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Macroeconomic Determinants of Share Prices in the Nigerian Capital Market

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Abstract

This study aims to determine the effects of macroeconomic variables on share prices in the Nigerian capital market. Empirical results show that macroeconomic variables have varied effects on stock prices. Regressing secondary data on the all-share index on the consumer price index, interest rate and productivity index from 1985-2013 shows that there exists negative relationship between these variables and share prices necessitating the introduction of fiscal and monetary policies that will reduce inflation, interest rate and improve industrial production to improve corporate earnings, dividends, share prices, capital gains; reduce investor apathy to share trading, improve equity trading in the Nigerian capital market and speed recovery of the market from the recent crash.

JEL classification numbers: E31, E43, E44, G12
Keywords: Macroeconomic variables, stock prices, interest rate, inflation, firm production, capital market

1 Introduction

Macroeconomic variables: inflation, interest rate and domestic industrial production, are known to affect economic transactions including capital market trading, returns and pricing. Chen et al (1986) noted that no satisfactory theory argues that the relation between financial markets and the macro economy is entirely is entirely in one direction. Results on relationship between macroeconomic variables and share prices may be positive or negative. Interest rate variations increases interest expense of highly leverage firms, reducing cash flows available for future dividend payments with negatives affect on share prices. The opportunity cost of equity investments also increases as interest rate makes bonds more attractive given its risk-return nature; with investors adjusting their portfolios, purchasing more bonds with negative effect on prices of stocks. Domestic production increases firm

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sales, income and dividend with positive effects on share prices. Changes in general price affects cash flows and increases expected return of investors and stock prices. What relationships exist between share prices in the Nigerian capital market and inflation, interest rate and industrial production?

1.1 Objective of the Study

The objective of this study is to determine the nature of the relationships existing between macroeconomic variables: inflation, interest rate and national industrial productivity and share prices in the Nigerian capital market.

1.2 Research Hypotheses

The following hypotheses are tested in this study on assured relationship between identified variables:

1. H_o: There exists no significant positive relationship between macroeconomic variables: inflation, interest rate and national productivity and share prices in the Nigerian capital market.
2. H_i: There exists a significant positive relationship between macroeconomic variables: inflation, interest rate and national productivity and share prices in the Nigerian capital market.

2 Theoretical Framework and Review of Literature

2.1 Theoretical Framework

Studies abound in capital market literature (Fama, 1981; Moya-Matinez et al, 2013; Poon and Taylor, 1991; Murherjee and Naka, 1995; and Gan et al, 2006) on relationships between stock prices and inflation, interest rate and domestic industrial production. Inflation affects real cash flows and expectations on investment as cost of equity, K_e which in turn increases stocks prices with positive effects on capital gains. Domestic industrial productivity increases firm sales, profits and dividend (a determinant of stock prices). Variations in interest rate according to Moya-Martinez et al (2013) and Graham and Harvey (2001) create much uncertainty to firms. This variation they argued affect both the firm's expectations about future corporate cash flows and the discount rate employed to value the cash flows, indirectly affecting firm value. Bartram (2002) contended that this phenomenon exerts a significant influence on firms as it affects financing costs and the value of financial assets and liabilities held by these firms; and seen to vary across time scales according to investment horizons of investors. Using the wavelet-based approach to ascertain determinants of stock prices in Spain, Moya-Martinez et al (2013) concluded that prices of shares of regulated industries as utilities, heavily indebted industries as real estate, food and beverages and the banking industry were most sensitive to interest rate variations.

