THE RELATIONSHIP BETWEEN STOCK PRICES AND MACROECONOMIC FACTORS IN THE NIGERIAN STOCK MARKET

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Abstract

This paper examines the dynamic equilibrium relationship between a group of macroeconomic variables and the Nigerian Stock Exchange index, using Johansen's (1991) vector error correction model. The macroeconomic variables investigated include the industrial production index, the consumer price index, money supply, oil prices and treasury bill rate. The estimation of the vector error correction model was done under two alternative definitions of money supply: M1 and M2. The results show that a cointegrating relation exists among macroeconomic variables. The cointegration relationship is consistent with earlier studies, unlike the signs of some of the variables, which are inconsistent with earlier studies.

1. INTRODUCTION

Prior to the introduction of the Structural Adjustment Program (SAP) in Nigeria, the economy was characterised by inefficiency, administrative control of interest rates, regulated licencing of financial institutions and a fixed exchange rate regime. The implementation of the Structural Adjustment Program in Nigeria, especially through the financial liberalization component, has brought changes in the Nigerian Financial environment that might have implications for macroeconomic factors in the Nigerian economy.

The principal objective of this paper is to use the cointegration method of Johansen (1991) to analyze the long-term equilibrium relationship between stock returns and relevant macroeconomic variables for the Nigerian stock market. Series of studies have been carried out to find the long-term equilibrium relationship between stock returns and macroeconomic variables for the USA, Japan, and other industrially developed countries. However, little work has been done to date on the relationship between stock returns and

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macroeconomic variables in the Nigerian stock market. This paper addresses the issue of analyzing long-term relationships between stock returns and relevant macroeconomic variables, using the cointegration method. The advantage of the cointegration technique stems from its ability to explore dynamic co-movements among variables examined. The paper will provide further evidence on the stock market's response to macroeconomic factors for similar emerging markets.

The rest of this paper is divided as follows: Section two gives an overview of the Nigerian economy and the stock market; Section three discusses the theoretical background and literature review while the methodology is discussed in Section four. The results are presented in Section five, while concluding remarks are discussed in Section six.

2. OVERVIEW OF THE NIGERIAN ECONOMY AND THE STOCK MARKET

In order to address the problems of Nigerian economy, the Structural Adjustment Program (SAP) was launched in Nigeria in July 1986. The major policy measures of SAP are to:

- Deregulate the foreign exchange market;
- Overcome the observed public sector inefficiencies through improved public expenditure control; Programs and the rationalisation of parastatals and
- Relieve the debt burden and attract a net inflow of foreign capital, while keeping a lid on foreign loans.

The introduction of SAP in Nigeria has had an impact on Macroeconomic Factors. Figure 1 shows the trend in the growth rate in Money supply, nominal GDP and real GDP between 1981 and 2004. Between 1980 and 1986, the average growth rate in nominal GDP was 61.20%. The average growth rate in money supply (M1) was 5.55%, while the average growth rate in real GDP was 28.66%. However, after the introduction of SAP, average growth rates in GDP and real GDP have been falling, while average growth rates in money supply have been increasing. Between 1987 and 2004, the average growth rates in nominal GDP, real GDP and money supply were 31.14%, 4.50% and 30.41% respectively. The introduction of SAP also impacted on exchange rates. Between 1980 and 1986, the rate of devaluation of the naira was 102.06%. However, after the introduction of SAP, that is, between 1986 and 2004, the rate of devaluation of the naira was 6,506.97%.

