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AN ANALYSIS OF THE SOUTH AFRICAN FTSE/JSE ALL-SHARE INDEX AND THE MACROECONOMIC VARIABLES DURING THE PERIOD 2002 TO 2010

***Raphael T Mpofu* ***

Abstract

This article looks at the relationship between the monthly data series of the FTSE/JSE all-share index and macroeconomic variables in South Africa for the period 2002 to 2010. While the use of aggregate indices can be misleading when interpreting the actual performance of companies, there is a need for investors and portfolio managers to understand the dynamics of stock prices. The macroeconomic variables used in the study are the manufacturing and mining indices, JSE total return, prime overdraft rate, the exchange rates between the South African rand and the US dollar and the rate of inflation. The findings suggest that the FTSE/JSE index's correlation with the macroeconomic variables studied is statistically significant, a finding similar to studies done in other countries. It was also found that the mining index, a unique index to mining countries, had a non-significant positive correlation with the FTSE/JSE index.

Keywords: FTSE/JSE all-share index, South Africa, macroeconomic variables, money supply, foreign exchange, CPI, prime overdraft lending rate, mining index, manufacturing index

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1. Introduction

Despite a number of studies undertaken to understand the impact of macroeconomic variables on stock indices, investors and portfolio managers still fail to predict the future price movements of these indices. While this is a global problem, the view is that, it is worse in emerging markets due to limited studies having been undertaken in these markets. The relationship between stock prices and macroeconomic variables has been discussed in various literature, looking at links between stock prices and variables such as money supply, inflation rates, interest rates and exchange rates has been shown to impact on equity returns and portfolio investments. Studies by Fama (1981); Friedman (1988); Chen (1991); Mukherjee and Naka (1995); Nasseh and Strauss (2000) and Tatom (2002) have all shown that macroeconomic variables affect stock prices positively or negatively.

In recent years, because of increasing international diversification, the global financial crisis, gradual abolishment of capital inflow barriers and foreign exchange restrictions or the adoption of more flexible exchange rate arrangements in emerging countries, the developed and less developed markets have become interdependent. Phylaktis and Ravazzolo (2005) note that globalization has made exchange rates play an even bigger role in influencing stock prices.

With more open economies, the diminishing dominance of the US dollar, with certain Asian countries, notably China and Russia coming out strongly against using the US dollar as a currency of trade (Pravda, 2009); the challenges facing the European Union and the Euro; the opening up of capital movements in China, Russia and former eastern-bloc countries; have all made the importance of monitoring exchange rates that more important. These changes have increased the variety of investment opportunities as well as the volatility of exchange rates and risk of investment decisions and management of portfolios and diversification strategies. For this study, the foreign exchange rates provided a means to explore the international effects of foreign countries on the pricing of JSE equities. The prime overdraft rate represents the money market. Interest rates play an important role in stock price movements, thus they must be included in the model. Economic theory predicts that the short-term interest rates have a negative impact on stock returns. An increase in interest rates may raise financing costs, and then reduce future corporate profitability and stock prices. Nevertheless, Mukherjee and Naka (1995)

found a positive relation between Japanese stock prices and the short-term interest rates represented by call money rates.

The consumer price index is used as a proxy for price induced inflation on stock prices. Ajayi and Mougoue (1996) argue that a rising stock market price is an indicator of higher inflation expectations. The money supply can be linked to stock prices through portfolio substitution or inflationary expectation. An increase in the money supply may raise the discount rate through inflationary expectation and, in turn, reduce stock prices. Alternatively, an increased money supply could enhance stock prices via the liquidity effect, i.e. higher liquidity in the economy reduces the interest rate and, consequently, raises stock prices (Cheung and Ng, 1998).

A study on the relationship between macroeconomic variables and stock market performance in South Africa is vital in enabling investors and portfolio managers to optimally manage and track portfolio prices. South Africa, which is regarded as one of the most dynamic emerging markets, will provide global investors and portfolio managers tools to better manage price movements.

Basic time series data covering the period 2002-2010 was used in the study. The relationship between the FTSE/JSE index and the macroeconomic variables was tested using linear regression. The model was analysed to test for fit using regression coefficients, correlation matrix, R^2, standard error of the estimate, analysis-of-variance table, predicted values, and residuals. Also, 95%-confidence intervals for each regression coefficient, variance inflation factor, Durbin-Watson test, distance normal probability plots. The signs of the coefficients were as expected, and most of the macroeconomic variables showed significant relationships with the FTSE/JSE all-share index.

