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The Interaction between the Stock Market and Macroeconomic Policy Variables in South Africa

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ABSTRACT The paper empirically examines the relationship between the stock market and macroeconomic policy variables in South African for the period from 1994 to 2012. The Johansen cointegration test and the restricted VAR model were employed to analyse the relationship between the variables of interest. The chosen method explicitly calculates the disturbances by inverting an estimated structural VAR of the relationship among the contemporaneous VAR residuals. The findings from the study suggest that there exists a long-term relationship between the selected macroeconomic variables and the stock market in South Africa. The results show that changes in money supply, interest rate, inflation, exchange rate and government expenditure are transmitted into the stock market. Thus achieving macroeconomic equilibrium is of great importance as any disequilibrium will be fed into the stock market which eventually might compromise its role of mobilising and allocating development financial resources to productive sectors of the economy.

INTRODUCTION

The Stock Market has emerged as one of the most important sectors of the economy as documented in a number of studies (Pathan and Masih 2013; Kulathunga 2016; Gurloveleen and Bhatia 2015; Ahmad et al. 2015; Mangala and Rani; 2015; Subramanian 2015). The interest in this area stems from the market being a channel for the corporate sector to raise development capital for business and investment activities. In other words the stock market is another source of development finance.

Apart from the stock market being a channel to raise capital, another important role of the stock market is to provide correct valuation of stocks and promote efficient allocation of capital. Khil and Lee (2000) regard the stock market as a suitable place for investors to avoid the threat of inflation and at the same time is an indicator towards the development of the nation.

However, a number of studies highlight that changes in macroeconomic factors may impact on the development of the stock market (Adam and Tweneboah 2008; Acikalin and Seyfettin 2008; Hosseini et al. 2011; Antwi et al. 2012; Chia and Lim 2015; Barakat et al. 2016; Jareño and Negrut 2016). The existing financial economic theory provides a number of models such as the portfolio balance and the flow oriented models that provide a framework for the study of this relationship. However conclusions have been varied.

In the case of South Africa, since 1994 the economy has experienced significant changes in its macroeconomic aggregates. Similarly, the transition from apartheid in 1994 to independence has witnessed various programmes of deregulation, privatisation and commercialization, which have had implications for the stock market growth and the state of macroeconomic variables.

A close analysis of the South African stock market index indicates that from 1995 until 2013, the South African Stock Market (FTSE/JSE) averaged 15755 Index points reaching an all-time high of 40984 Index points in March of 2013 and a record low of 4308 Index points in September of 1998. At the same time, it is interesting to note that macroeconomic variables such as the inflation rate, exchange rate, interest rate, Gross Domestic product (GDP) amongst other have also assumed different values in South Africa. Taking a closer look at the exchange rate between the South African Rand and the US dollar, it is evident it has depreciated from R6.00 per US dollar to around R13.00 in September 2015. In addition changes in the inflation rate have prompted the central bank authorities to pursue the inflation targeting regime, where the authorities have been changing the interest rates so as to keep inflation in the target range of 3 - 6 percent.

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Given the changes in macroeconomic variables, alongside the stock market activities in South Africa, and considering the importance of the stock market to the broader economy in South Africa, the study focused on establishing the relationship between the stock market and five macroeconomic variables in South Africa. The study is composed of 5 sections with section 1 being the introduction. Section two discussed the relevant literature between the variables of interest. Section is based on the estimation of methods to be utilised in the examination, section four will present the results obtained in the study whilst the final section concludes.

Review of Relevant Literature

There is no consensus regarding the available studies on the relationship between macroeconomic variables and the stock market. The prominent models that explain the relationship between the stock market and macroeconomic variables include the stock oriented model, the portfolio balance and the efficient market hypothesis. All these variables have varying conclusions. One of the earlier studies in the area include Cheung and Ng (1998) who argues that the stock market is generally related to deviations in macro variables. In addition, Flannery and Protopapadakis (2002) mention that macroeconomic variables are excellent candidates for risk factors because they simultaneously affect firm cash flows and the risk adjusted discount rate. Although prominent earlier studies such as Fama (1990), Chen et al. (1986) and Barro (1990), Gan et al. (2006) focused on developed countries, there has been a proliferation of studies on the effect of macroeconomic variables on stock market in developing countries as well as other emerging countries such as Tweneboah (2008), Herve et al. (2011), Oseni (2011), Hsing (2011), Hosseini et al. (2011), Mohd et al. (2012), Antwi et al (2013), Chia and Lim (2015), and Jareño and Negrut (2016). However different results have been obtained. The difference in results could be attributed to the different methodologies utilised in the studies. Beginning with the studies which utilised the VAR models, Mohd et al. (2012) carried out a study on Malaysia for the period from 1999-2007 using monthly data. Empirical results show that the Islamic share prices as measured by the KLSI index exhibited a positive relationship with a number of macroeconomic variables such as economic growth rate and inflation. On the other hand a negative relationship between the stock market and money supply as measured by M3, Islamic investment rate, and the foreign exchange rate. The results were found to be consistent with Chia and Lim (2015) for the same country though they contradicted the findings of Ibrahim and Azizi (2003).