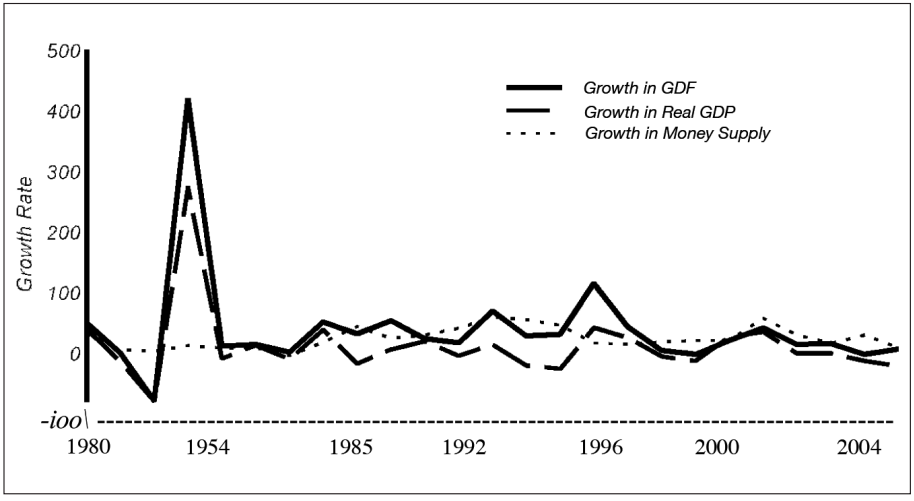
The performance of the Nigerian stock market has shown fluctuating

Table 1. Trend in the Value of Transactions, New Issues and Market Capitalisation in the Nigerian Stock Market

Year	Value of Transactions (VT) (N'million)	New Issues (N'million)	Market Capitalisation (MC) (N'million)	Gross Domestic Product (GDP) (N'million)	VT as % of MC	NI as % of GDP	MC % of GDP
1980	388.7	378.82	4462.4	50846.6	8.71	0.75	8.78
1981	304.8	455.22	4976.8	50749.1	6.12	0.90	9.81
1982	215	533.44	4025.7	10922	5.34	4.88	36.86
1983	397.9	448.5	5768	56745.2	6.90	0.79	10.16
1984	256.5	159.75	5514.9	63076.2	4.65	0.25	8.74
1985	316.6	817.19	6670.7	71620.5	4.75	1.14	9.31
1986	497.9	835.07	6794.8	72792.7	7.33	1.15	9.33
1987	382.4	450.73	8297.6	110184.6	4.61	0.41	7.53
1988	850.3	399.98	10020.8	145183.1	8.49	0.28	6.90
1989	610.3	1629.86	12848.7	222539.1	4.75	0.73	5.77
1990	225.4	9964.47	16358.4	274672.1	1.38	3.63	5.96
1991	242.1	1870	23125	320432.9	1.05	0.58	7.22
1992	491.7	3306.3	31272.6	541783.2	1.57	0.61	5.77
1993	804.4	2636.9	47436.1	693623.4	1.70	0.38	6.84
1994	985.9	2161.7	66368.9	907875.4	1.49	0.24	7.31
1995	1838.8	4425.6	180305.1	1951884.8	1.02	0.23	9.24
1996	6979.6	5858.18	285815.8	2787283.7	2.44	0.21	10.25
1997	10330.5	10467.3	281956.6	2906624.9	3.66	0.36	9.70
1998	13571.1	15018	262517.3	2836814.2	5.17	0.53	9.25
1999	14072	11993.5	300041.1	3440204.1	4.69	0.35	8.72
2000	28153.1	35500	466058.7	4866280	6.04	0.73	9.58
2001	57683.8	38000	648449.5	5526204.9	8.90	0.69	11.73
2002	59406.7	68600	747599.8	6398907.7	7.95	1.07	11.68
2003	17908.6	185000	1324898	6255470	1.35	2.96	21.18
2004	225505.5	235500	1925937.5	6665040	11.71	3.53	28.90

Source: Central Bank of Nigeria Annual Report and Accounts (Various issues)