This study aimed at determining causality relationships between stock market prices and macroeconomic variables as well as measuring the magnitude and persistence of the responses in the index due to changes in macroeconomic fundamentals. This study also aims to contribute to information that most investors require when constructing an effective equity portfolio investment. The results of the study will provide general rather than specific information that could be useful for investors when building their equity portfolio investments. This study does not provide specific strategies for the investors to apply; instead, it aims to provide additional information that could be blended together with other information in order to generate more effective strategies in equity portfolio investment.

The next section provides the literature review on factors influencing asset prices and indices, the effects of inefficient asset pricing and a selected set of existing asset pricing techniques.

2. Review of Related Literature

Economists have demonstrated that the forces of demand and supply in a free economy determine the market price of an asset. Given this view point, there is a need to determine what these forces are. In the stock market, mostly in the secondary market where stocks are actively traded, it is accepted that stock prices are influenced by a number of factors. Ross (1976) modelled stock returns with macroeconomic variables whereby stock returns could be predicted with one variable (*βeta*) in a model previously developed by Sharpe (1964). However, later studies proved that this was not sufficient to cover the complexity of the capital markets. For example, Choi *et al.* (1992) investigated the impact of interest rates and exchange rates on stock returns and concluded that the interest rates and exchange rates did have an impact on share prices.

The Capital asset pricing model (CAPM) developed by Sharpe (1964) considers the risk-free return and volatility of the risk-free return to market return as the only determinants of stock price. Asset price as described by CAPM has a linear relationship with two independent variables. This approach has been criticized by some researchers Loderer et al. (1991), who stated that asset pricing is considered efficient if the price of the asset reflects all available market information leading to total elimination of outperforming the market or investor arbitrage behaviour. While the CAPM is still one of the mostly used models in determining stock prices, there still seems to be a need to look at the underlying factors that determine the risk exposure (*βeta*), risk free rate and market return associated with the components in the CAPM. The purpose of this study was therefore to determine these external factors that influence stock prices.

Earlier it was stated that the economist popular view is that the most basic factors that influence price of commodities are demand and supply factors. Purchases of equity assets lead to an upward movement in the stock price while sales of equity stocks lead to a price decline. It is the behaviour of investors that this study seeks to determine the causes of such decisions to purchase or sell, invest or disinvest, balance and rebalance their portfolios.

Government policies, macroeconomic variables, a firm's performance indicators, the competitiveness of an industry, and economic growth rate all have an effect on demand behaviour of investors, both in the primary and secondary markets. Docking and Koch (2004) argue that a direct

relationship exists between dividend announcement and equity price behaviour. Ologunde *et al.* (2006) found that interest rates had an impact on stock prices of firms on the Nigerian stock exchange.

The relationship between the stock market price and macroeconomic forces has been widely analyzed in finance and macroeconomic literature (Fama, 1981; Chen *et al.*, 1986; Kwon and Bacon, 1997; Flannery and Protopadakis, 2002; Hondroyiannis and Papapetrou, 2001; Masayami and Sim, 2001a; Park and Ratti, 2000; Praphan and Subhash, 2002). On a daily basis, stock price movements indicate that there are external shocks that influence these prices, albeit in different scales (Chen *et al.*, 1986). This invariably implies that any variation in macroeconomic variables contributes to certain shocks on stock prices. Masayami and Sim (2001b) and Binder *et al.* (2001) also suggest that stock market indices react differently towards changes in macroeconomic variables. Ewing *et al.* (2003) also confirmed these earlier findings of stock market indices being influenced by macroeconomic shocks on the five major Standard & Poor (S&P) market specific stock market indices. They found evidence that macroeconomic variables influenced the behaviour of the stock market. The finding revealed that some indices reacted more volatile to macroeconomic shocks than others.

