH and early evidence strongly supported both weak and semi strong form EMH to the extent that efficiency of capital markets became a generally accepted hypothesis. However, they contend that this hypothesis lacks generality. A number of stock price anomalies have been uncovered suggesting investors can earn excess returns using simple trading strategies. Nevertheless, they conclude that as a first approximation, current share price is a reasonable estimate of a company's value.

Wild and Subramanyam (2009) further contend that market efficiency depends not only on availability of information but also on its correct interpretation. That is, even if all information available at a given point in time is incorporated in price, this price does not necessary reflect value. A security can be under – or overvalued, depending on the extent of an incorrect interpretation or faulty evaluation of available information by the aggregate market. Hence securities markets for larger companies are more efficient (informed) because of the greater following by analysts due to potential rewards from information search and analysis compared to following smaller, less prominent companies.

2.2.7 Crowding Out Effect Theory

Schiller (2006) explains that the crowding out effect is an economic theory advanced mainly to explain an increase in interest rates due to rising government expenditure. Monetarists argue that there are only two ways for the government to pay for this increased expenditure (G). The government must either raise additional taxes or borrow more money. If the government increases taxes, the disposal income of consumers will be reduced and private spending will fall. If the government borrows more money to pay for its expenditures, there will be less money available for loans to private consumers and investors. Friedman (1969) champions the monetarist view with the argument that the state of the government budget has a considerable effect on interest rates. If the government runs a large deficit, it means the government has to borrow in the market, which raises the demand for loanable funds and so tends to raise interest rates. On the other hand, if the government budget shifts to a surplus, that adds to the supply of loanable funds, and so tends to lower interest rates.

From this theory, it may be concluded that investors use a rise or fall in Treasury bill rates as a signal of the soundness of the economic environment. Higher nominal Treasury bill rates may be indicative of an unstable economic environment with higher inflationary expectations while lower nominal Treasury bill rates may be a sign of improved economic conditions with lower inflation. Since investors incorporate a risk free rate in their valuation of securities, a rise in Treasury bill rates should result in a lower valuation of stocks while a fall in interest rates should lead to a rise in the value of common stocks.

2.3 Determinants of Stock Market Returns

Apiyeva (2007) notes that many studies have been conducted to discover the determinants of stock market returns in emerging markets as there are underlying differences between developed and emerging markets. From an analysis of determinants of stock market returns, three main groups of determinants emerge; economic factors (e.g. interest or exchange rates) and risk factors (e.g. total risk, downside betas) while Madura (2008) adds market and firm specific factors.

2.3.1 Economic Factors

Chen, Roll& Ross (1986) after analyzing a number of macroeconomic factors concluded that the variables that had a significant effect in explaining stock returns were industrial production, changes in the risk premium (the difference between risk free rate and return on equities in a diversified portfolio), twists in the yield curve of interest rates and measures of unanticipated inflation. Later, Elton, Gruber & Mei(1994) using the APT model identified five principal factors that could influence stock returns as the yield spread, interest rates, exchange rates, changes in Real Gross National Product (GNP) and inflation. Madura (2008) confirms this view and elaborates that economic factors include economic growth, interest rates, inflation and exchange rates.

2.3.2 Market and Firm Specific Factors

Apart from economic factors, Madura (2008) adds market and firm specific factors to the determinants of stock market returns. Market related factors include investor sentiment, which represents the general mood of investors in the stock market. He explains that

since stock valuations reflect expectations, in some periods the stock market performance is not highly correlated with economic conditions. For instance, even though the economy may be weak, stock prices may rise if most investors believe the economy will improve in the near future.

Madura (2008) also discusses that some firms are more exposed to their own industry conditions than the general economic environment such that investors use announcements from such firms as signals of their future economic prospects. Such signals may include dividend announcements and earnings surprises. An increase in dividends may signal that a firm can more easily pay dividends and therefore it has sufficient cash flow. When a firm's announced earnings are higher some investors raise their estimates of the firm's future cash flow and therefore revalue the stock upward.

2.3.3 Risk Factors

Brooks (2008) defines sovereign credit ratings as an assessment of the riskiness of debt issued by government. These ratings embody an estimate of the probability that the borrower will default on her obligation. Gendreau and Heckman (2003) posit that sovereign spreads over the yield of similar US Treasuries are usually used by investors in developing markets as indicators of country-specific risk. They tested hypothetical portfolios of emerging equities from 21 countries and found that wide spreads indicate relatively strong future returns in the sample countries and that narrower spreads indicated weak future returns. They argue that foreign spreads incorporate the risk of

external debt default and therefore consequences of such a default which may include a currency crisis, flight of capital and political upheaval.

Kaminsky and Schmukler (1992) observe that sovereign risk ratings have a direct impact on emerging financial markets, including equity prices and argue that "stock markets can be adversely affected by the downgrading of sovereign bonds because governments may raise taxes on firms (reducing firms' future stream of profits) to neutralise the adverse budget effect of higher interest rates on government bonds triggered by the downgrade. These cross-asset effects can be large".

Erb et al (1995) found that country ratings account for 30 percent of the cross-sectional variation in average equity returns when a six month lag was allowed for to take into account the full effect of the rating on equity prices.

2.4 Review of Empirical Studies

Aggarwal (1981) examined the relationship between exchange rates and stock prices in US by studying monthly data for the period 1974 to 1978. He observed that the trade weighted exchange rate and US stock market indices were positively correlated. Aggarwal therefore concluded that the two variables interacted in a manner consistent with the flow model. Fluctuations in exchange rates could directly affect the stock prices of multinational firms by influencing the value of overseas operations.

Chen, Roll & Ross (1986) after analyzing a number of macroeconomic factors noted that the variables that had a significant effect in explaining stock returns were industrial production, changes in the risk premium (the difference between risk free rate and return on equities in a diversified portfolio, twists in the yield curve of interest rates and less strongly measures of unanticipated inflation. They concluded that the negative risk premiums indicated that stocks whose returns are inversely related to increases in long term rates over short term rates are valued more by investors. When long term real rates decrease, there is a lower return on any form of capital. Investors who want protection against this possibility will place a relatively higher value on assets whose prices increase when long term rates decline and such assets will carry a negative risk premium.

Ajayi (1998) examined the relationship between exchange rates and stock prices among developing and developed markets in Hong Kong, Singapore, Thailand and Malaysia. He used Granger-Sim causality to examine the relationship between movements in the stock price indices and movements in exchange rates. The findings confirmed the consistency in the relationship between stock market prices and exchange rates among developed economies, which were in accordance with the portfolio model in which stock prices movements cause fluctuations in exchange rates. However, the patterns of causality among the emerging Asian economies were mixed. He found no significant causal relationships between exchange rates and stock prices in Hong Kong, Thailand and Malaysia while in Singapore he found that stock price changes led to fluctuations in exchange rates. Ajayi (1998) attributed the differences in findings between developed and developing markets to structural differences between the currency and stock markets of

each. Markets are likely to be integrated and deep in developed economies while markets in developing economies tend to be smaller, more concentrated and less accessible to foreign investors. Stock prices in developing markets therefore tend to display weak macroeconomic relationships and have weaker linkages to currency markets.

Gupta, Chevalier & Sayekt (1999), using an ARIMA approach described by Markridakis (1982) examined the causality relationship between interest rates and exchange rates on the stock prices of Jakarta Stock Exchange from 1993 to 1997. They found that there was no strong causal relationship between stock price and interest rate or exchange rate. The conclusion was that generally the exchange rate and stock price series seemed quite independent of each other.

Adjasi and Biekpe (2006) examined the relationship between interest rates and stock market returns for seven African countries. Cointegration tests indicated a long-run relationship between interest rates and stock prices for Kenya and South Africa. The short-run dynamic Vector Error Correction Model Granger causality revealed a unidirectional causality from stock returns to interest rate in Kenya and bi- directional causality in South Africa. Responses to shocks from impulse response functions revealed long lasting effects in Egypt, Ghana, Nigeria and Tunisia and were short-lived in Mauritius.