For China and India, Hosseini et al. (2011) employed the VAR model due to its ability to take into account the simultaneous relationship between the variables of interest and found that in both the long and short run, there is a linkage between crude oil price, money supply and industrial production and the stock market indices in China and India. In the long run, the impact of increases in crude oil price in China was found to be positive but in India this effect is negative. In terms of money supply, the impact on Indian stock market is negative, but for China, there is a positive impact. The authors noted that the effect of industrial production is negative only in China. These results however are contrary to Mangala and Rani (2015).

Adam and Tweneboah (2008) and Antwi et al. (2013) also examined the relationship between the stock market and macroeconomic variables in the case of Ghana. Adam and Tweneboah (2008) established that there is a presence of cointegration between macroeconomic variables and the stock market in Ghana. On the other hand utilising the Granger causality test, Antwi et al. (2013) established that there was a uni-directional causality running from fiscal policy to the stock market. Thus the author emphasised that government activities in Ghana have a bearing on the performance of the stock market.

On separate studies, Oseni (2011) looked at the relationship between macroeconomic variables and the stock market in Nigeria for the period from 1986 to 2010 using monthly data. The authors utilised the EGARCH model to estimate the volatility in each of the variable employed in the model. The LAVAR Granger Causality test was also used to determine the nexus between the stock market volatility and macroeconomic variables volatility in Nigeria. The result of the analysis suggests that there was bi-directional causal relationship between stock market volatility and real GDP volatility, confirming the existence of a feedback phenomenon between Nigeria's real GDP and stock prices. These results confirm that the stock market activities can influence macroeco-

nomic variables, at the same time changes in macroeconomic variables are transmitted into the stock market. This confirms the stock oriented model as well as the portfolio balance theory. Other studies which support this result include Inci and Lee (2014) and Ahmad et al. (2015).

Barakati et al. (2015) examined the relationship between the stock market and several macroeconomic variables in Tunisia and Egypt from 1998 to 2014. The authors utilised the Johansen cointegration test as well as Granger causality tests to establish the direction of effect. The empirical results revealed that there is a long-term relationship between macroeconomic variables and the stock market in the two countries. However granger causality tests indicated that there was evidence of a bi-directional causality between the stock market in Tunisia which was not the case for Egypt, implying that the nature of the relationship between the variables varies from country to country.

The available studies in South Africa include Jefferis and Okeahalam (2000), Moolman (2004), Ocran (2007) and Arjoon et al. (2011). It is interesting that the majority of these studies have utilised the common variables such as the exchange rate, interest rate and inflation, not taking into account the role played by the government through its fiscal policy despite the role of government being outstanding in the majority of the developing countries. The review of literature shows that establishing the relationship between the stock market and macroeconomic policy variables is an area which has attracted attention. Though in the past many studies were much concentrated in developed countries, will less studies on developing countries due to underdevelopment of developing countries stock markets, it is interesting that a lot has changed. It is interesting to note that most developing economies have revitalized their stock markets through implementing financial liberalization policy programmes, including interest rate and exchange rate liberalization. This also applies to South Africa. Thus the study is undertaken in the case of South Africa taking into account the recent changes in the stock market as well as the effects of fiscal policy.

METHODOLOGY

The methodology utilised in the study is discussed in this section. Firstly the model utilised in the study is presented followed by estimation techniques as well as the discussion on the data used.

Model Specification

In examining the relationship between the stock market and macroeconomic policy variables in South Africa the study utilised the Vector Autoregression (VAR) methodology given the nature of the relationship between the variables as highlighted in the literature review section. Westaway (1999) states that Vector Autoregressions (VARs) are dynamic systems of equations in which the current level of each variable in the system, for example, inflation, real exchange rates and interest rates, depends on past movements in that variable and on all the other variables in the system. It also uses minimal assumptions about the underlying structure of the economy and, instead, focuses entirely on deriving a good statistical representation of the past interactions between economic variables, letting the data determine the model. The VAR approach is a convenient method of summarizing the dynamic relationships among variables in such circumstances, since once estimated they can be used to simulate the response over time of any variable in the set to either an 'own' disturbance or a disturbance to any variable in the system (Ramaswamy and Slok 1998). VARs have also been found to be most suitable in capturing the feedback relationships among macroeconomic variables. In addition, the restricted VAR approach takes precedence over the single equation approach for capturing the long-run equilibrium of variables while it incorporates an error correction mechanism to track the short run dynamics among the variables (Feasel et al. 2001). More importantly, the structural version of the reduced-form VAR (which separates the influence of shocks from those of structure to capture the interactions among the variables of interest) is employed in the study. This method explicitly calculates the disturbances by inverting an estimated structural VAR of the relationship among the contemporaneous VAR residuals.