Other studies have found that stock price movements can be attributed to changes in these macroeconomic variables directly or via the informational content or news feeds of various macroeconomic variables, such as interest rates, exchange rates, inflation indices, money supply and gross domestic product. These studies have also found that stock prices express the collective expectations of investors, and changes in these expectations determine investment success. Seen in this light, stock prices are driven by information-expectations on a number of economic factors and variables, mostly macroeconomic variables. Mitchell and Mulherin (1994) found that the number of Dow Jones announcements and the aggregate measures of securities market activity such as trading volumes and market returns are related. Fleming and Remolona (1999) found that new public information in the U.S. Treasury Market tends to set-off an adjustment process for prices, trading volume, and bid-ask spreads; and Doong, Yang and Wang (2005) found that investors in Asian markets tend to react more significantly to negative stock news originating from US sources. They conclude that variations in macroeconomic variables should always form a basis for analysing stock price movements.

A number of studies have been done in developed countries, such as the USA, Japan and Europe (Chen *et al.*, 1986; Chen, 1991; Clare and Thomas, 1994; Mukherjee and Naka, 1995; Gjerde and Saettem, 1999; Flannery and Protopapadakis, 2002), but very few studies are reported from emerging markets. One of the studies of note from emerging markets is by Doong *et al.* (2005) who looked at stock prices in South-East Asia. They found that in general, there was a causality relationship between a majority of macroeconomic variables, but found limited correlation between exchange rates and stock prices in Indonesia, Korea, Malaysia and Thailand. This confirmed findings from an earlier study by Ibrahim (2000), who found evidence of a causality relationship between stock prices and multiple variables, which include money supply, exchange rates, interest rates and inflation. Other studies in Eastern Europe also confirm that there is a causality relationship between stock prices and macroeconomic variables (Wongbangpo and Sharma, 2002; Hondroyiannis and Papapetrou, 2001).

In the most recent times, investors have become more involved in asset allocation decisions. This has placed a greater demand on portfolio managers to be more analytical in diversification decisions in order to minimize the portfolio risks as well as maximize the overall return from an investment (Grubel, 1968; Lessard, 1973; Lin, 2000; Surz, 2007). This study aims at determine if "information factors" or macroeconomic variables affect the FTSE/JSE index as well as examining the extent of this effect.

The next section looks at the data and the sources, the data restructuring and the model used for data analysis, which will be followed by a discussion and interpretation of the results, leading to a conclusion and recommendations.

3. Materials and Methods

3.1 The hypothesized model

The basis for the model is that macroeconomic variables have a deterministic impact on stock market prices. The statistical tests were carried out on monthly time series data on the FTSE/JSE (ALSI) all-share index (the dependent variable) against the following independent macroeconomic variables: manufacturing index (MFGINDX); the mining index (MININDX); the consumer price index (CPI); the JSE total return (JSEVAL); the prime overdraft rate (PRIME) as representing the interest rate at which investors borrow or lend money and the rand exchange rate against the US dollar (USAX).

The independent variables were then tested for testing the following hypotheses and a model was developed as shown below: The general model tested is as follows:

$$ALSI_t = \int (MFGINDX_t, CPI_t, JSEVAL_t, PRIME_{t,} MININDX_t, USAX_t)$$

The following hypotheses were made:

- There is a positive relationship between the ALSI and MNFINDX, JSEVAL, USAX and MININDX

- There is a negative correlation between ALSI and PRIME & CPI

It was hypothesised that there is a positive relationship between ALSI and MNFINDX & MININDX. We hypothesise that a buoyant economy leads to increased economic activity and corporate profitability through the increase in output, cash flows, and dividends paid, which will lead to higher stock prices. A recession will have the opposite effect. This is supported by research done by Geske and Roll (1983), Mukherjee and Naka (1995), Ibrahim (2000), Handroyiannis and Papapetrou (2001), Wongbangpo and Sharma (2002), and Ibrahim and Aziz (2003).

It was also hypothesised that a positive correlation exists between the ALSI and USAX, since the strengthening of the domestic currency against major trading partners brings about an increase in the competitiveness level of a country. This, it is assumed, will lead to better profitability and company value as reflected by higher stock prices (Solnik, 1987; Soenen and Hennigar, 1988; and Mukherjee and Naka, 1995).

The hypothesis that ALSI and JSEVAL are positively related can be explained by their joint dependency on the rate of information flow. The model suggests that price and volume change simultaneously in response to new information Girard and Biswas (2007.

The hypothesis that CPI and ALSI are negatively correlated is derived from studies by Bodie (1976), Fama and Schwert (1977), Fama (1981) and Jaffe and Mandelker,(1976) who demonstrated that expected inflation, unexpected inflation, and changes in the expected inflation are all inversely related to both nominal and real stock returns (ALSI). They contend that the negative stock return–inflation relations are induced by a combination of money demand theory and quantity theory of money.