Kofi and Kwabena (2006), using the Johansen cointegrating technique, examined the relationship between exchange rates and stock prices on the Ghana Stock Exchange from November 1990 to August 2009. The tests indicated that there is a long-run relationship between stock prices and exchange rates in Ghana. However, the empirical findings based on the Granger causality test showed that there is no Granger causality between these two variables. Thus the notion that fluctuation in foreign exchange rates lead to changes in the stock market index and vice versa was not confirmed for Ghana for the period under study.

Mutoko (2006), using GARCH, also studied the relationship between Treasury bill rates and stock prices using weekly data for the period 5 April 1996 to 21 Dec 2001 in Kenya. She found that during times of restrictive monetary policy or rising interest rates, the stock market performed poorly. Conversely, periods of loose monetary policy generally coincided with strong stock market performance.

Mangani (2008) using an augmented GARCH(1,1) model examined the effects of the discount rate and gold prices on two JSE stock portfolios, the JSE All Share index (denoted ALSI) and an equally weighted portfolio of selected JSE stocks (denoted PORT). PORT was constructed from an indiscriminate sample of forty two individual stocks with standing history of long trading. The results showed that both the discount rate and the gold price impacted on mean returns and that the effects of both the discount rate and the price of gold on mean returns were consistent with theory: contractionary monetary policy could lower stock returns.

Richards and Simpson (2009) examined the interaction between exchange rates and stock markets in Australia for the period 2 January 2003 to 30 June 2006 using daily observations of Australian stock prices and the Australian-US dollar exchange rate. The study found that past evidence of causality running from exchange rate to the stock price was not supported. However, the study found that a uni-directional causal relationship exists between the variables, with stock prices changes found to Granger- cause changes in the Australian dollar exchange rate during the sample period. These results therefore demonstrated a more consistent relationship with the portfolio balance approach.

Laopodis (2013) examined the dynamic linkages between monetary policy and the stock market during the three distinct monetary regimes of Burns, Volcker and Greenspan since the 1970s. He found that that there was a disconnection between Federal Reserve actions (via the federal funds rate) and responses by the stock market in the 1990s. He also noted that the impact of inflation on the stock market was not significant in the later parts of 1980s and the 1990s. Further, he also observed that significant asymmetric effects of monetary policy on the stock markets were observed throughout each monetary regime but these were more pronounced during bear markets than bull markets. He concluded therefore that there was no consistent dynamic relationship between monetary policy and the stock market and that the nature of such dynamics was different in each of the three monetary regimes.

Eita (2014) analysed the causal relationship between stock market returns and interest rates in Namibia. He used the cointegrated vector autoregression methodology and monthly data covering the period 1996-2012. The results revealed that there is a negative relationship between interest rate and stock market returns in Namibia suggesting that a tight monetary policy through increase in interest rate reduces stock market returns. The causality test showed that there is a bi-directional causality between stock market returns and interest rates in Namibia.

Chirchir (2014),using the Tada and Yamamoto methodology, studied the relationship between share prices on the NSE and interest rates for the ten year period from October 2002 to September 2012 in Kenya. He found an insignificant negative causal relationship between interest rates and stock prices. When interest rates rise, share prices decline as would be expected from theory.

Although not related specifically to stock prices, a study was conducted in Malawi on the exchange rate pass through to consumer prices using the Augmented Phillips Curve and Vector Autoregressive Approaches (Jombo, Simwaka and Chiumia, 2014). It was found that there is a pass through effect ranging from 0.15 to 0.20 elasticities suggesting a modest influence of exchange rate movements on domestic prices and that the effect of an exchange rate shock is fairly gradual taking about 4 quarters to reach full impact. It can therefore be assumed based on this study that the exchange rate pass through may also have an effect on stock prices in Malawi although this is yet to be documented.

2.4 Summary of Literature Review

On the basis of theoretical literature and empirical studies, there have been different kinds of conclusions drawn on the reaction of stock market prices to various economic variables such as interest rates and exchange rates. Many studies done in advanced economies generally support the portfolio model of the causal relationship between stock prices and the economic factors of interest rates and exchange rates with the stock market causing the changes in interest rates and exchange rates although this is not always the case as concluded, for example, by Laopodis (2013) who stated that was no consistent dynamic relationship between monetary policy and the stock market and that the nature of such dynamics was different in the three monetary regimes in US since the 1970s.

Adjasi and Biepke (2006) while confirming that stock prices and interest rates are inversely related in Kenya conclude that the causality runs from stock prices to interest rates in Kenya in contrast to Chirchir (2014) and Mutoko (2006) who concluded that causality runs from interest rates to stock prices. Kofi et al (2006) while acknowledging that there is a long term relationship between exchange rates and stock prices in Ghana concludes that changes in exchange rates do not necessarily Granger cause movements in stock prices.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents research methodology and design of the study. A research design is the framework or plan for a study used to collect and analyze data (Churchill & Iacobucci, 2005).

3.2 Research Design

The study adopted a case study research design in collection and recording of secondary data so as to facilitate the analysis. Yin (1981) defines a case study "as an empirical enquiry that investigates a contemporary phenomenon within its real-life context, when the boundaries between phenomenon and context are not clearly evident and in which multiple sources of evidence are used". The data collected consists of the MSE index, Treasury bill rates and exchange rates.

3.3 Data Collection

The study made use of secondary data. Secondary data can be defined as data collected by others, not specifically for the research question at hand. Data on the MASI was collected from the Malawi Stock Exchange. The weekly exchange rates and Treasury bill rates were obtained from the Reserve Bank of Malawi which is Malawi's Central Bank. The data covered the period from January 2002 to June 2014. The period of twelve years was chosen as weekly financial data was available for the period and could be representative of the performance of the exchange over the years.

3.4 Data Analysis

The data was organized systematically organised using Microsoft Excel before it was utilized in the Eviews 8.1 Econometrics Software.

3.4.1 Analytical Model

This study made use of a GARCH model which was developed independently by Bollerslev (1986) and Taylor (1986). GARCH allows conditional variance to be dependent upon its own lags. GARCH models are thought to be more parsimonious and that they avoid over fitting. One advantage of GARCH over CLRM (Classical Linear Regression Models) is that they model around heteroscedacity (non constant variance of the error terms) while CLRM models regard this as a problem to be treated. Brooks (2008) explains that if the errors are heteroscedastic, but assumed homoscedastic (constant variance of error terms), any inferences made from the model would be wrong as the standard error estimates may not correct.

Brooks (2008) further explains that another important feature of financial asset returns that motivates the use of GARCH models is 'volatility clustering' or 'volatility pooling'. Volatility clustering describes the tendency of large changes in asset prices (whether positive or negative) to follow large changes and small changes (whether positive or negative) to follow small changes. Putting it in another way, the current level of volatility tends to be positively correlated with its level during the immediately preceding periods. Brooks (2008) observes that volatility, as measured by the standard deviation or variance of returns, is often used as a crude measure of the total risk of a financial asset and that

arguably it is one of the most important concepts in the whole of finance. Volatility clustering therefore makes financial data more amenable to analysis using nonlinear models such as ARCH (autoregressive conditionally heteroscedastic) or GARCH (Generalised autoregressive conditionally heteroscedastic). However, since ARCH models have a number of limitations such as difficulties in coming up with the value of *q* (the number of lags to be used in the model) resulting in a large conditional variance model that may not be parsimonious, GARCH models which overcome this problem are used.