2.2 Review of Literature

Macroeconomic variables and stock prices

Empirical evidences abound in literature supporting arguments of existing relationships between macroeconomic variables and stock prices. Findings by Arango et al (2002) showed some evidence of non-linear and inverse relationship between share prices on the Bogota stock market and the interest rate as measured by the interbank loan interest rate. A relative analysis of effects of industrial production and interest rates on stock prices by Gjerde and Saettem (1999) revealed that interest rates have a closer linkage with stock returns as an increase in interest rate encourage rise in rates to the industrial sector with negative effects on stock prices; contending that industrial production generates a delayed positive response of stock prices. Using the Granger-Causality test on capital market data from January 1992-December 2008 in China to determine whether the Shanghai Composite Index (SCI) is a leading indicator for macroeconomic variables, Garza-Garcia and Yu (2010) concluded that Chinese stock prices are determined by changes in domestic variables: inflation, industrial production, money supply, short-term interest rate and exchange rate. Chan and Lo (2000) noted that Chinese A-share market values are closely related with domestic macroeconomic variables. On the contrary, Poon and Taylor (1991) argued that macro-economic variables do not affect share prices in the UK. Using the industrial production and short and long-term interest rates data, Nasseh and Strauss (2000) concluded that a significant relationship exists between these variables and stock prices in six European economies. Findings by Murherjee and Naka (1995) from their study of the Japanese stock market showed that industrial production, inflation and long-term government and bank interest rate affect stock prices. Similar results were by Hussainey and Ngoc (2009), Geske and Roll (1983) and Fama (1981). Findings by Gan et al (2006) in New Zealand and Kwon and Shin (1999) in South Korea did not support this finding.

Using historical data on share returns, dividends, productivity of R&D capital, patent capital and fixed capital over 80 years for 11 OECD countries (G7 countries, Australia, Netherlands, Sweden and Denmark), Davis and Davis (2008) concluded that the sharp increase in equity prices over the 1990's was widely attributed to permanently higher growth derived from sales in new markets from R&D efforts which increased earnings and dividends. Furthering, Hall (2001, 2000), Hobijn and Jovanovic (2001) and Greenwood and Javanovic (1999) argued that the significant generation of intangible assets during the information and communication revolution in the 1990's improved firms' operations and reduced cost with positive effects on corporate profits and dividend growth. Applying Tobin's q model of the interaction between capital productivity shares and equity prices, Madsen and Davis (2004) concluded that changes in equity prices precedes the impact of the shock to productivity if equity markets react in a forward-looking way to news of innovations; with stocks leading to higher tangible and intangible capital stock in the long-run with equity prices reverting back to a long-run equilibrium. To the IMF (2000) and Shiller (2000), increases in share prices in Europe in the 1990's seem attributable to decreases in risk premium, higher international liquidity, disinflation and irrational exuberance. On the contrary, Campbell and Shiller (2001) argued that the equity price boom in the 1990's was attributable to accelerating labour productivity which increased output and output/hour.

Findings by Kiley (2000) showed that share prices drop on impact in response to positive productivity innovations caused by adverse interest rate effects. Fama (1981) observed that expected inflation may be negatively correlated with shocks to future growth which affect

share prices. Furthering, Balvers et al (1990) noted that in markets with risk averse agents, stock returns vary with the state of the business cycle.

Fluctuations in interest (which depends on the minimum rediscount rate of the Central Bank) to Wong (2010), affects share prices as reduction in this rate affects returns on bonds with a spiral negative effect on returns on shares. Furthering, Wong (2010) noted that a reduction in interest rate may stimulate the economy, increasing corporate profits, dividends and growth rate of dividends. This argument is supported by Osuagwu (2012), contending that share prices are affected by monetary policy as interest rate on bonds is function of the minimum rediscount rate of the apex bank. Findings by Bohl et al (2007), Erdem et al (2005), Eleftherious (2002) and Lobo (2002) showed a positive relationship exists between stock prices and interest rate. This positive relationship to Bohl et al (2007) relies on the heteroskedascitity in interest rates and stock returns; contending that this exists when shocks create great volatility in the stock market. Countering, Reilly et al (2007), Puah and Jayaraman (2007), McMillan (2005) from studies in USA, Paul and Mallik (2003), Wongbangpo and Sharma (2002) from studies in Indonesia, Malaysia, Philppine, Singapore and Thailand, Apergis and Eleftheriou (2002) in Athens and Gjerde and Saettem (1999) from studies in Norway identified a negative relationship between stock prices and interest rate.