This is also supported by studies on money supply. Studies have found that an increase in the money supply generates an excess supply of money which can lead to an excess demand for equity stocks leading to a surge in stock prices. There is also a possibility of a negative impact on stock prices due to an increase in money supply portfolio substitution effects: changes in the equilibrium position of money in relation to other assets in the portfolio can lead to a rebalancing of a portfolio, which in turn can lead to a drop in demand for stocks in favour of cash holdings. This, according to the studies, is due to the inflationary impact of increasing money supply leading to higher returns for cash holdings. Mukherjee and Naka (1995) found a positive long-run relation for Japan, also supported by Maysami and Koh (2000) for Singapore in a later study. Ibrahim and Aziz (2003) identify a negative relationship for Malaysia. Although Sprinkel (1964) found a strong relationship between U.S. stock prices and money supply using data from 1918 through 1960, later studies found no causality (Rozeff, 1974; Kraft and Kraft, 1977). No causality was found for UK stock either (Diacgiannis, 1986; Poon and Taylor, 1991; Cheng, 1995; Clare and Thomas, 1994).

It is also hypothesised that there is a negative correlation between PRIME and ALSI, and this is based on studies that have shown that the volatility of interest rates is critical for asset pricing. According to the asset pricing model used for stocks, an increase in the interest rates is seen as raising the required rate of return, which negatively affects the asset's present value, that is, its current price (or ALSI in this study). Nominal interest rates are regarded as having an opportunity cost, which in turn influences their portfolio compositions. An increase in the opportunity cost will influence investors to substitute equity stocks for other assets, for example, fixed income portfolios, like government bonds in their portfolios. Therefore, an increase in interest rates has a negative effect on stock prices from the perspective of asset portfolio allocation, while a decrease in interest rates is expected to have an opposite effect.

The literature review and the theoretical framework discussed have formed the basis for the methodology adopted in the study. In the next section, the methodology is discussed, with emphasis being placed on the statistical techniques used and the assumptions made.

3.2 Methodology

South African stock price data is as calculated by the FTSE/JSE covering the period 2002 to 2010. A longer period was not possible due to changes in the calculation method of the index prior to January 2002. Macroeconomic variable data is obtained from Statistics South Africa and the South African Reserve Bank. The data is also verified where it is held in both databases. The data for all macroeconomic variables is available from the 1960s except for the CPI, which is only available from 2002 due to changes in the base

year used to calculate the index, as well as the basket of goods used in the composition of the CPI.

This study employed a multiple regression approach in analysing the time series data to determine the relationship between the FTSE/JSE index and the macroeconomic variables. In a multiple regression model, where more than two independent variables are analysed, multicollinearity between variables may not be ruled out. The literature on multicollinearity can be divided into three major topics: (1) under what conditions multicollinearity will occur; (2) how multicollinearity problems can be detected; and (3) how multicollinearity should be managed. Mason and Perreault (1991) have documented the conditions under which multicollinearity may pose problems in regression. They show that multicollinearity leads to inaccurate estimates of coefficients and standard errors as well as inference errors, but they also argue that the problem should not be viewed in isolation, and that a high R^2 and large sample size can offset the problems caused by multicollinearity. Mason and Perreault (1991) conclude that increasing the "explained variance" in the dependent variable mitigates the effects of multicollinearity. Removing measurement error should increase the amount of variance explained by the structural model and therefore mitigate multicollinearity.

Schmidt and Muller (1978) discuss three specific methods for assessing multicollinearity: (1) the multiple correlations between the independent variables; (2) the Haitovsky test, which assesses singularity of the correlation matrix of the independent variables; and (3) the determinant and Eigenvalues of the correlation matrix of the independent variables. However, these methods have limitations because they do not provide clear guidelines about when multicollinearity is likely to cause inference errors.

Kaplan (1994) reviews several general methods that can be used to detect multicollinearity, including inspection of the (1) correlation matrix of the predictor variables, (2) correlation matrix of the path coefficients, (3) determinant of the correlation matrix of the predictor variables, (4) sign of the path coefficients, and (5) variance inflation factors (VIF). This study used VIF as produced in SPSS to determine which variables had serious multicollinearity and had to be removed from the analysis.