Assuming that X_t is the nx1 vector of variables, the intra-impulse transmission process of which is to be captured by the study, the dimension of X_t (that is n) is 6, given the six variables of the analysis. Using matrix algebra notations, a 6-variable structural dynamic economic model for the study can be stated as:

$\beta X_t \mu = m + GX_{t\,i} + \mu_t$ 1

Where β is the matrix of variable coefficients

X_t is the 6 x 1 vector of observations at time t of the variables of the study, which is vector X is defined as $X_t = (IALSH_t, IGOVt, IM3t, CPI_t, REP_t, EX_t)$

Also, μ is the vector of constants

Γ is a matrix polynomial of appropriate dimension

ε_t is a diagonal matrix of *structural innovations* that has zero means, constant variance, and are individually serially uncorrelated, that is

$\varepsilon_t \sim (O, å)$.....(2)

Where

ALSH = the log South African stock market index,

LG = the log government expenditure,

LM3 = the log money supply,

REP = the domestic real interest rate,

EX = the ZAR/USD expected rate,

CPI = inflation

Definition of Variables and Apriori Expectations

$LALSH_t$ is the natural logarithm of the all share South African stock market index which is the proxy for stock market in the study. This index represents prices of all classes of shares at the Johannesburg Stock Exchange (JSE).

LM3 is the natural logarithm of the total amount of money available in an economy at a particular point in time and in this study we use M3 which is the currency in circulation and demand deposits. A positive relationship between the increase in money supply and stock market performance was expected. This is in line with studies such as Maysami and Koh (2000), Maysami et al. (2004), Pathan and Masih (2013) and Mangala and Rani (2015). These studies suggest that an expansionary money supply which increases the amount of money circulating in the economy increases economic activities and hence share prices of companies.

REP is the domestic real interest rate measured by the repo rate. A negative relationship between the stock market and the rate of interest is expected in the study. When interest rates increase, this had a negative impact on the borrowing prospects of a company as well as its economic activity. This is consistent with Maysami and Koh (2000), Wongbangpo and Sharma (2002), Pathan and Masih (2013), Jareño and Negrut (2016), and Barahat et al. (2016).

EX is the exchange rate between the South African Exchange rate and the US dollar. The US rand exchange rate is utilised in the study considering the trade relationship between South Africa and the US. An increase in this variable indicates an appreciation of the rand and a decrease indicates a depreciation of the rand. The exchange rate is vital to the study given that the South African economy is an open economy which is greatly supported by international trade, hence, the importance of ZAR/USD expected rate. Given that South Africa is export oriented, a negative relationship between the stock market and exchange rate was be expected. In this case exporting companies when the rand depreciate will export more and reap more profits. More profits will result in the company's share appreciating. This is consistent with studies such as Mangala and Rani (2015) and Chia and Lim (2015).

Consumer Price Index (CPI) is the measure of inflation. A positive relationship between inflation and the stock market was expected. This is in line with studies such as Ibrahim (2001, 2003) and Khil and Lee (2000), Barakat et al. (2015). These studies suggest that when inflation is on the rise, economic agents may prefer investing their money in the stock market rather that keeping it as cash as it will lose its value.

GE is government expenditure. This variable measures the impact of government activity on the economy. A negative relationship between government expenditure and stock market development was expected. An increase in government expenditure may crowd out private investment in South Africa (Biza et al. 2015) which will ultimately have negative effects on the company's share.

Estimation Techniques

The first stage of analysis involved verifying the order of integration of variables used. This was achieved through the Augmented Dickey Fuller and Phillips and Perron tests which are the two popular tests used to test the order of integration in the literature. The ADF test for unit root involves the estimation of the following equation:

$$\Delta y_t = a_o + \lambda\ y_{t-1} + a_2 t + \beta_1 \Delta y^{t-1} + \mu_t \quad (3)$$

The equation shows that ΔYt = Yt – Yt-1; ΔYt-1 = Yt-1 –Yt-2 and the number of lags to be included is empirically determined using Schwarz information criteria. The same critical values just like the case of the Dickey Fuller test are calculated by Monte Carlo simulation in MacKinnon-

Haug-Michelis (1999) given that the distribution is not standard. The test proceeds by testing the significance of the co-efficient of Yt-1. The augmenting is done to remove possible autocorrelation among error terms. In the event that the calculated values are greater than the critical values, we reject the null hypothesis and state that the variable is stationary. The Phillips Perron test on the other hand allows for fairly mild assumptions concerning the distribution of errors. The test regression for the Phillips-Perron which is an AR (1) process is given as:

$$\Delta y_{t-1} = a_0 + \gamma y_{t-1} + e_t \quad \text{.....(4)}$$

Given that there is likely to be serial correlation in our explanatory variables (inflation, repo rate and stock market index), the PP test corrects for higher order serial correlation by adding lagged differenced terms on the right-hand side. This test makes a correction to the t-statistic of the coefficient from the AR (1) regression to account for the serial correlation in . In addition, the PP test has an advantage over the ADF test when the concerned time series has a structural break.