Figure 1. Growth Rate in Money Supply, GDP and Real GDP in Nigeria



trends overtime. Table 1 shows the trend in the value of transactions, new issues and Market capitalization between 1981 and 2004. Between 1980 and 1986, the average value of trading transaction was N339.62857 million, the average value of New issues was **N**518.284286 million, while the average value of market capitalization was N5459.043 million. However, after the introduction of SAP, that is, between 1987 and 2004, the average values of trading transactions, new issues and market capitalization increased substantially. Between 1987 and 2004, the average values of trading transactions, new issues and market capitalization were N24,446.789 million, N35,154.584 million and N368, 850.417 million respectively. This represents a 7,098.1%, 6682.88% and 6656.69% increase respectively. The increase in the value of transactions, new issues and market capitalization could have been due to changes in macroeconomic factors. However, on a relative basis there is a downward trend. Between 1980 and 1986, the average market turnover (value of trading transaction as a percentage of market capitalization) was 6.36%, the average new issues as a percentage of GDP was 1.41% while the average market capitalization as a percentage of GDP was 13.29%. However, between 1987 and 2004, the average market turnover, the average new issues as a percentage of GDP and the average market capitalization as a percentage of GDP were 4.33%, 0.97% and 10.20% respectively. The downward trend could have been due to a change in macroeconomic factors. Thus, it will be of interest to evaluate the relationship between the stock market and macroeconomic factors.

3. THEORETICAL BACKGROUND AND LITERATURE REVIEW

Ross (1976), Roll (1978) and Roll and Ross (1980) developed the arbitrage pricing model (APT) in order to show that multiple factors can explain stock returns. The APT is a multi-factor model (i.e., multiple beta model). Arbitrage Pricing Theory (APT) assumes that observed stock returns are generated as follows:

where

$$R_i = E(R_t) + \sum_{j=1}^{n} b_{ij}F_j + e_i \quad (1)$$

R_i = actual return on security i.
$E(R_i)$ = expected return on security i.
F_j = the (uncertain) value of factor j.
b_{ij} = sensitivity to factor j.
e_i = the error term (assumed to be uncorrelated with the factor). This is also the (uncertain) security-specific return. In equilibrium, according to the APT, expected return on security i, E(Ri) will be given by:

$$E(R_i) = R_f + \lambda_1 b_{i1} + \lambda_2 b_{i2} + \ldots \lambda_n b_{in} \quad (2)$$

Where R_f = risk-free rate.

λ_n = risk premium for the types of risk associated with particular factors. The risk premium, λ_n (4) can be rewritten as:

$$\lambda_n = E_n - R_f \quad (3)$$

where E_n = expected return of a portfolio which has unit response (sensitivity) to the nth factor and zero response (sensitivity) to other factors.

The development of the Arbitrage Pricing Theory (APT) has led to the conduct of a series of tests using different proxies for APT factors and factor loading. If a set of variables or characteristics or factors that affect expected return could be specified a priori, then the market price of these characteristics over any period of time could be measured fairly easily. Researchers have tested asset-pricing models against macroeconomic variables. Chen, Roll and Ross (1986) tested the long-term equilibrium relationship between stock prices and relevant macroeconomic variables. They find that asset prices react sensitively to economic news, especially to unanticipated news.

Darrat and Mukherjee (1987), using a Vector Autoregression (VAR) model

on the Indian data, found that a significant causal relationship exists between stock returns and certain macroeconomic variables. Brown and Otsuki (1990) in a Japanese study, found that money supply, production index, crude oil price, exchange rate, call money rate and a residual market error affect the Japanese stock market. Mukherjee and Naka (1995), using vector error correction to a model of seven equations, found that a long-term equilibrium relationship exists between the Japanese stock market and six macroeconomic variables such as exchange rate, money supply, inflation, industrial production, long-term government bond rate and call money rate.

Al-sharkas (2004) analyzed the long-term equilibrium relationships between a group of macroeconomic variables and the Amman Stock Exchange index. The macroeconomic variables are represented by the industrial production index, the consumer price index, money supply, and treasury bill rate. Using Johansen's (1991) vector error correction model, Al-sharkas (2004) found that macroeconomic variables are cointegrated, i.e., a cointegrating relation exists among the variables.