The general formulation of a GARCH (p, q) model is given below;

$$R_t = \alpha + \mu_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3.1)$$

$$\mu_t = \Omega_{t-1} \sim N(0, h_t) \ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3.2)$$

$$h_t = \varphi + \sum_{i=1}^{q} \lambda_i \mu^2_{t-i} + \sum_{j=1}^{P} \theta_j h_{t-j} \ldots\ldots\ldots\ldots\ldots\ldots \quad (3.3)$$

Where:

R_t represents uncorrelated returns on the stock market at time t

μ_t is the error term which is normally distributed with a conditionally heteroscedastic variance (h_t) but conditional on the information set $\Omega_{t-1.}$

α_i, φj, λ_i, θ_j are coefficients to be estimated (i, j = 0, 1, 2)

3.4.2 Operationalization of the Variables

The study used the Malawi All Share Index (MASI), interest rates (91 days T-bill rate) and nominal exchange rates. The MASI was the one used to calculate stock returns. The exchange rate was expressed in terms of number of Malawi Kwacha per one US dollar.

In order to test how the macroeconomic variables of interest rates and exchange rates affect stock returns, the variables were incorporated into the GARCH model outlined above. The variables were also tested for stationarity, using a unit root test. A stationary series can be defined as one with a *constant mean*, *constant variance* and *constant autocovariances* for each given lag (Brooks, 2008). Gujarati (2004) observes that a characteristic of most financial series that show volatility such as stock prices and exchange rates is that in their *level form* they are random walks; that is, they are non stationary. However, in the first differences form, they are generally stationary.

The model used is therefore stated in the following equations below;

$$R_t = \alpha_0 + \alpha_1 DIR_t + \alpha_2 DXR_t + \mu_t \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (3.4)$$

$$\mu_t = \Omega_{t-1} \sim N(0, h_t) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3.5)$$

$$h_t = \varphi_0 + \lambda_1 \mu^2_{t-1} + \theta_1 h_{t-1} + \varphi_1 DIR_t + \varphi 2 DXR_t \quad \ldots\ldots\ldots\ldots \quad (3.6)$$

Note: The variables are incorporated into the model in their stationary form

Where:

R_t was be calculated as: $\ln P_t - \ln P_{t-1}$

P_t is the weekly closing price (MASI)

DIR_t is the differenced interest rate

DXR_t is the log of the exchange rate.

α_i, φ_j, λ_1 and θ_1 are the intercepts and coefficients used to interpret results for all i and j = 0, 1, 2.

Where i stands for explanatory variables in the mean equation (equation 3.4) and j represents the explanatory variables in the variance equation (equation 3.6). Third and fourth symbols denote the ARCH and GARCH terms respectively.

Equation 3.5 shows that the error term (μ_t) is calculated based on past information thought relevant (Ω_{t-1}). This information is represented by the conditional variance (volatility) term (h_t) in the equation.

h_t is called heteroscedastic conditional variance because variance (volatility) is dependent upon its own lags (h_{t-1}) and the squared value of the error term in the previous period (μ^2_{t-1}) and that the variance of errors is not constant but changes with time as shown in equation 3.6. Thus h_t reveals that errors are correlated from one period to another. In other words the errors are 'autocorrelated.' This autocorrelation of the error terms therefore makes the GARCH (1, 1) model suitable as most financial market returns display 'volatility clustering.' Volatility clustering occurs when volatility appears in bunches where large returns (whether positive or negative) are expected to follow large returns, and small returns (whether positive or negative) to follow small returns.

As already highlighted above, heteroscedasticity makes Ordinary Least Squares (OLS) regression unsuitable for analysis of data which displays 'volatility clustering.' OLS regressions assume that errors are not correlated from one period to another and therefore violation of this requirement may result in wrong inferences being made from such regressions.

The investigation will therefore test the following hypotheses:

H_0 = Interest rates and exchange rates had no impact whatsoever on stock market returns (i.e.$\alpha_1 = \varphi_j = 0$ for i, j =1, 2)

H_1=Not H_0

H_2= Interest rates and/or exchange rates impacted on both mean returns and return volatilities (i.e.$\alpha_1 \neq 0$, and /or $\varphi_j \neq 0$, for at least one i, j = 1, 2);

H_3 = Interest rates and/or exchange rates only impacted on mean returns only (i.e. $\varphi_j = 0$ for both j =1, 2, but $\alpha_1 \neq 0$ for at least i = 1, 2);

H_4= Interest rates and/or exchange rate only impacted on return volatilities (i.e.$\alpha_1 = 0$ for both i = 1, 2 but at least one $\varphi_j \neq 0$ for some j = 1, 2).

3.4.5 Test of Significance

The model was evaluated at a 10 percent level of significance.

CHAPTER FOUR

DATA ANALYSIS, RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents exploratory tests done on the data to check whether the model is adequate, estimates the GARCH (1, 1) model and discusses the findings of the study. The study sought to determine the effect of interest rates and exchange rates on the market returns of the Malawi Stock Exchange. Secondary data was collected from the Malawi Stock Exchange and the Reserve Bank of Malawi. The data was used in modeling the relationship between the independent variables (in this case, exchange rates and interest rates) and the dependent variable (the MASI).

4.2 Descriptive Statistics

Table 4.1 gives summary statistics of the variables of the study highlighting the mean, minimum, maximum, standard deviation, skewness, kurtosis, Jarque – Bera statistics.

Table 4.1 Descriptive Statistics

	3 months annualized Treasury bills Rates	**IR**	**EXR**	**MASI**
Mean	20.56271	0.394353	167.5547	0.518561
Maximum	46.46000	0.891014	434.9571	33.95211
Minimum	4.920000	0.094356	67.77890	-59.97293
Std. Dev.	12.05292	0.231152	92.19460	3.845795
Skewness	0.594251	0.594251	1.682575	-4.634117
Kurtosis	2.199850	2.199850	4.604461	107.5633
Jarque-Bera	55.68154	55.68154	376.9976	298900.8
Probability	0.000000*	0.000000*	0.000000*	0.000000*

Note: * = significance at 5 percent level

Source: Research Findings

Skewness measures the extent to which a distribution is not symmetric about its mean value and kurtosis measures how fat or thin the tails of the distribution are. A normal distribution is not skewed and is defined to have a kurtosis of 3 and is said to be mesokurtic. Excess kurtosis is equal to the coefficient of kurtosis minus 3. A normal distribution therefore has a coefficient of excess kurtosis of zero. A leptokurtic distribution is one which has fatter tails and is more peaked at the mean than a normally distributed random variable with the same mean and variance.

Brooks (2008) intimates that the Jarque-Bera (JB) statistic is one of the most commonly applied tests for normality. The Jarque- Bera statistic has a χ^2 distribution with 2 degrees of freedom under the null hypothesis of normally distributed errors. If a distribution is normal, the Jarque- Bera Statistic would not be significant. This means that the probability of the JB statistic should be bigger than 0.05 to not reject the null of normality at the 5 percent level.

The positive maximum and negative minimum on the MASI shows that investors can make both profits and losses on the MSE. The table also reveals that stock market returns were negatively skewed and not normally distributed in the period of study. The Treasury bill yields have been given on both an annualized and weekly basis. The conversion of the annualized yields to weekly basis was necessary since the GARCH model was estimated on a weekly basis to be in line with the other variables. The standard deviation of 12.05 percent on an annualized basis shows that the yields on treasury bills were highly volatile and the mean of 20.56 percent shows that interest rates have been very high in Malawi. Even more volatile have been exchange rates with a standard deviation

of 92.19 percent during the period of study. The high JB statistics and the probability of 0 to six decimal places imply that all the variables are not normally distributed.

4.3 Diagnostic Tests

Diagnostic tests were carried out to find how the data fits the model and in a way to establish credibility for the results that follow.