Examining the existence of speculative bubbles in Central European stock market and its effects on stock prices using the stock market indices and the prices of individual stocks with the highest capitalization, Oleg et al (2013) concluded that no significant bubbles in asset prices existed except for Polish stocks of chemical companies from 2004-2007, and Czech and Hungarian stocks of new and prospective sectors. Testing the effect of macroeconomic variables on the Ghana Stock Exchange, Kyereboah-Coleman and Agyire-Tettey (2008) concluded that lending rates and inflation rate affect the performances of the stock market. This result supports findings of Fama (1981). Replicating this study in Vietnam capital market, Hussainey and Ngoc (2009) observed that there are statistically significant associations among the domestic production sector, money markets and stock prices. To McMillan (2005), a significant positive association exists between industrial production and stock prices in the USA; attributing this to the fact that an increase in real sector production raises cash flows in the future with attendant increases in future dividends. Canova and de Nicolo (1995) observed that news of international variables can contain information on the future trends of home variables. Findings by Dickinson (2005) from studies of the USA, UK, France and Germany showed evidences of short-run interactions among international stock indices. Nasseh and Strauss (2000) attributed the result in the European markets to the integration of fiscal and monetary policies of these countries as cross-border factors are seen as domestic variables.

Findings by Reilly et al (2007), Dinenis and Staikouras (1998), Prasad and Rajan (1995) and Lynge and Zumwalt (1980) showed that interest rates negatively and significantly affects stock prices. To Graham and Harvey (2001), interest risk is seen as the second most important determinant of share prices. Furthering, Moya-Martinez et al (2013) opined that variations in interest rates affect both the expectations of the firm about future cash flows and the discount rate for valuation of these flows and firm value. They stressed the likelihood of a connection existing between interest rates and stock prices, observing a variation in this connection across time scales according to the investment horizon of investors. In times of speculative trading, these arguments seems plausible as Moya-Martinez et al (2013) concluded that the association between interest rate and share prices are strongest at the "coarsest time scales than at the finest ones".

Empirical results from the study of the Spanish stock market by Moya-Martinez et al (2013) showed that the market exhibits a remarkable degree of interest rate exposures with observable differences across industries depending on the time horizon considered, based on the argument that Spanish firms are adversely affected by interest rises which in turn adversely affects earnings, dividends and share prices. This result supports findings of Reilly et al (2007), Dinenis and Staikouras (1998), Prasad and Rajan (1995) and Lynge and Zumwalt (1980) across all industries. The availability of advanced tools for managing interest rate risks has according to Korkeamaki (2011), Czaja et al (2009), and Ryan and Worthington (2004) reduced interest rate risk exposures of firms. On the sensitivity of share prices to movements in interest rates in time horizons, Ferrer et al (2010), Czaja et al (2009), Bartram (2002) and Oertmann et al (2000) argued that such sensitivities are greater in responses to movements in long-term interest rates than variations in short-term rates

3 Research Methodology

3.1 Research Design

The research design used for this study is the survey design.

3.2 Study Population

The population for this study is Nigeria as macroeconomic variables: inflation, interest rate, national productivity, and prices of all listed stocks in Nigeria are brought under study.

3.3 Study Samples and Sampling Technique

The sample for this study is Nigeria, purposively sampled for the study as study variables are national variables affecting the entire nation.

3.4 Sources of data

Data for this study are secondary data on the all-share index (a composite price of all listed stocks on the Nigerian Stock Exchange), inflation (measured by the consumer price index), interest rate and national industrial productivity (measured by the productivity index) obtained from the CBN Statistical Bulletin (2013).

3.5 Validity and Reliability of Data

The CBN Statistical Bulletin is the official data bulletin of the Federal Government of Nigeria. The data contained therein are certified as authentic by the Central Bank of Nigeria (CBN), the Bureau of Statistics, and the ministry of finance. Thus the data are valid and reliable.

3.6 Data Analysis Technique

To determine the relationship existing between identified macroeconomic variables and stock prices, we use the ordinary least square model:

$$STP = \alpha + \beta 1INTR + \beta 2INFL + \beta 3INPRIX + \mu$$

Where STP = stock prices
INFL = inflation
INTR = interest rate
INPRIX = industrial productivity index

3.7 Data Presentation and Analysis

Prices of equities on the Nigerian Stock Exchange proxied by the all-share price index, interest rate, inflation proxied by the all-composite price index and firms' productivity proxied by the productivity index data for the period 1985-2013 for the study are presented in table 1.