Other studies on monetary policy and stock prices include, among others, Homa and Jafee (1971), Palmer (1970), Hamburger and Kochin (1972), Cooper (1974), Rozeff (1974), Thornton (1993) and Fama (1981, 1990).

However, little work has been done on the relationship between stock prices and macroeconomic variables in the Nigerian stock market. Yohannes (1994) tested the efficiency of Nigerian Stock Market with respect to macroeconomic variables. Using the causality approach, he found an inconclusive result since they do not give a unified solution (See, Yohannes, 1994). Olowe (1996) showed that, between January 1981 and December 1990, there is an insignificant positive relation between stock returns and expected inflation, and an insignificant negative relation between stock returns and unexpected inflation. The inconclusive result of Yohannes (1994) and the insignificant relation obtained by Olowe (1996) suggests that more work still needs to be done on the relationship between stock prices and macroeconomic variables in Nigeria. Thus, there is still a dearth of empirical work in Nigeria on the relationship between stock prices and macroeconomic variables.

This paper uses the cointegration method of Johansen (1991) to analyze the long-term equilibrium relationship between stock returns and relevant macroeconomic variables for the Nigerian stock market. Series of studies have been done to find the long-term equilibrium relationship between stock returns and macroeconomic variables for developed countries. Yohannes' (1994) results, using annual data on stock returns and macroeconomic variables, are inconclusive. The present study, unlike Yohannes (1994), uses quarterly data and the cointegration method. The paper attempts to find

whether a long-term equilibrium relationship exists between the Nigerian stock market return and the level of real economic activity, money supply, exchange rates, inflation, oil prices and interest rates. The advantage of the Johansen's VECM cointegration technique stems from its ability to explore dynamic co-movements among variables examined.

Furthermore, studying the relationship between the macroeconomic indicators and the Nigerian stock market will provide further evidence on the stock market's response to macroeconomic factors in the Nigerian stock market.

4. METHODOLOGY

4.1. The Data

The data used in this study were obtained from various issues of the statistical bulletins and annual reports of the Central Bank of Nigeria. The stock price data were collected from the daily official list of the Nigerian Stock exchange. The implementation of the SAP started in Nigeria in September 1986 with the deregulation of the Nigerian Foreign exchange market. In order not to bias the result of the study, the study focused only on the period after the introduction of the SAP. Thus, the sample period consists of quarterly observations for each variable of the study, from the last quarter of 1986 to the last quarter of 2004.

This study investigates the dynamic relationship between stock prices and macroeconomic variables. The Nigerian Stock Exchange Index (SR) is used as a proxy for stock prices. The macroeconomic variables used in the study are inflation (INF), money supply (M1), Industrial production (IND), exchange rates (EXH), oil prices (OP) and interest rates (TR). The choice of variables is almost similar to Chen, Roll and Ross (1986), Darrat and Mukherjee (1987), Hamao (1988), Brown and Otsuki (1988), Darrat (1990), Lee (1992), Yohannes (1994), Mukherjee and Naka (1995) and Al-sharkas (2004). The rationale for the variables is as follows:

Inflation: Inflation rates will be computed using consumer price indexes. Inflation impacts both the level of the discount rate and the size of future cash flows. Roll and Ross (1980), Chen, Roll and Ross (1986), Berry, Brumeister and McElroy (1988), Sorensen, Salomon, Davenport and Fiore (1988) also included this variable in their study. Since the introduction of the SAP, inflation has been a problem in Nigeria. Yohannes' (1994) study is inconclusive. It will be of interest to examine the dynamic relationship between this variable and stock returns in Nigeria.

***Money Supply*:** The money supply variable that will be used here is M1, which has been found to be superior to other measures (see Yohannes (1994)). However, the study will also present result for M2. A wide range of studies on the relation between money supply and stock prices can be found (See, Homa and Jaffe, (1971); Hamburger and Kochin, (1972), Malkiel and Quandt (1972), Rozeff (1974), Pearce and Roley (1983) among others). Since the implementation of the SAP in Nigeria, money supply has been an important issue in monetary management, because of its implication on liquidity, interest rates and exchange rates. Changes in money supply might have implications for the demand for quoted securities and, thus, stock returns. It will be of interest to examine the dynamic relationship between this variable and stock returns in Nigeria.