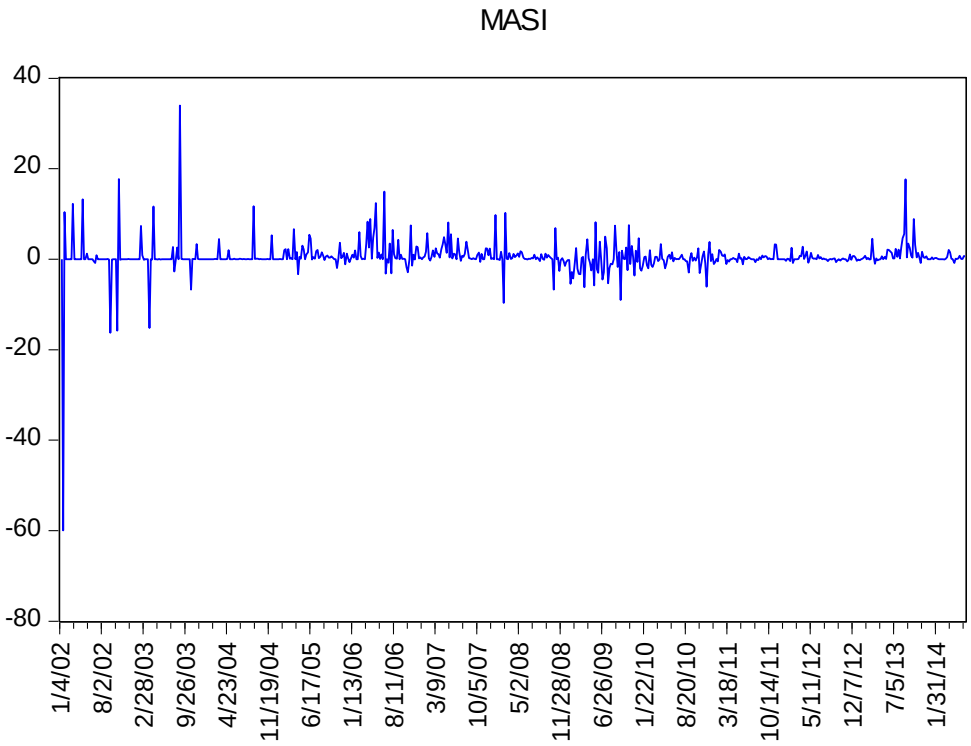
4.3.1 Unit Root Testing

Unit root testing was carried out using the Augmented Dicker Fuller Tests (ADF) on the variables to find out if they were stationary. Brooks (2008) observes that an examination of whether a series is stationary or not is important for several reasons. One reason is that stationarity or non stationarity of a series can strongly influence its behaviour or properties. For a stationary series, "shocks" to the system will eventually die away with the passage of time in that a shock at time *t* will have smaller and smaller effects in subsequent periods such as *t+1*, *t+2* and so on. In a non stationary series, the persistence of shocks is infinite as they do not die with time. Brooks (2008) also states that non stationary data may lead to spurious regressions which seem to give a good fit and predict significant relationships among the variables where no relationships really exist. These regressions are meaningless and cannot be relied upon for any inferences.

Unit root tests revealed that the stock market returns (MASI) were stationary in levels (original form) while the variables of interest rates and exchange rates were non

stationary in levels but became stationary after differencing them once as shown in figures 4.1 to 4.3 below.

Figure 4.1 Graph of the MASI

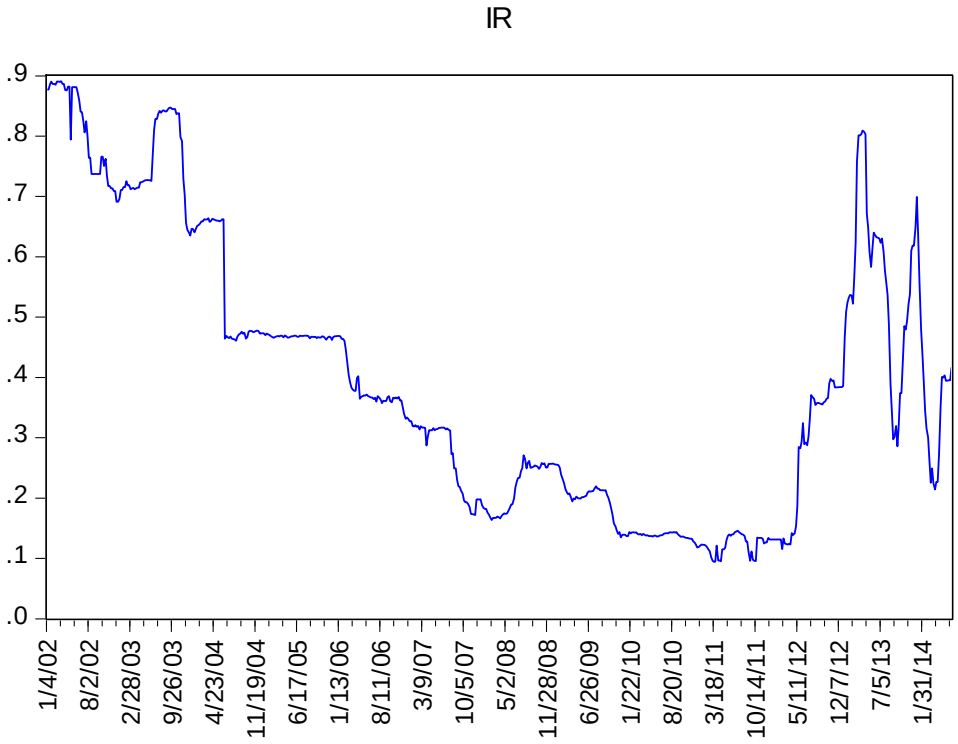


Source: Research Findings

The graph of the MASI above shows that it was stationary in levels, as apart from a few large returns which deviated from a mean of around 0 (zero), there is no discernible upward or downward trend in the series. It can therefore be said that the returns are reverting to the mean of zero. Volatility clustering is also clearly being displayed in the graph. The period January 2002 to September 2003 was characterised by both large negative and positive swings in the returns which later died down through October 2003 to November 2006. The volatility persisted again albeit on a medium scale for the period

December 2006 to March 2011. After that there was a long period of low volatility until May to August 2013 when there was a remarkable burst in volatility before reverting again to the mean of zero.

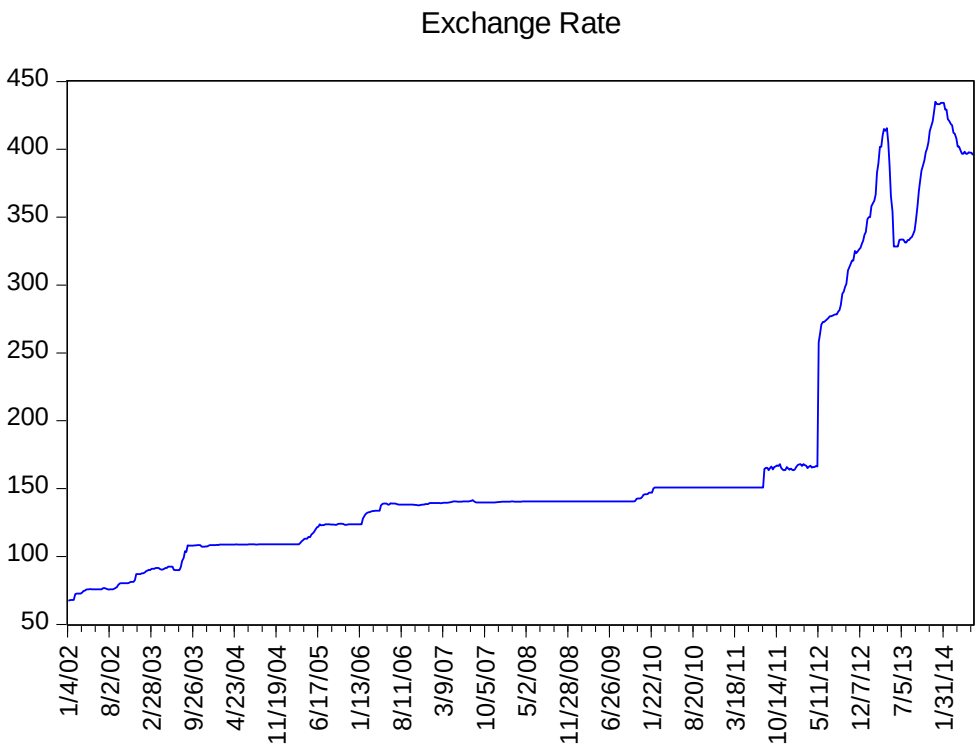
Figure 4.2 Graph of weekly interest rates



Source: Research Findings

The graph of the weekly interest rates shows that IR is not stationary. The graph has a stochastic trend as it has both a downward and an upward trend. For a long period interest rates have been falling; there is a notable downward trend from January 2002 to May 2012. After that, the pattern is clearly random but with an upward trend.