A multicollinearity test was therefore conducted for all the independent variables. This was done by first standardizing the data set and then calculating a correlation matrix using Pearson Coefficient of correlation. The decision was to drop all those variables with VIFs greater than 10.

4. Results and Discussion

4.1 Multicollinearity tests

As discussed in an earlier section, where more than two independent variables are tested for a relationship with a dependent variable, multicollinearity between variables has to be tested. A multicollinearity test was conducted for all the independent variables using the Pearson coefficient of correlation. Table 1 presents the initial list of variables identified for the study before a multicollinearity test was run. Table 2 below shows the final list of macroeconomic variables after the multi-stage multicollinearity tests in the form of a VIFs and Eigenvalues had been run. The variance inflation factors (VIFs) observed in the collinearity table are less than 10 while the 5 out of the 6 variables have Eigenvalues that are less than 1. From the table, it is clear that there is very little multicollinearity and the regression model serve the purpose of the study, which was to determine if there is a relationship between ALSI and the macroeconomic variables.

Table 1. Initial Variables before multicollinearity tests

Variable	Variable Label
MS	Money supply as defined by M1
GOVI	Secondary Market: BEASSA Government Bond index
ALBI	Secondary Market: BEASSA All Bond total return index
JSEVAL	JSE Total Return
AUSX	Foreign exchange rate : SA cent per Australian dollar Middle rates (R1 = 100 cents)
PULAX	Foreign exchange rate : SA cent per Botswana pula Middle rates (R1 = 100 cents)
ECUX	Foreign exchange rate : SA cent per ECU Middle rates (R1 = 100 cents)
YENX	Foreign exchange rate : SA cent per Japanese yen Middle rates (R1 = 100 cents)
CHNX	Foreign exchange rate: SA cent per China Yuan Middle rate (R1 = 100 cents)
UKPX	Foreign exchange rate : SA cent per UK pound Middle rates (R1 = 100 cents)
USAX	Foreign exchange rate : SA cent per USA dollar Middle rates (R1 = 100 cents)
NOM15X	Nominal effective exchange rate of the rand: Average for the period - 15 trading partners
REAL15X	Real effective exchange rate of the rand: Average for the period - 15 trading partners
PRIME	Prime overdraft rate
CPI	Consumer Price Index
MFGINDX	Manufacturing Index
MININDX	Mining Index

Table 2. Multicollinearity Statistics-Final Variables

		Collinearity Statistics		
Variable	**Variable Label**	**Tolerance**	**VIF**	**Eigenvalue**
				2.383
JSEVAL	JSE Total Return	.117	8.548	2.147
USAX	Rand-US Dollar Exchange Rate	.345	2.903	1.000
PRIME	Prime overdraft rate	.468	2.137	.980
CPI	Consumer Price Index	.195	5.135	.244
MFGINDX	Manufacturing Index	.309	3.231	.176
MININDX	Mining Index	.234	4.276	.069