The second stage involved investigating the cointegration relationship between the variables. For this purpose, the Johansen and Juselius (1990) maximum likelihood approach was used. Cointegration test is used to determine if there is any long-run equilibrium relationship between stock market index and the variables concerned. The Johansen method to cointegration is preferred to Engle-Granger approach because; it captures the underlying time series properties of the data. It is a systems equation test which provides estimates of all cointegrating relationships that may exist within a vector of non-stationary variables or a mixture of stationary and non-stationary variables. Once the number of cointegrating relationships has been established, a series of likelihood ratios tests can be performed to test different hypothesis about them. The technique is based on full system estimation and has greater power and helps to eliminate simultaneous equation bias and raise efficiency relative to single equation methods. In addition, the Johansen methodology is based on the maximum likelihood framework which offers much better properties and strengths than the traditional EG approach which is residual based.

However, prior to estimating the Johansen cointegration test the lag length selection was determined empirically. Choosing the appropriate lag length is important in econometric analysis because it affects the stability of the VAR model. Having established cointegration, the VECM was specified to analyse the short-run relationships between the variables. Within the restricted VAR framework, the equation to be estimated in the study can be specified as follows:

$$(\beta_{11}LALSH_{-1}+\beta_{21}GE_{t-1}+\beta_{31}MS_{t-1}+\beta_{41}DRI_{t-1}+\beta_{51}EX_{t-1}+\beta_{61}EX_{t-1}+\beta_{71}C+\varepsilon_t)$$

Which will feeds into 6 different equations as follows:

$$\Delta AALASH_t = a_{11}\ (\beta_{11}LALSH_{-1}+\beta_{21}GE_{t-1}+\beta_{31}MS_{t-1}+\beta_{41}EX_{t-1}+\beta_{51}REP_{t-1}+\beta_{61}CPI_{t-1}+\varepsilon_t)$$

$$\Delta GE_t = a_{21}\ [\beta_{11}LALSH_{-1}+\beta_{21}GE_{t-1}+\beta_{31}MS_{t-1}+\beta_{41}EX_{t-1}+\beta_{51}I_{t-1}+\beta_{61}CPI_{t-1}+\varepsilon_t]$$

$$\Delta MS_t = a_{31}\ [\beta_{11}LALSH_{-1}+\beta_{21}GE_{t-1}+\beta_{31}MS_{t-1}+\beta_{41}EX_{t-1}+\beta_{51}REP_{t-1}+\beta_{61}CPI_{t-1}+\varepsilon_t]$$

$$\Delta EX_t = a_{41}\ [\beta_{11}LALSH_{-1}+\beta_{21}GE_{t-1}+\beta_{31}MS_{t-1}+\beta_{41}EX_{t-1}+\beta_{51}REP_{t-1}+\varepsilon_\tau+\beta_{61}CPI_{t-1}+\varepsilon_t]$$

$$\Delta REP_t = a_{51}\ [\beta_{11}LALSH_{-1}+\beta_{21}GE_{t-1}+\beta_{31}MS_{t-1}+\beta_{41}EX_{t-1}+\beta_{51}REP_{t-1}+\varepsilon_\tau+\beta_{61}CPI_{t-1}+\varepsilon_t]$$

$$\Delta CPI_t = a_{61}\ [\beta_{11}LALSH_{-1}+\beta_{21}GE_{t-1}+\beta_{31}MS_{t-1}+\beta_{41}EX_{t-1}+\beta_{51}REP_{t-1}+\varepsilon_\tau+\beta_{61}CPI_{t-1}+\varepsilon_t]$$

Granger causality tests were also conducted to establish the direction of causality between the stock market and the selected macroeconomic variables utilised in the study given that some prior studies such as Antwi (2013), Inci and Lee (2014) have established that the direction of effect can run both ways.

Data Description

A total of six macroeconomic variables and data on the stock market was used in the analysis. The definitions of each variable, period and source are described in Table 1.

RESULTS AND DISCUSSION

The results of the models estimated in the previous section are presented and discussed in this section. The time series properties of the data are firstly presented and discussed.