Figure 4.3 Graph of weekly Exchange Rates



Source: Research Findings

The graph of the exchange rates shows that interest rates were not stationary. The graph has a deterministic trend which is trending upwards. The Malawi Kwacha has been depreciating steadily from a value of about MWK80 per 1 USD in January 2002 to around MWK170 per 1 USD before a devaluation which brought the currency to a middle rate of about Mwk250/ 1 USD by May 2012. Ever since that time, the value of the Kwacha has been random at one time depreciating to as much as MWK450 per 1 US dollar.

Results of the ADF tests for each series before and after differencing are given in Table 4.2 below. Only the MASI returns were stationary in levels as the computed value was

bigger (disregarding the negative sign) than the absolute critical value at 1 percent significance level. Exchange rates and interest rates only became stationary at first differences as the computed values in absolute levels (disregarding the negative signs) became bigger than the critical values in absolute levels at 1 percent level of significance.

Table 4.2: Results of the ADF Tests

Variable	**In Levels**		**First Differences**	
	Computed Value	**Critical value at 1% significance level**	**Computed Value**	**Critical value at 1% significance level**
MASI	-27.64571	-3.440181	N/A	N/A
IR	-2.384217	-3.440197	-13.00831	-3.440197
EXR	0.416355	-3.440197	-13.09970	-3.440197

Source: Research Findings

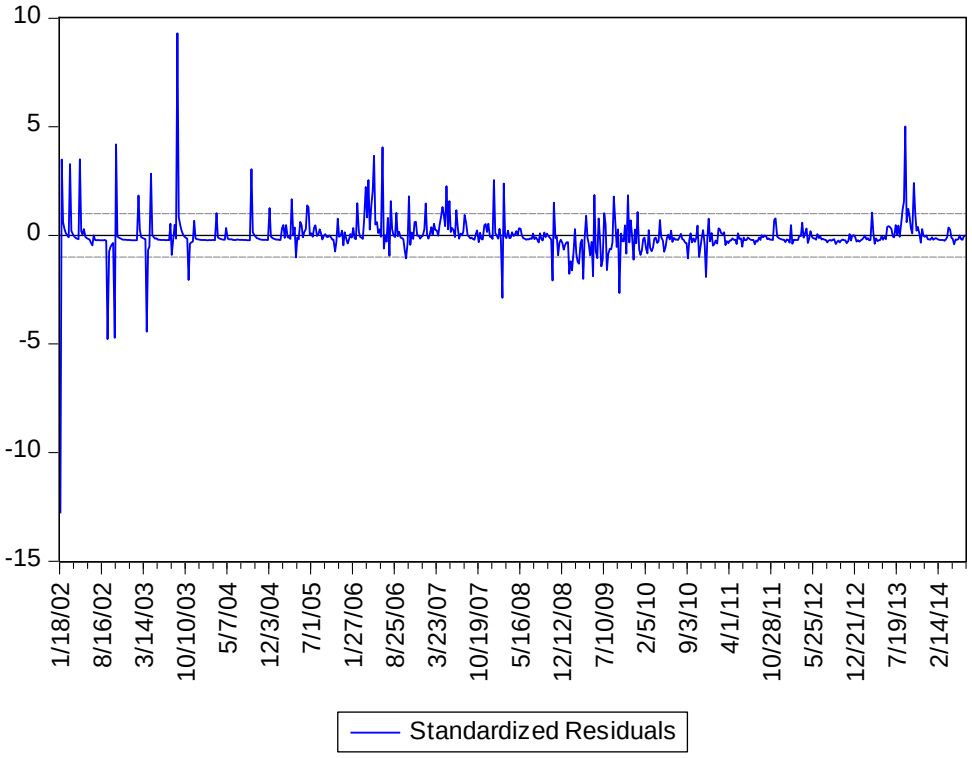
4.3.2 OLS Estimation

Brooks (2008) recommends that before estimating a GARCH-type model, it is important to compute the Engle (1982) test for ARCH effects to ensure that this class of models is appropriate for the data. ARCH effects occur when the variance of the errors changes over time and is known as heteroscedasticity as opposed to systematic change with the

explanatory variables (homoscedasticity). Moreover, the variance of the errors is such that they are also conditionally dependent on their own lags. As explained earlier, GARCH models were designed to work with heteroscedasticity while OLS regressions treat heteroscedasticity as a problem to be corrected therefore performing an OLS regression in the presence of autoregressive conditional heteroscedasticity would not yield meaningful results.

An OLS regression (based on Equation 3.4) was performed and a test for the presence of ARCH performed. Below is a graphical presentation of the squared residuals of the returns in Figure 4.2 and a histogram of the residual returns in Figure 4.5.

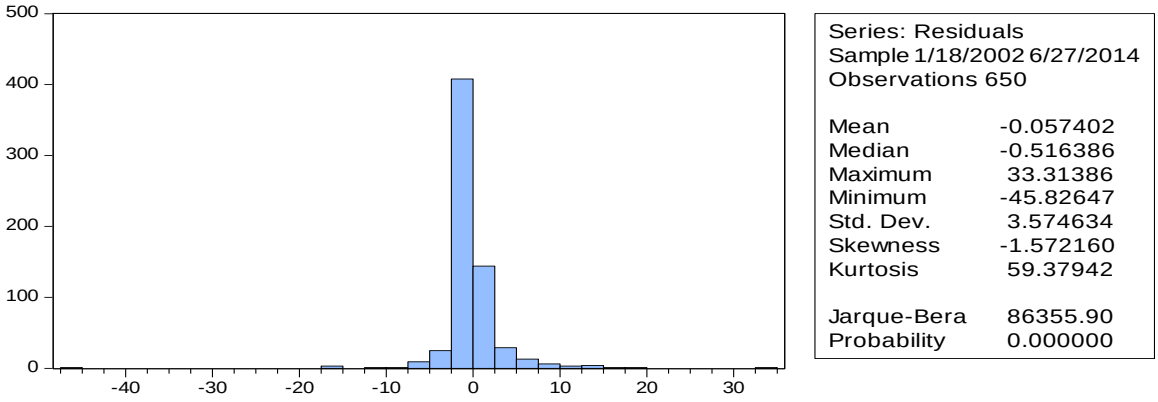
Figure 4.4 Graph of Standardized Residual Returns



Source: Research Findings

The pattern of the graph of standardised residual returns suggests that there is some level of volatility in market returns of the MSE where 'volatility clustering' is being displayed in which periods of low volatility are followed by low volatility and periods of high volatility (swings) are followed by high volatility.

Figure 4.5 Histogram of Residuals



Source: Research Findings

The histogram of MSE return residuals and the statistics are also indicative of non normal distribution. The residuals are negatively skewed and have a large kurtosis of 59.38 suggesting that an OLS regression would be inappropriate for the data as one of the assumptions of the OLS is that the error terms or residuals should be normally distributed.

The results of the Engle (1982) test for ARCH effects also confirmed the presence of heteroscedasticity in market return residuals as can be seen in Appendix II. Both the F-version and the LM-statistic are very significant at less than 5% suggesting the presence of ARCH in the MASI market returns.

The residuals were also tested for serial correlation. Serial correlation occurs when errors from one period are correlated with errors from a previous period. Serial correlation in the returns may result in wrong inferences being drawn from the regression results and it is a requirement for GARCH models that returns must not be serially correlated. It was confirmed that there was no serial autocorrelation in the market return residuals as shown by the correlogram of MASI returns and the results of the Breusch Godfrey Test in appendix IIIa and IIIb.