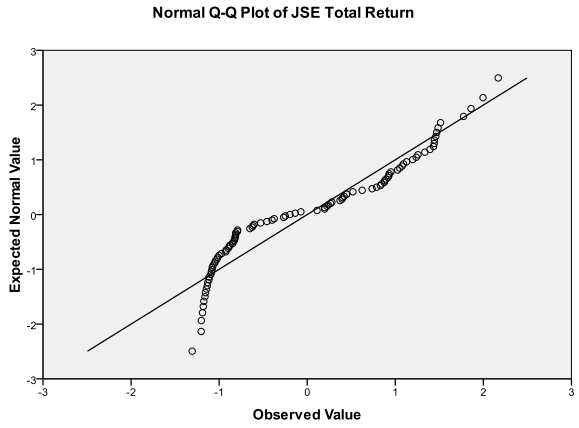
4.2 Descriptive Analysis

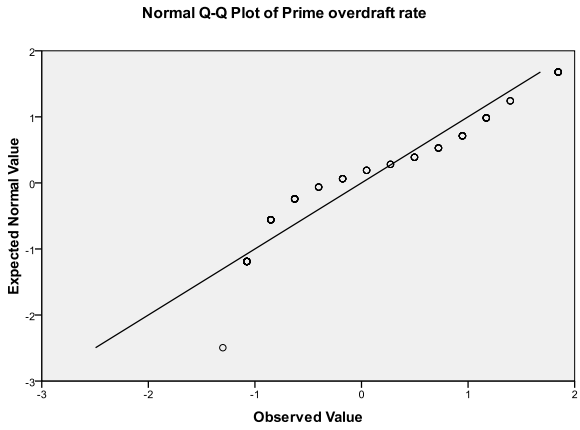
Table 3 provides the summary statistics for all the macroeconomic variables in this study. It reveals that the distribution of the series could be considered as slightly dispersed as represented by the standard deviation values. On the other hand, the skewness of the distributions was considered as approximately normal as its values were closer to zero. Normal distributions produce a skewness statistic of about zero. The results from this analysis also revealed that the kurtosis values for all of the series were less than 2.0 and so are acceptable. The negative value indicates the possibility of a platykurtic (flat) distribution. This finding provided a general indication that the distributions of the series of macroeconomic variables were normal.

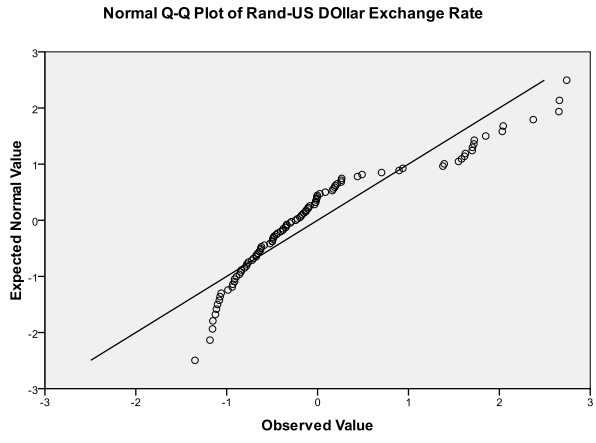
Table 3. Descriptive Statistics for All Macroeconomic Variables

						Skewness		Kurtosis	
	N	Minimum	Maximum	Mean	Std. Deviation	Statistic	Std. Error	Statistic	Std. Error
JSE Total Return	99	-1.306	2.169	.000	1.000	.347	.243	-1.291	.481
Rand-US Dollar Exchange Rate	99	-1.349	2.741	.000	1.000	1.154	.243	.496	.481
Prime overdraft rate	99	-1.301	1.845	.000	1.000	.489	.243	-1.168	.481
Consumer Price Index	99	-1.542	2.101	.000	1.000	.787	.243	-.694	.481
Manufacturing Index	99	-2.805	2.710	.000	1.000	-.385	.243	-.150	.481
Mining Index	99	-1.541	2.383	.000	1.000	.622	.243	-.807	.481
Valid N (listwise)	99								

The information concerning the normality distribution of the series for macroeconomic variables could also be observed in the normal probability plot as shown in Figure I. The fitted line in the normal probability plot was more or less a straight line for all macroeconomic variables. This finding demonstrated that the macroeconomic variables were normally distributed.







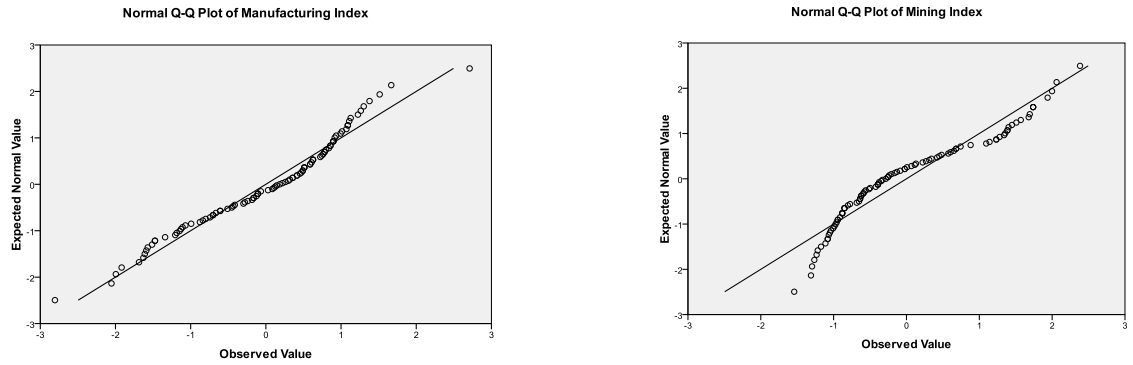


Figure 1. Normal Probability Plots

4.3 Discussion of Findings

A regression analysis was then run on the independent variables MFGINDX, MININDX, PRIME, USAX, JSEVAL and CPI. The dependent variable is the ALSI. Tables 4 to 6 show the results of the regression analysis.