Table 2 presents the results for the unit-root tests using Phillips-Perron (PP) and Augmented Dickey-Fuller (ADF) tests for the order of integration of each variable. The results indicates that at level series, the null hypothesis of a unit root could not be rejected even at 10 percent level. However after first differencing both the ADF and the PP confirm that the series are stationary. This implies that the variables are integrated of order I (which is a requirement for the Johansen cointegration test. Having established the order of integration of the

Table 1: Data descriptions

S.No.	*Variables*	*Description*	*Duration*	*Source*
1	Stock market Index	*ALSHARE* Stock market Index used as the proxy for South African stock market Index.	Quarterly data from 1994 to 2012.	JSE
2	Government Expenditure	*Government Expenditure* used as the proxy for the measure of fiscal policy.	Quarterly data from 1994 to 2012.	South African Reserve Bank (SARB)
3	Money supply (M3)	*M3* used as a proxy for the money supply in South Africa.	Quarterly data from 1994 to 2012.	Statistics South Africa online query
4	Domestic real interest rate.	*I* used as the proxy for interest rate.	Quarterly data from 1994 to 2012	South African Reserve Bank (SARB).
	ZAR/USD expected rate.	*ZAR/USD* used as the benchmark for foreign exchange rate in South Africa.	Quarterly data from 1994 to 2012.	Statistics South Africa online query
6	Inflation	Inflation used as the proxy for the *CPI* in South Africa.	Quarterly data from 1994 to 2012	Statistics South Africa online query

Table 2: Unit root tests

Variables	*Level*				*First Difference*			
	ADF		*PP*		*ADF*		*PP*	
	Constant	*Trend and intercept*	*Constant*	*Trend and intercept*	*Constant*	*Trend and intercept*	*Constant*	*Trend and intercept*
Govt	0.249	-0.394	8.739	8.990	-3.249**	-2.394*	-45.71***	-5.902***
Inflation	1.512	-1.082	1.975	-0.959	2.512**	-4.082**	-8.730***	-9.140***
LALSH	-0.205	-2.554	-0.286	-1.984	-7.020***	-6.997***	-6.956***	-6.930***
LMS	-2.489	-1.655	-2.489	-1.647	-8.341***	-8.791***	-8.377***	-8.790***
RER	-2.822	-2.787	-2.799	-2.771	-9.196***	-9.136***	-9.196***	-9.136***
Interest rate	-1.556	-3.749	-0.753	-2.563	-5.959***	-5.944***	-5.222***	-5.209***

*, ** and ***: Denote significance at 1%, 5% and 10% respectively.

data, the second step was to choose the appropriate lag length. This is reported in Table 3.

The lag length results indicate that a lag of 1 is chosen by three information criterion, the Akaike information criterion (AIC), Schwarz information criterion (SC) and the Hannan-Quinn information criterion (HQ). Therefore a lag of one was chosen as the optimum lag length to be used in the study. Having determined the time series properties of the data and choosing the appropriate lag length, the next step is to determine if there exists a long-term relationship between the variables employed in the study. This was

Table 3: Lag length selection criteria

Lag	*LogL*	*LR*	*FPE*	*AIC*	*SC*	*HQ*
0	-818.2	NA	680.4	23.55	23.74	23.62
1	-303.8	925.8	0.000	9.882*	11.23*	10.41*
2	-271.0	53.53	0.000	9.971	12.47	10.96
3	-240.5	44.39	0.001	10.12	13.79	11.58
4	-178.2	80.07*	0.000*	9.379	14.19	11.29
5	-146.5	35.35	0.000	9.501	15.47	11.87
6	-97.50	46.23	0.000	9.128	16.25	11.96

* indicates lag order selected by the criterion

achieved through the Johansen cointegration test. The results from both the Johansen's Trace test and max Eigenvalue are reported in Table 4. The empirical results suggests that the variables are cointegrated with r =1. This implies that there exists a long-term relationship between the variables of interest.

Table 4 affirm that there is a long term relationship between the measure of the stock market and macroeconomic variables utilised in the study. To further examine the relationships between the coefficients between the variables in the study, the long-term relationship normalised on the ALSH which is the measure of the stock market is reported in Table 5.

The empirical results indicate that the relationship between the stock market and money supply is negative in the case of South Africa. This result is contrary to the apriori expectation and does not corroborate the findings of Maysami and Koh (2000), Maysami et al. (2004) and Barakat et al. (2015) who established a positive relationship between the stock market performance and money supply. These researchers documented a positive relationship based on the money supply expansionary effect and this phenomenon would increase the actual economic activities and affect the share price through the profit gained by the corporate firms and in turn will increase the future cash flow and share prices. However, the results are consistent with the findings previous researchers like Ibrahim and Aziz (2003) in Malaysia and Mohd (2012). It is argued that the negative relationship is based on the direct relationship as regards to excessive money supply in the market which would cause inflation problems as well as affecting the increase of the discount rate and later on, causing a fall in share prices (Gan et al. 2006). The empirical results indicates the there is a negative relationship between government expenditure and stock market development. This can be attributed to the crowding out effect as an increase in government expenditure results in an increase in the rate of interest, negatively affecting the stock market. This is consistent with the apriori expectations. The relationship between inflation and the stock market is negative. This confirms to the apriori expectations. This is supported by Ibrahim and Wan (2001), Khil and Lee (2000) and Barakat et al. (2015) who found that the relationship between the stock market and inflation is a positive one. The scholars stressed that share prices should relate positively with the inflation rate via value protection (hedging operation). As such, equity as value protection from the threat of inflation