4.4 Model Estimation

After confirming the presence of ARCH in the market returns and the inadequacy of OLS regression in the preceding paragraphs, a GARCH (1, 1) model was used in estimating the variables. The model was estimated using the maximum likelihood (ML) technique, employing the Marquardt algorithm within the Eviews 8.1 package to improve the convergence rate of the iterative processes. Brooks (2008) explains that maximum likelihood method works by finding the most likely values of the parameters given the actual data. Specifically, a log-likelihood function is formed and the values of the parameters that maximize it are sought.

Brooks (2008) observes that in general the GARCH(1,1) is sufficient to capture the volatility clustering in the data and rarely is any higher order model estimated or even advocated in academic finance literature although there can be so many extensions of the GARCH model. The model has been evaluated at 10 percent level of significance and

results are shown in Table 4.3 below and an Eviews computer output is presented in appendix IV.

Table 4.3 Output for the GARCH (1, 1) model

Mean Equation				
Variable	**Coefficient**	**Std. Error**	**z-Statistic**	**Prob.**
α	0.539366	0.139022	3.879711	0.0001*
DEXR	0.04902	0.028561	1.716353	0.0861*
DIR	-0.041181	0.016234	-2.536787	0.0112*
Variance Equation				
φ	2.284022	0.201677	11.32515	0.0000*
λ	0.047674	0.009306	5.122891	0.0000*
θ	0.684069	0.022028	31.05403	0.0000*
DEXR	0.584015	0.046313	12.61018	0.0000*
DIR	-0.169573	0.011811	-14.35713	0.0000*

Note: * means significant at 10%

Source: Research Findings

4.5 Interpretation of the Findings

The results in the mean equation indicate that both variables i.e. interest rates and exchange had an impact on stock market returns and therefore rejecting the null hypothesis H_o which stated that interest rates and exchange rates had no impact whatsoever on stock market returns. According to these results an increase in interest

rates has a negative effect on stock market returns while a depreciation of the Malawi Kwacha has a positive effect on stock market returns.

In the variance equation, both the ARCH (λ_1) and the GARCH (θ_1) terms are statistically significant together with the variables of interest rates and exchange rates. The significant GARCH term shows that this is an appropriate model to account for volatility on the MSE and that volatility in a preceding period influences volatility in the next period. The significant ARCH term is indicative of a positive relationship in which shocks on the macroeconomic variables of interest rates and exchange rates are translated into more volatility on the Malawi Stock Exchange. The ARCH and GARCH coefficients sum up to less than one demonstrating that shocks to the MSE are transitory rather than permanent and die with the passage of time.

The negative coefficient for interest rate indicates that an increase in interest rates has a dampening effect on the volatility of stock returns. The positive coefficient for exchange rate suggests that a depreciation of the Malawi Kwacha increases volatility of stock market returns.

Overall, the findings on interest rates are consistent with theory; interest rates and stock prices are inversely related. An increase in interest rates lowers stock market returns while a decrease in interest rates has the opposite effect of increasing stock market returns. Further, the findings on exchange rates are also consistent with theory. Depreciation of a currency should lead to increased competitiveness for a country's

exporters who experience improved earnings in local currency. Depreciation should also result into a reduction of the balance of payments deficit for a country. Depreciation should therefore be good news to exporters and may lead to an improved financial health of an economy if the export sector is dominant.

The findings have not supported the earlier assumption made that depreciation would have a negative impact on stock market returns in Malawi as the import sector dominates in the economy. On the contrary, although depreciation has inflationary effects on the economy, it has a positive effect on stock market returns. A closer look at the companies making up the MSE reveals that there is a sugar exporting company, hotels and financial institutions. The sugar manufacturing company earns a lot in domestic currency when the currency depreciates while the financial institutions stand to make windfall gains on their speculative activities when the currency depreciates. The hotels, which are tourist operators, also become competitive as their services become cheaper to foreigners. Overall, the securities on the MSE become cheaper in foreign currency in the event of a depreciation of the Malawi Kwacha thus attracting foreign portfolio managers wishing to add to their market positions.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter is organized into summary of findings, conclusions of the study, recommendations for policy, limitations of the study and suggestions for further research.

5.2 Summary

The study was designed to investigate the effect of interest rates and exchange rates on market returns of the Malawi Stock Exchange. A case study methodology was adopted and the study was conducted within the context of the Malawi Stock Exchange. Weekly secondary data was collected for the twelve year period of study and the data consisted of the Malawi All Share Index (MASI), 3 months Treasury bill yields which were used as proxy for interest rates and the US dollar/ Malawi Kwacha middle exchange rates.

Collected data was suitably transformed into series of continuously compounded returns to aid in the comparison of returns across the three different asset categories. The data was then analysed using the GARCH (1, 1) framework after noting the inadequacy of OLS regression in the estimation of results. The GARCH (1, 1) model was used to estimate two sets of equations. The first equation examined the effect of interest rates and exchange rates on the mean returns of the MSE while the second equation evaluated the effect of both variables on the volatility of the MSE.

Findings from the study confirmed that the macroeconomic variables of interest rates and exchange rates have an effect on the market returns of the MSE. These economic variables affected both the mean returns as well as volatility of such returns. In keeping with theory, interest rates were found to be inversely related to stock prices. This means that an increase in interest rates depresses stock prices and vice versa. Interest rates were also found to have a dampening effect on stock market volatility. Further, exchange rates were also found to cause movements in stock prices. A depreciation of the currency was found to cause positive movements in stock market returns and also further increased the volatility of the stock market returns. This is in agreement with economic theory which postulates that a depreciation of a country's currency should be able to stimulate exports and improve its balance of trade with other nations resulting in a reduction of any trade deficits and an improvement in the overall balance of payments position.

5.3 Conclusion

These findings led to the conclusion that interest rates and exchange rates affect the market returns of the Malawi Stock Exchange and the volatility of such returns. The volatility is transitory and it decreases with the passage of time.

5.4 Recommendations for Policy

As earlier explained in the introduction to this research, the stock market plays a number of roles in an economy like providing a price discovery mechanism for shares traded on an exchange, allocating resources to the more productive sectors of the economy and of course grading management by evaluating the performance of companies listed on stock

exchanges. Since the study has established that there is a link between the macroeconomic variables of interest rates and exchange rates on stock returns, it is imperative that policy makers should seek to implement policies that do not adversely affect investors and other economic agents. Strategies should be in place to achieve desired fiscal and monetary objectives without unduly affecting the prices of shares on the MSE.

Although the study did not collect data on Malawi's public debt, the high average interest rates are indicative of high budget deficits which have a crowding out effect on the private sector. The fiscal and monetary authorities should aim at implementing effective public debt management strategies aimed at lowering interest rates, controlling inflation and stimulating private sector investment and economic growth.

The findings of the study can also be used by investors and fund managers in their portfolio allocation decisions when investing in Treasury bills or shares on the Malawi Stock Exchange. The fluctuations in interest rates and exchange rates can be used as signals to determine the appropriate time to either enter or exit the stock market.

5.5 Limitations of the Study

GARCH models are data intensive and although the study attempted to use weekly data, only 652 weeks were covered as weekly data on interest rates and exchange rates was not easily available prior to January 2002. It is therefore preferable to use daily data in such

models but this was also not available. Such limitations may affect the conclusions drawn from the model estimation results.

The other limitation is the small size of the MSE. Although GARCH models are robust, we were unable to check the effect of interest rates and exchange rates on various sectors of the economy as only the Malawi All Share Index (MASI) was used. The index has not been segregated into the various sectors of the MSE due to the small size of the market so the results of this study may lack generality.

5.6 Areas for Further Research

The research only investigated the effect of two macroeconomic variables on the MSE yet investors use a broad range of factors such as levels of taxation, unemployment, industrial production, money supply, level of foreign exchange reserves, inflation, impact of IMF programs and many more. These economic variables would give a better overall picture of the model and its predictive power. A study encompassing all these other factors would therefore be desirable.