Table 4. Regression model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
	.967[a]	.934	.930	.2647674

Table 5. Analysis of variance (ANOVA)

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	91.554	6	15.259	217.670	.000[a]
Residual	6.449	92	.070		
Total	98.004	98			

Table 5. Regression coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	.000013	.027		.000	1.000
JSE Total Return	.315	.078	.315	4.029	.000
Rand-US Dollar Exchange Rate	.053	.046	.053	1.167	.246
Prime overdraft rate	-.177	.039	-.177	-4.526	.000
Consumer Price Index	.239	.061	.239	3.935	.000
Manufacturing Index	-.073	.048	-.073	-1.519	.132
Mining Index	.534	.055	.534	9.661	.000

The following hypotheses are accepted:

- There is a significant positive relationship between ALSI and JSEVAL
- There is a positive relationship between ALSI and USAX but the relationship is not very significant
- There is a significant negative relationship between ALSI and PRIME
- There is a significant positive relationship between ALSI and CPI
- There is a negative relationship between ALSI and MFGINDX but the relationship is not significant
- There is a significant positive relationship between ALSI and MININDX

According to the model developed, it can now be represented as follows:

$$ALSI_t = \int (MFGINDX_t, CPI_t, JSEVAL_t, PRIME_t, MININDX_t, USAX_t) \text{ or;}$$

$$ALSI_t = 0.000013 - 0.073MFGINDX + 0.239CPI + 0.315JSEVAL - 0.177PRIME + 0.534MININDX + 0.053USAX$$

The all-share index (ALSI) is highly sensitive to variation as indicated by R^2 of 0.934. In other words, according to our model, 93.4% of the variation in the FTSE/JSE all-share index is explained by the macroeconomic independent variables. The variability as measured by the coefficient of variation (*βeta*) is positive for JSEVAL (0.315), USAX (o.o53), CPI (0.239) and MININDX (0.534) and is negative for MFGINDX (-.073) and PRIME (-.177).

The positive MININDX's coefficient in relation to the all-share index is in agreement with some other studies (Ibrahim 2003; Mukherjee and Naka 1995; Chaudhuri and Smiles, 2004). While the relationship between the MININDX and ALSI is accepted, the hypothesis that the positive relationship is significant is not accepted. This would be explained by the fact that although mining contributes significantly to the South African foreign exchange earnings and exports, its contribution to GDP is less than 3 percent. In addition, the market capitalisation of mining equities on the JSE is less than 4%.

The *βeta* for the JSEVAL and PRIME were found to be insignificant based on p-values of 0.4029 and -4.526 respectively. The MFGINDX's coefficient is negative and insignificant. This is unexpected. Studies in developed countries have proved that the production index in those countries played a significant role in driving the equities value of those markets. It would seem, however, that the South African economy's dependence on manufacturing is insignificant. It underlies the current debate that economic development, as it happened between 1870 and 1910, is being driven by commodity trade (Russia, Nigeria, and Middle East).

The relationship between ALSI and USAX has a positive *βeta* of 0.053 and a low p-value of 1.167, which is not statistically significant. The low significance is also unexpected based on findings from developed countries that show that local and foreign investors tend to invest in an economy that has a strong and stable currency. The rand has over the last ten years exhibited such characteristics. This anomaly could be explained by the current foreign exchange control regime in place, which does not allow for free movement of capital. Since 1998 the rand has been gaining against the US dollar and studies show that a strengthening currency is likely to negatively affect demand for a country's equities by foreign investors and is also likely to encourage local investors to purchase foreign equities. This does, however, confirm however the positive correlation between USAX and ALSI since the exchange rate is expressed as one unit of local currency equivalent to a foreign unit of currency. The hypothesis that foreign exchange rate affects the all-share index significantly is not accepted although there is acceptance of its positive effect on ALSI.