Table 4: Johansen-Juselius Cointegration Test

Model	*Null hypothesis*	*Statistical trace*	*Critical value (5%)*	*Maximum Eigen Statistical Trace*	*Critical value (5%)*	*Variable*	*Long-term coefficient elasticity*	*Results*
Lag Length=1#	r ≤ 0	107.9500**	95.75366	49.45206**	40.07757	LOGALSH	1.000000	Statistical Trace and Maximum-eigen value showed a 1- way cointegration
	r ≤ 1	58.49798	69.81889	23.74905	33.87687	G	-1.542802	
	r ≤ 2	34.74893	47.85613	15.46773	27.58434	LOGMS	-7.449635	
	r ≤ 3	19.28120	29.79707	10.23860	21.13162	IR	0.618768	
	r ≤ 4	9.042599	15.49471	9.037406	14.26460	RER	0.057175	
	R ≤ 5	0.005193	3.841466	0.005193	3.841466	I	0.411452	
						C	2.286143	

*, ** and ***: Denote significance at 1%, 5% and 10% respectively.

Table 5: Long-term cointegration results normalised on the ALSH

Dependent variable	*Independent variables*					
(ALSH)	*G*	*LOGMS*	*IR*	*EX*	*I*	*C*
Coefficient	-1.542**	-7.449**	-0.618**	-0.057**	0.411**	89.05
Standard Errors	(0.203)	(1.533)	(0.109)	(0.024)	(0.068)	
t-statistics	(-7.581)	(-4.857)	(-5.645)	(-2.341)	(6.010)	

*, ** and ***: Denote significance at 1%, 5% and 10% respectively.

and has a claim on a real asset proves that the higher the inflation rate, the higher the demand for a particular share. The study also shows that the relationship between ALSH and Interest rate (IR) is negative and significant. The type of relationship between the two variables is as expected whereby the findings are in line with the findings of Maysami and Koh (2000), Wongbangpo and Sharma (2002), and Kulathunga (2016). The basis for this type of relationship refers to the rise in interest rates which would cause the share prices to decline via the decrease in future corporate profit due to the increasing borrowing and production costs. As regards the relationship between the exchange rate and the stock market, the findings showed that the two variables share a long-term relationship which is negative and significant. These findings is supported by Maysami and Koh (2000), Wongbangpo and Sharma (2002), Ibrahim and Wan (2001) and Ibrahim and Aziz (2003) and Kulathunga (2016). The basis for the long-term negative relationship between the two variables can be attributed to the negative value of the real expected rate coefficient. Ibrahim and Wan (2001) stated that this negative relationship could be caused by a few factors, for example, whether a country in export oriented or not. The declining value of the currency would encourage more exports. However, the declining currency value would increase the production costs due to the increase in domestic prices. This would in turn decrease the profit margin for that particular firm and the firm's share prices would decrease.

Long term Granger Causal Relationship can be seen based on the value of ECT-1 for every variable in Table 6. Based on the result of VECM test, it is found that the value of ECT-1 for ALSH variable is significant. This proves that the variables of G, MS, IR, RER and Inf are the long term Granger cause for ALSH. In other words, in the event that there is disequilibrium, about 61percent of it is corrected within a quarter. These results are in line with Puah and Jayaraman (2003) and Wongbangpo and Sharma (2002). Short term Granger Causal relationships can be observed through Wald test (F statistics) on a group of the related coefficients. Based on Table 6, it is proven that only variables of EX and IR are the short term Granger cause for ALSH in South Africa. This implies that changes in the interst rate and exchange rates do significantly impact on the stock market performance in South Africa.

CONCLUSION

The main objective of this study was to investigate the interaction between the stock market and macroeconomic variables in South Africa. The analysis carried out in the study has established that though all variables are significant in explaining the changes on the stock market,

Table 6: Vector Error Correction Model (VECM)

Dependent variables	*Independent variables F-Statistic(Wald Test)*						*t-statistic*
	ΔLOGALSH	*ΔG*	*ΔLOGMS*	*ΔIR*	*ΔRER*	*ΔInf*	*Ect-1*
ΔLOGALSH	7.784***	3.663*	10.48***	0.560	0.474	-0.605**	(0.005) (3.011)
ΔG	0.405		0.140	0.084	1.118	0.564	0.931** (0.130) (7.123)
ΔLOGMS	0.002	0.075		0.034	0.003	0.324	-0.000 (0.002) (0.085)
ΔIR	26.62***	0.191	0.024		1.223	2.565	-0.025 (0.070) (0.347)
ΔRER	4.037**	1.747	3.396*	2.892*		0.001	-0.471 (0.504) (-0.933)
ΔInf	0.235	3.660*	3.637*	0.060	0.097		0.144 (0.084) (1.719)