Future research can also concentrate on the effect of economic variables on individual companies or sectors of the Malawi Stock Exchange to get a better overall picture of the power of the model on individual companies or sectors of the economy. The model has found some evidence that there is a one way interaction between exchange rates and stock market returns which is line with the ‘flow through model’ in which fluctuations in exchange rates cause fluctuations in stock prices. However, the ‘portfolio model’ has not

been investigated in which fluctuations in stock prices cause changes in exchange rates. Future studies may therefore model such behaviour by employing Granger- causality tests as embedded in Vector Autoregression Approaches (VARs).

The research did not delve into the leverage effects of the changes in interest rates and exchange rates on MSE market returns. The leverage effect is the tendency for volatility to rise more fallowing a large price fall than following a price rise of the same magnitude. Future research may therefore be interested in the asymmetric effects of the economic variables on stock market returns.

REFERENCES

Adjasi, C., & Biekpe, N. (2006). Interest rate and stock market returns in Africa, *African Finance Journal,* 8(2), 12-27.

Africa Strictly Business.com Reporter. (2013). *Top-Performing African Stock Markets in 2013.*Retrieved from http://www.africastrictlybusiness.com/lists/top-performing-african-stock-markets-2013.

Aggarwal, R. (1991). Exchange rates and stock prices: A study of the US capital markets under floating exchange rates, *Akron Business and Economic Review*, 12, 7-12.

Ajayi, R.A., Friedman, J., & Mehdian, S.M. (1998). On the relationship between stock returns and exchange rates: Tests of Granger Causality, *Global Finance Journal,* 9(2), 241-251.

Apiyeva, D. (2007).The determinants of stock market performance in emerging economies: the case of Latin America and Asia Pacific (Doctoral dissertation, Middlesex University). Retrieved from http://eprints.mdx.ac.uk/8097/1/Apiyeva-Phd..pdf

Branson, W., Halttunen, H., & Masson, P. (1977). Exchange rates in the short run: the Dollar Deutsche mark rate, *European Economic Review*, 10, 303 – 324.

Brearly, R.A and Myers S.C., (2002).*Principles of Corporate Finance,* Tata McGraw Hill, New Dheli.

Brigham, E.F., & Davies P.R. (2010). *Intermediate Financial Management,* South-Western Cengage Learning, Mason, USA.

Brooks. C., (2008). *Introductory Econometrics for Finance,* Cambridge University Press. Cambridge, United Kingdom.

Chen, Nai-fu, Roll Richard; and Stephen A Ross (1986). Economic forces and the stock market, *Journal of Business* 59, 383-403.

Chirchir, D (2014). The relationship between share prices and interest rates: Evidence from Kenya, *Journal of Finance and Investment Analysis*, 3(2), 91-98

Churchill, G.A., & Iacobucci, D. (2005).*Marketing Research*, Methodological Foundation. Harcourt College Publishers.

Copeland, T., Koller, T., & Murin, J. (2000).*Valuation measuring and managing value of companies*, Third Edition, New York, John Willey & Sons Inc.

Cowles, A. and Associates (1939).*Common Stock Indices*, Principia Press Inc., Bloomington, Indiana

Darrat, A.F., & Dickens, R.N. (1999). On the interrelationship among real, monetary and financial variables, *Applied Economics*, 9, 289- 293.

Dornbush, R. and Fischer, S. (1980). Exchange Rates and Current Account, *American Economic Review*, 70 (5), 960-971.

Eita, J (2014). Interest rate and stock market returns in Namibia, *International Business & Economics Research Journal* – (July/August), 13 (4).

Eiteman, D.C., Stonehill, A., &Moffett, H. (2004). *Multinational Business Finance*, Pearson Series in Finance.

Erb, C., Harvey, C & Viskanta, T. (1994). Forecasting international equity correlations, *Financial Analysts Journal*, (November- December), 32-45.

Erb, C., Harvey, C., & Viscanta, T. (1995).Country Risk and Global Equity Selection, *Financial Analysts Journal*, (November- December).

Fama, E (1970). Efficient Capital Markets: A review of theory and empirical work. *Journal of Finance,* XXV (2), 383 -417.

Fama, E. F., and French, K. (1998). The cross section of expected stock returns, *Journal of Finance,* XLVII (2).

Fama, E.F., & French K.R., (1995). Size and book-to- market factors in earnings and returns, *Journal of Finance,* 50, 131-155.

Fischer, D.E., & Jordan, R.J (1995). *Security analysis and portfolio management* (6thed). Virginia, USA: Prentice Hall.

Franck, P., & Young, A. (1972) Stock price reaction of multinational firms to exchange realignments, *Financial Management* 1, 66-73.

Friedman M., &Heller W. (1969*). Monetary vs. Fiscal Policy*, New York: Norton, 50-51.

Gendreau, B., and Heckman, L. (2003).Sovereign spread and emerging market equity returns, *Journal of Portfolio Management*, 104-114.

Grinblatt, M & Titman S (2002) *Financial Markets and Corporate Strategy* (Int. Ed), McGraw Hill.

Gujarati, D. (2004). *Basic Econometrics*, 4th Edition, Mc-Graw Hill, NY

Gupta, J. P., Chevalier, A.,& Sayekt, F. (n.d).*The Causality between interest rate, exchange rate and stock price in emerging markets: The case of the Jakarta Stock Exchange*, Retrieved from SSRN-ID 251253.

Howells, P., &Bain, K. (2008). *The Economics of Money, Banking and Finance,* Pearson Education.

Ioannidis, C., and A. Kontonikas (2008).The impact of monetary policy on stock prices, *Journal of Policy Modeling*, 30, 33–53

Jombo, W., Simwaka, K., & Chiumia, A. (2014). Exchange Rate Pass-Through in Malawi: Evidence from Augmented Phillips Curve and Vector Autoregressive Approaches, *Standard Global Journal of Business Management*, 1(2), 34-40. Retrieved from http://www.rbm.mw/documents/research_papers/Exchange%20rate%20pass-through%20in%20Malawi.pdf.

Kaminsky, G., and Schumkler, S. (1992). Emerging market instability: Do sovereign ratings affect country risk and stock returns, *The World Bank Economic Review*, 16(2), 171- 195.

Kofi, O., &Kwabena, O., (2006). Macroeconomic factors and the Ghana Stock Exchange, the *African Finance Journal*, 8(1), 26-38.

Laopodis, N.T (2013). Monetary policy and stock market dynamics across monetary regimes, *Journal of International Money and Finance*, 33, 381–406.

Madura, J (2008). *Financial Markets and Institutions*, New Dheli Reprint: Cengage Learning.

Mangani, R. (2007). Modeling return volatility on the JSE Securities Exchange of South Africa, *The African Finance Journal*, 10(1), 55-72.

Mishkin, F.S. (2004). *The economics of money, banking, and financial markets*, The Addison-Wesley series in economics.

Mutoko, R.K. (2006). *Analysing the effect of Treasury bill rates on stock market returns using GARCH* (Unpublished MBA Project). University of Nairobi, Nairobi, Kenya.

Richards, N.D., &Simpson, J. (2009). The interaction between exchange rates and stock prices: An Australian context, *International Journal of Economics and Finance*

*1(1).*Retrieved from http://ccsenet.org/journal/index.php/ijef/article/viewFile/189/179.

Roll, R., & Ross, S. (1980). An empirical investigation of the Arbitrage Pricing Theory, *Journal of Finance,* 1073 -1103.

Schiller B. R. (2006). *The Economy Today,* New York, McGraw-Hill / Irwin.