The other variable that was found to be significant is PRIME, which exhibited a negative *βeta* of -.177 and a low p-value of -4.526. The negative coefficient of PRIME is in agreement with the findings of Al-Qenae et al. (2002) and Mukherjee and Naka (1995). The prime overdraft lending rate is a strong tool in influencing economic growth and is used by the South African Reserve Bank as a monetary policy tool. The monetary policy premise is that with prime interest rates dropping, the level of consumer borrowing will increase leading to more cash being available for equity investors. Increased demand for stocks will lead to an increase in the value of ALSI. This would also be supported by another, highly correlated variable; money supply as measured by M1, that money supply has positive effect on ALSI via the liquidity effect. The stock price is positively related to output which also positively correlates with the money supply. The positive relation between stock prices and the money supply is empirically supported by Bulmash and Trivoli (1991), Abdullah and Hayworth (1993), and Mukherjee and Naka (1995). The hypothesis that PRIME negatively affects ALSI significantly is accepted.

As was expected, this study shows that ALSI and CPI are negatively correlated, as shown by a significant positive *βeta* of .239 and a p-value of 3.935. Studies appear to support the premise that inflation equities are an imperfect hedge for inflation in the short- and medium-term, and are much better hedges in the long-term than the short-term. The period of study was over an eight year period, which would border closer to medium term horizon for investors. The findings in this study therefore seem to contradict this belief and can only be explained by other studies that have found that equities should be inflation neutral, with only unanticipated inflation negatively impacting them (Abdullah and Hayworth, 1993; Ajayi and Mougoue, 1996; Cheung and Ng, 1998). The South African Reserve Bank's inflation targeting policy has between 2000 and 2009 been failing to contain inflation within the target bracket, and this could explain why the study's findings show

a significant positive relationship; investors' inflations expectations are that inflation is on an upward trend.

For the purposes of the study, these results are satisfactory, and a summary conclusion is presented in the next section.

5. Conclusion

The forces of demand and supply have a direct effect on the stock price while the other macroeconomic variables influence the demand and supply of stocks. The impact, positive or negative, makes predicting stock market index movements difficult. For example, the overdraft prime lending rate in South Africa is used as an instrument of government monetary policy. The monetary policy decision made on interest rates by the South African Reserve Bank's Monetary Policy Committee is aimed at curbing inflation (CPI) growth, that is, contractionary effects on the consumer price index. The policy implications are however much more complicated and affect a number of other, sometimes seemingly unrelated aspects of business and commerce, like demand for equities on the JSE. This study sought to investigate macroeconomic variables' relationship with the FTSE/JSE all-share index.

This study analysed the relationship between the FTSE/JSE all-share index and six macroeconomic variables using monthly time series data during the period January 2002 and March 2010. It was observed that a negative relationship exists between stock prices and prime interest rates and the manufacturing production index; while a positive relationship existed between stock prices and the mining index, the JSE total returns, the exchange rate between the South African rand and the US dollar and the rate of inflation (CPI).

The study has contributed to existing literature in confirming existing theories; or raising new questions about certain findings that could be true in developed countries but not necessarily so in emerging economies. The findings from this study can contribute significantly to information needed by investors when they make decisions on diversifying their portfolio in various sectors by encompassing it with other relevant information in achieving maximum return at minimum level of risk. Hence, the findings from this study will provide important guideline for investors in formulating their portfolio investment strategies in maximizing overall returns. In addition, policy makers who are concerned about the growth of the capital market are better informed on how to deploy monetary policy instruments as well other macroeconomic variables to achieve the desired market growth.

One of the principal motivations of this study was to identify the relationship between market macroeconomic variables in South Africa and the FTSE/JSE all-share index during the period January 2002 and March 2010. Six of the macroeconomic variables in the study were found to have some correlation and influence on the movement of the FTSE/JSE all-share index.

There are several possible directions for future investigations. First, it is proposed that the data set should include other macroeconomic variables, such as the gross domestic product, trade balance, oil prices, long-term interest rates, financial index, resources index and bond prices. This would probably show some differences in the properties of the index as compared to the present study as the South African economy becomes more and more intertwined with global markets.

Secondly, it would also be interesting to look at data from other emerging markets. The results from such studies could provide useful information concerning country equity indices in various financial markets, particularly in terms of direction of response and magnitude of effect arising from to variations in macroeconomic variables.

Finally, additional tests can be done to determine the reactions of equity indices towards changes in economic cycles in South Africa. A similar study could be undertaken in other emerging markets.

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