*, ** and ***: Denote significance at 1%, 5% and 10% respectively, ( ) probability

the stock market in South Africa is positively related to inflation. On the other hand, it was found that there is a negative relationship between the stock market and other remaining variables. The findings in this study suggest that it is important to achieve macroeconomic equilibrium in South Africa because any disequilibrium in macroeconomics will also be transmitted into the stock market and influence its effectiveness in playing its role of mobilising and allocating capital to the productive sectors of the economy.

RECOMMENDATIONS

There are a number of policy implications which arise from the findings of this study. Firstly, the empirical results imply that policy makers in South Africa should take into account that influencing the economy through changes in macroeconomic variables such as the money supply, interest rates, or the exchange rate may inadvertently depress the stock market, and curtail capital formation which itself would lead to further slowdown of the economy.

Secondly, the presence of cointegrating relationships between the selected macroeconomic variables and the stock market may nullify the conclusions of the efficient market hypothesis in the case of South Africa for the study period. Thus, the behaviour of the stock market may to some extent be predicted, contrary to the EMH conclusions. This suggests that there are possibilities of superior returns as information becomes available of specific macroeconomic variables.

LIMITATIONS OF THE STUDY

One of the short comings that might have been experienced during the study is that the model may not have included all macroeconomic variables that significantly affect the stock market in South Africa. Another short coming is that some events outside the period of study that could have affected the stock market in South Africa may not be captured. More importantly, the model may not be able to identify other structural but non-quantifiable factors such as political developments that may have affected the performance of the South African stock market. In each of these cases, sufficient qualitative narrations were attempted to enrich the study.

REFERENCES

Acikalin S, Seyfettin URA 2008. An empirical analysis of the Istanbul Stock Exchange. *Investment Management and Financial Innovations*, 5: 8-16.

Adam AM, Tweneboah G 2008. Macroeconomic Factors and Stock Market Movement: Evidence from Ghana. From <htt://papers.ssrn.com/sol3/papers.> (Retrieved on 8 Febuary 2015).

Ahmad AU, Abdullah A, Sulong Z 2015. Causal relationship between stock market returns and macroeconomic variables in Nigeria, *Journal of Humanities and Social Science*, 20: 74-96.

Antwi S, Ebenezer AMFE, Zhao X 2012. The effect of macroeconomic variables on stock prices in emerging stock market: Empirical evidence from Ghana. *International Journal of Social Science Tomorrow,* 1(10): 1-10.

Arjoon R, Botes M, Chesang L, Gupta R 2011. The Long-run Relationship between Inflation and Real Stock Prices: Empirical Evidence from South Africa. Department of Economics *Working Paper Series*, University of Pretoria, Pretoria.

Barakat MR, Elgazzar SH, Hanafy KM 2016. Impact of macroeconomic variables on stock markets: Evidence from emerging markets. *International Journal of Economics and Finance*; 8(1): 195-207.

Barro RJ 1990. The stock market and investment. *Review of Financial Studies,* 3: 115-131.

Biza R, Kapingura FM, Tsegaye A 2015. Do budget deficits crowd out private investment? The case of the South African economy. *International Journal of Economic Policy in Emerging Economies,* 8: 52-76.

Chen N, Roll R, Ross SA 1986. Economic forces and stock market. *Journal of Business,* 59: 383-403.

Cheung Y, Ng L 1998. International evidence on the stock market and aggregate economic activity. *Journal of Empirical Finance,* 5: 281-296.

Chia RC, Lim SY 2015. Malaysian stock price and macroeconomic variables: Autoregressive Distributed Lag (ARDL) Bounds Test. *Kajian Malaysia,* 33: 85–103.

Fama E 1990. Stock returns, expected returns, and real activity. *Journal of Finance*, 45: 1089-1108.

Feasel E, Kim Y, Smith SC 2001. A VAR approach to growth empirics: Korea. *Review of Development Economics,* 5: 421-432.

Flannery MJ, Protopapadakis AA 2002. Macroeconomic factors do influence aggregate stock returns. *The Review of Financial Studies*, 15: 751-782.

Gan R, Lee M, Yong HHA, Zhang J 2006. Macroeconomic variables and stock market interactions: New Zealand evidence. *Investment Management and Financial Innovations*, 3: 89-101.

Gurloveleen K, Bhatia BS 2015. An Impact of Macroeconomic Variables on the functioning of Indian Stock Market: A Study of Manufacturing Firms of BSE 500. *Journal of Stock and Forex Trading*, 5: 1-5.