Sharpe, W. F. (1964). Capital Asset Prices – a theory of market equilibrium under conditions of risk, *Journal of Finance*, 31-47

Simwaka, K., Ligoya, P., Kabango, G., &Chikonda, M. (2012). Money supply and inflation in Malawi: An econometric investigation, *The International Journal of Applied Economics and Finance,* 6(3), 74-88. Doi: 10.3923/ijaef.2012.74.88

Wild, J.J., & Subramanyam K.R. (2002).*Financial Statement Analysis* (10th ed.), New York, United States of America.

Yin, R. K. (1981).The case study as a serious research strategy, *Knowledge: Creation, Diffusion, Utilization*, 3 (September), 97-114.

APPENDICES

APPENDIX I: Companies Listed on the MSE as at 30 June 2014

Agriculture

Illovo Sugar Company Limited listed on 25 March 1997

Banking and Insurance

Standard Bank of Malawi Limited listed 29 June 1998

First Merchant Bank Limited listed on 19 June 2006

National Bank of Malawi Limited listed on 21 August 2000

NBS Bank Limited listed on 27 June 2007

Real Insurance Limited listed on 29 September 2008

Diversified Conglomerates

Press Corporation Limited listed on 9 September 1998

Old Mutual plc listed on 12 July 1999

NICO Holdings Limited listed on 21 March 2005

Investment

National Investment Trust Limited listed on 21 March 2005

Malawi Properties Investment Company Limited listed on 3 November 2008

Telecommunications

Telekom Networks Malawi listed on 3 November 2008

Tourism

Blantyre Hotels Limited listed on 25 March 1997

Sunbird Hotels Limited listed on 8 December 2002

Appendix II: **Table A2: Results of the test for the presence of ARCH**

Heteroskedasticity Test: ARCH

F-statistic	8.289989	Prob. F(1,647)	0.0041
Obs*R-squared	8.210416	Prob. Chi-Square(1)	0.0042

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 10/11/14 Time: 14:17
Sample (adjusted): 1/25/2002 6/27/2014
Included observations: 649 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	8.764914	2.088651	4.196447	0.0000
RESID^2(-1)	0.061069	0.021210	2.879234	0.0041

R-squared	0.012651	Mean dependent var	9.545456
Adjusted R-squared	0.011125	S.D. dependent var	53.05523
S.E. of regression	52.75929	Akaike info criterion	10.77243
Sum squared resid	1800952.	Schwarz criterion	10.78623
Log likelihood	-3493.655	Hannan-Quinn criter.	10.77778
F-statistic	8.289989	Durbin-Watson stat	2.042558
Prob(F-statistic)	0.004118		

Source: Research Findings

Appendix III: **Table A3: Correlogram of returns showing no serial correlation**

Date: 10/11/14 Time: 14:34
Sample: 1/04/2002 6/27/2014
Included observations: 650

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
.|. |	.|. |	1	0.061	0.061	2.4347	0.119
.|. |	.|. |	2	-0.003	-0.007	2.4410	0.295
.|. |	.|. |	3	-0.004	-0.003	2.4493	0.485
.|. |	.|. |	4	-0.004	-0.004	2.4602	0.652
.|. |	.|. |	5	0.006	0.006	2.4821	0.779
.|. |	.|. |	6	0.020	0.020	2.7540	0.839
.|. |	.|. |	7	0.045	0.043	4.0757	0.771
.|. |	.|. |	8	0.001	-0.004	4.0772	0.850
.|. |	.|. |	9	-0.009	-0.008	4.1256	0.903
.|. |	.|. |	10	-0.006	-0.004	4.1470	0.940
.|. |	.|. |	11	-0.009	-0.008	4.1961	0.964
.|. |	.|. |	12	-0.004	-0.004	4.2084	0.979
.|. |	.|. |	13	-0.004	-0.005	4.2201	0.989
.|. |	.|. |	14	0.044	0.043	5.4866	0.978
.|. |	.|. |	15	-0.009	-0.014	5.5405	0.986
.|. |	.|. |	16	-0.007	-0.005	5.5760	0.992
.|. |	.|. |	17	-0.006	-0.005	5.6022	0.995
.|. |	.|. |	18	-0.008	-0.006	5.6409	0.997
.|. |	.|. |	19	0.010	0.011	5.7133	0.999
.|. |	.|. |	20	-0.002	-0.005	5.7159	0.999
.|. |	.|. |	21	-0.009	-0.012	5.7690	1.000
.|. |	.|. |	22	0.048	0.051	7.3121	0.999
.|. |	.|. |	23	0.003	-0.001	7.3193	0.999
.|. |	.|. |	24	-0.008	-0.008	7.3681	1.000
.|. |	.|. |	25	0.003	0.005	7.3727	1.000
.|. |	.|. |	26	0.002	0.001	7.3745	1.000
.|. |	.|. |	27	-0.001	-0.001	7.3759	1.000
.|. |	.|. |	28	0.012	0.009	7.4750	1.000
.|. |	.|. |	29	-0.008	-0.013	7.5164	1.000
.|. |	.|. |	30	-0.007	-0.005	7.5532	1.000
.|. |	.|. |	31	-0.004	-0.002	7.5644	1.000
.|. |	.|. |	32	-0.003	-0.002	7.5692	1.000
.|. |	.|. |	33	0.002	0.001	7.5718	1.000
.|* |	.|* |	34	0.090	0.091	13.148	1.000
.|. |	.|. |	35	-0.007	-0.017	13.177	1.000
.|. |	.|. |	36	-0.006	-0.008	13.205	1.000

Source: Research Findings

Appendix IIIb

Table A4: Breusch-Godfrey Serial Correlation LM Test:

F-statistic	9.094877	Prob. F(2,645)	0.0001
Obs*R-squared	17.66472	Prob. Chi-Square(2)	0.0001

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 10/11/14 Time: 15:09
Sample: 1/18/2002 6/27/2014
Included observations: 650
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.015315	0.107741	-0.142146	0.8870
AR(1)	-0.245444	0.104693	-2.344421	0.0194
MA(1)	-0.037863	0.073597	-0.514466	0.6071
RESID(-1)	0.302145	0.094392	3.200966	0.0014
RESID(-2)	0.264845	0.062229	4.255949	0.0000

R-squared	0.027176	Mean dependent var	-0.057402
Adjusted R-squared	0.021143	S.D. dependent var	3.574634
S.E. of regression	3.536642	Akaike info criterion	5.371895
Sum squared resid	8067.552	Schwarz criterion	5.406333
Log likelihood	-1740.866	Hannan-Quinn criter.	5.385252
F-statistic	4.504630	Durbin-Watson stat	1.764610
Prob(F-statistic)	0.001351		

Source: Research Findings

Appendix IV

Table A5: Output for GARCH Model

Dependent Variable: MASI
Method: ML - ARCH (Marquardt) - Normal distribution
Date: 10/11/14 Time: 15:48
Sample (adjusted): 1/11/2002 6/27/2014
Included observations: 651 after adjustments
Convergence achieved after 96 iterations
Presample variance: backcast (parameter = 0.7)
GARCH = C(4) + C(5)*RESID(-1)^2 + C(6)*GARCH(-1) + C(7)*DEXR + C(8) *DIR

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	0.539366	0.139022	3.879711	0.0001
DEXR	0.049020	0.028561	1.716353	0.0861
DIR	-0.041181	0.016234	-2.536787	0.0112
Variance Equation				
C	2.284022	0.201677	11.32515	0.0000
RESID(-1)^2	0.047674	0.009306	5.122891	0.0000
GARCH(-1)	0.684069	0.022028	31.05403	0.0000
DEXR	0.584015	0.046313	12.61018	0.0000
DIR	-0.169573	0.011811	-14.35713	0.0000

R-squared	0.000574	Mean dependent var	0.518561
Adjusted R-squared	-0.002510	S.D. dependent var	3.845795
S.E. of regression	3.850619	Akaike info criterion	4.926369
Sum squared resid	9608.069	Schwarz criterion	4.981404
Log likelihood	-1595.533	Hannan-Quinn criter.	4.947714
Durbin-Watson stat	2.173379		

Source: Research Findings