Table 1: All-share price index, interest rate, all-composite price index and productivity index

Year	All-share price index	Interest rate	All composite price index	Productivity index
1985	127.3	11.75	1.0	160.86
1986	163.8	12.00	13.7	162.96
1987	190.9	19.20	9.70	169.28
1988	233.6	17.60	61.2	179.35
1989	325.3	24.60	44.7	183.96
1990	513.8	27.70	36.5	162.9
1991	783.0	20.80	23.07	178
1992	1107.6	31.20	48.81	169.5
1993	1543.8	36.09	61.3	145.5
1994	2205.0	21.00	76.8	144.2
1995	5092.2	20.79	51.6	139.2
1996	6992.1	20.86	14.3	138.7
1997	6440.5	23.32	10.2	144.2
1998	5672.7	21.34	11.9	133.1
1999	5266.4	27.19	0.2	137.7
2000	8111.0	21.55	14.5	138.2
2001	10963.1	21.34	16.5	146.2
2002	12137.7	30.19	12.1	148.0
2003	20128.9	22.88	23.8	148.0
2004	23844.5	20.82	10.09	145.7
2005	24085.8	19.49	11.61	145.8
2006	33189.3	18.70	8.61	145.7
2007	57990.2	18.36	6.6	89.7
2008	31450.8	21.15	15.1	91.1
2009	20827.2	23.70	12.9	117.8
2010	24770.5	21.86	11.8	118.2
2011	20730	23.21	10.3	1122.1
2012	28078.81	24.61	12.0	136.9
2013	41329.19	24.90	8.0	138

Source: Central Bank of Nigeria Annual Reports and Accounts 2009 and 2013, and Statistical Bulletin 2013.

The all-share index increased from 127.3 in 1985 to 41329.19 in 2013. Within the same period, National interest rate increased from 11.75% to 24.90%. The all composite price index increased from 1.0 in 1985 to 8.0 2013. Within the period, productivity index declined from 160.86 to 138.

Relationships between identified variables are shown in fig.1:

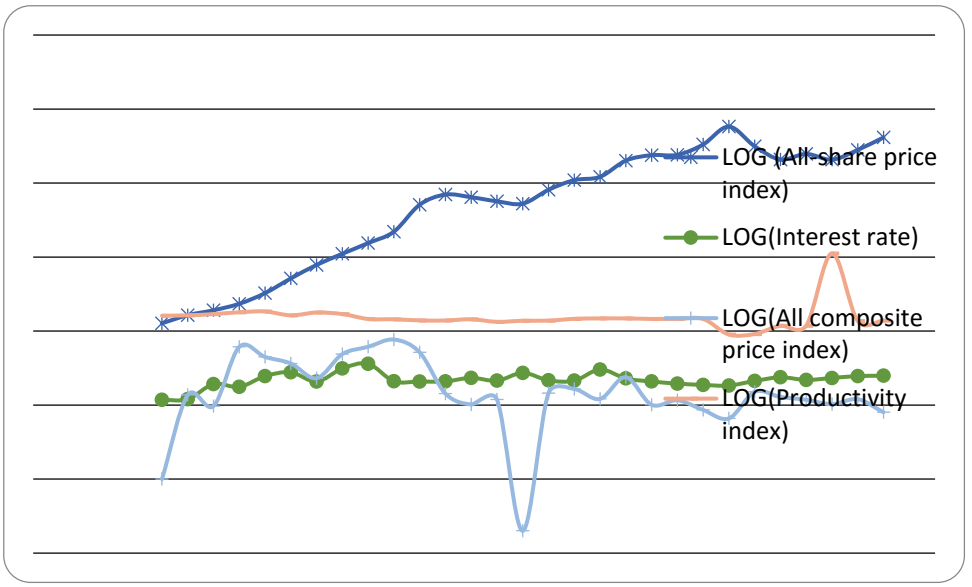

Figure 1: Relationships between the all-share index, inflation, interest rate and industrial productivity index

Analyzing the data on table 1 using the OLS, the resultant regression equation is:

$$STP = 79780.62 - 66.77779INTR - 149.5073INFL - 425.8830INPRIX + \mu$$

(table 2),
With R2 value of 0.663651.