Herve DBG, Chanmalai B, Shen Y 2011. The study of causal relationships between stock markets indices and macroeconomic variables in Cote d'Ivoire: Evidence from Error-Correction Models and Granger causality test. *International Journal of Business and Management,* 6: 146-170.

Hosseini SM, Ahmad Z, Lai YW 2011. The role of macroeconomic variables on stock market index in

China and India. *International Journal of Economics and Finance,* 3: 233-243.

Hsing Y 2011. Macrodeterminants of the stock market index and policy implication: The case of a central European Country. *Eurosian Journal of business and Economics,* 4: 1-11.

Ibrahim M, Aziz, H 2003.Macroeconomic variables and the Malaysian equity market, *Journal of Economic Studies* 30: 6-22.

Ibrahim M, Wan SWY 2001. Macroeconomic variables, exchange rate and stock price: A Malaysian perspective. *IIUM Journal of Economics and Management*, 9: 141-163.

Inci AC, Bong-Soo L 2014. Dynamic relations between stock returns and exchange rate changes. *European Financial Management*, 20: 71-106.

Jareño F, Negrut L 2015. US stock market and macroeconomic factors. *The Journal of Applied Business Research*, 32: 325-340.

Jefferis K, Okeahalam C 2000. The impact of economic fundamentals on stock markets in Southern Africa. *Development Southern Africa,* 17: 23-51.

Johansen S, Juselius K 1990. Maximum likelihood estimation and inference on cointegration with applications to the demand for money. *Oxford Bulletin of Economics and Statistics,* 52: 169-210.

Johansen S 1991. Estimation and hypothesis testing of cointegration vectors in Gaussian Vector Autoregressive Models. *Econometrica*, 59: 1551-1580.

Khil J, Lee BS 2000. Are common stocks a good hedge against inflation? Evidence from the Pasific-rim countries. *Pasific-Basin Finance Journal,* 8: 457-482.

Kulathunga K 2016. Macroeconomic factors and stock market development: With special reference to Colombo Stock Exchange. *International Journal of Scientific and Research Publications*, 5: 1-7.

Mackinnon JG, Haug AA, Michelis L 1999. Numerical distribution functions of likelihood ratio tests for cointegration. *Journal of Applied Econometrics,* 14: 563–577.

Mangala D, Rani A 2015. Revisiting the dynamic relationship between macroeconomic fundamentals and stock prices: An evidence from Indian Stock Market. *International Journal of Financial Management*, 5: 53-63.

Maysami RC, Koh TS 2000. A Vector Error Correction model of the Singapore stock market. *International Review of Economics and Finance*, 9: 79-96.

Maysami RC, Howe LC, Hamzah MA 2004. Relationship between macroeconomic variables and stock market indices: Cointegration evidence from stock exchange of Singapore's All-S sector indices. *Jurnal Pengurusan*, 24: 47-77.

Mohd Y 2012. Macroeconomic variables and Malaysian Islamic Stock Market: A time series analysis. *Journal of Business Studies Quarterly,* 3: 1-13.

Moolman H 2004. *An Asymmetric Econometric Model of the South African Stock Market.* Pretoria: University of Pretoria.

Mukherjee TK, Naka, A 1995. Dynamic relations between macroeconomic variables and the Japanese Stock Market, An application of Vector Error Correction Model. *Journal of Finance Research,* 18: 223-237.

Ocran MK 2007. Interrelations Among Stock Prices of South Africa and the United States and the Rand/ Dollar Exchange Rate. *A Paper Presented at the 12th Annual Conference of the African Econometric Society,* Cape Sun Hotel, Cape Town, July 4-6, 2007.

Oseni IO 2011. Stock market volatility and macroeconomic variables volatility in Nigeria: An exponential GARCH approach. *European Journal of Business and Management*, 3: 2222-2839.

Pathan R Masih M 2013. Relationship between macroeconomic variables and stock market index: Evidence from India. *Munich Personal RePEc Archiv*, MPRA Paper 63302, University Library of Munich, Germany.

Puah CH, Jayaraman TK 2007. Macroeconomic activities and Stock Prices in a South Pacific Island Economy. *International Journal of Economics and Management*, 1: 229-244.

Ramaswamy R, Slok T 1998. The real effects of monetary policy in the European Union: What are the differences? *IMF Staff Papers,* 45: 374-396.

Subramanian M 2015. A study on impact of macroeconomic variables in the stock market. *International Journal of Economics and Management Studies,* 5: 25-33.

Westaway P 1999. Economic Models at the Bank of England. From <http://www.bankofengland.co.uk/publications/Documents/other/beqm/1999/five.pdf> (Retrieved on 14 May 2012).

Wongbangpo P, Sharma SC 2002. Stock market and macroeconomic fundamental dynamic interaction: ASEAN-5 countries. *Journal of Asian Economics*, 13: 27-51.

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