Table 2: Regression coefficients of variables
Dependent Variable: stock prices
Method: Least Squares
Sample: 1985 2013
Included observations: 29

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	79780.62	16509.34	4.832455	0.0001
INTR	-66.77779	413.3329	-0.161559	0.8730
INPRIX	-149.5073	110.9928	-1.346999	0.1901
INFL	-425.8830	94.27732	-4.517344	0.0001

R-squared	0.663651	Mean dependent var	13596.37
Adjusted R-squared	0.611289	S.D. dependent var	14807.27
S.E. of regression	10351.45	Akaike info criterion	21.45508
Sum squared resid	2.68E+09	Schwarz criterion	21.64368
Log likelihood	-307.0987	Hannan-Quinn criter.	21.51415
F –statistic	10.76452	Durbin-Watson stat	2.599476
Prob(F-statistic)	0.000100		

With the existence of negative relationships between the all-share index and identified macroeconomic variables: inflation, interest rate and national productivity, we accept the null hypothesis i.e. there exists no significant positive relationship between macroeconomic variables: inflation, interest rate and national productivity and stock prices in the Nigerian capital market.

4 Research Findings and Policy Implications of Findings

Research results show that there exist negative relationships between share prices and inflation, interest rate and industrial productivity. This finding supports earlier results by Hussainey and Ngoe (2009), Reilly et al (2007), Kyereboah-Coleman and Agyire-Tettey (2005), Dinenis and Staikouras (1998), Prasad and Rajan (1995) and Lynge and Zumwalt (1980). The β value for the relationship between the all-share index and inflation of -425.8830 (table 2) shows that a negative relationship (significant at 5%) exists between both variables; implying that the higher the level of inflation in Nigeria, the lower the price of shares on the Nigerian Stock Exchange (proxied by the all-share index). This seems attributable to increased returns on bonds and debentures caused by inflation, necessitating divestment by investors from share investments to interest-bearing investments (bonds and debentures) with share supply glut negatively affecting share prices on the Nigerian Stock Exchange.

The β value of -149.5073 for relationship between the all-share index and productivity index shows that a negative relationship (insignificant at 5%) exists between both variables. The negative relationship between both variables indicate that increased national productivity does not increase returns to shareholders as input costs are seen to be high, reducing corporate incomes and dividends. The available corporate incomes are not distributed to shareholders as dividends but retained for future business financing to reduce investment financing costs, all negatively affecting share prices. This necessitates a review of the fiscal and monetary of Nigeria to reduce production input costs, increase corporate earnings, dividend and share prices.

The β value of -66.77779 for relationship between interest rate and all-share index shows that the relationship subsisting between both variables is negative and insignificant at 5%. This result indicates that high interest rate increases financing costs, with negative effects on corporate earnings, dividends and share prices; necessitating a reduction of interest rate to reduce financing costs, improve corporate earnings, dividends and share prices. Thus economic managers should introduce fiscal and monetary policies aimed at reducing inflation, stabilizing earnings on interest-bearing securities, increase investment in shares and boost prices of shares on the Nigeria Stock Exchange, reduce input costs, increase corporate earnings, dividends and share prices.

Cointegration result:

Cointegration results in table 3 (in the appendix) show that there exists no cointegration in the data set of variables. This result is substantiated by the Durbin-Watson value of 2.599 (table 2).

5 Conclusions and Recommendations

From the research results, we conclude that there exists a negative relationship between share prices in the Nigerian capital market (proxied by the all-share index) and inflation, interest rate and national productivity. To improve returns to shareholders from share investments, boost trading on the Nigerian stock Exchange and ensure full recovery of the Nigerian capital market from the recent crash, monetary and fiscal policies aimed at reducing interest rate, inflation and production input costs should be introduced by monetary and fiscal policy makers to increase corporate profits, dividends, share prices, capital gains, remove investor apathy to share investment, boost share trading and ensure the recovery of the Nigerian capital market from the recent crash.

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Appendix

Table A.3: Cointegration result of study data

Sample (adjusted): 1987 2013
Included observations: 27 after adjustments
Trend assumption: Linear deterministic trend
Series: SER02-05
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.036929	1.015965	3.841466	0.3135

Trace test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.036929	1.015965	3.841466	0.3135

Max-eigenvalue test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

SER02-05
7.57E-05

Unrestricted Adjustment Coefficients (alpha):

D(SER02-05)	-1575.152