Exchange Rates: The measure of exchange rates that will be considered here is the average monthly exchange rate expressed in terms of US dollars per naira (the domestic currency). Sorensen, Salomon, Davenport and Fiore (1988) also included this variable in their study. Since the introduction of SAP in Nigeria, with its components of a deregulated foreign exchange rate, exchange risk has been a concern of both local and foreign investors, because most quoted companies depend heavily on foreign trade. Between 1980 and 1986, the devaluation rate of the naira was 102.06%. However, after the introduction of SAP, that is, between 1986 and 2004, the rate of devaluation of the naira was 6,506.97%. It will be of interest to examine the dynamic relationship between this variable and stock returns in Nigeria.

Industrial Production: Changes in industrial production affect investors' opportunities and the real value of cash flows. Roll and Ross (1980), Chen, Roll and Ross (1986), Berry, Brumeister and McElroy (1988), Sorensen, Salomon, Davenport and Fiore (1988) also included this variable in their study. Since the introduction of SAP in Nigeria, the real growth trend of the economy has been of concern to investors. Industrial production is used as a proxy for growth, which provides a gauge of general economic well being. It will be of interest to examine the dynamic relationship between this variable and stock returns in Nigeria.

Oil Prices: Changes in Oil prices are an important factor in Nigeria as it could influence stock returns. Most firms in Nigeria depend directly or indirectly, on the oil sector. Foreign exchange increase or decrease would therefore result in a contraction or expansion of activities of firms in Nigeria, which would again be reflected in the price and/or returns of these firms. Furthermore, the Nigerian economy is heavily dependent on the oil sector,

both for government revenues and export income. In 2004, the oil sector accounted for about 79.28% of total government revenue. The fluctuation in oil prices could have a negative implication for the economy and thus stock prices. It will be of interest to examine the dynamic relationship between this variable and stock returns in Nigeria.

All the variables used in the study are transformed into natural logarithms and they are all defined in Table 2. The summary statistics of the macroeconomic variables used in this study, for both level observation and first differences, are shown in Tables 3 and 4 respectively. Table 4 shows that stock prices grew at the rate of 6.9% per quarter, exchange rates grew at the rate of 5.2% per quarter, inflation rates grew at the rate of 5.7% per quarter, narrow money supply (M1) grew at the rate of 6.5% per quarter, while broad money supply (M2) grew at the rate of 6.3% per quarter. However, oil prices, treasury bill rate and industrial production grew at low rates per quarter of 1.5%, 0.8% and 0.7% respectively. Table 4 also shows, as expected, that the maximum value of TR exceeds that of INF, indicating that debt holders earn real returns.

4.3. Cointegration Test

The purpose of the cointegration test is to determine whether a group of non-stationary series is cointegrated or not. Cointegration is a linear combi-

Table 2. Definition of Variables used in the Study

Variable	Definition
NSE	This is the proxy for stock prices. It is represented by the end of quarter closing prices of Nigerian Stock Exchange index
EXH	Average exchange rate of Naira per one US dollar at the end of each quarter
INF	Inflation rate. This is represented by end of quater composite consumer price index
IND	End of quarter Index of Industrial production
M1	Narrow Money supply. This is defined as currency outside banks plus demand deposits. Demand deposits consist of state, local and parastatals deposits at the Central Bank of Nigeria, state, local and private sector deposits as well as demand of non-financial public enterprises at Commercial and Merchant banks
M2	Broad money supply. This is defined as M1 + quasi-money. Quasi-money is defined as Time, savings and Foreign currency deposits of Commercial and Merchant banks
OP	United States Free of Board Costs of OPEC Countries Crude Oil (Dollars per Barrel)*
TR	Treasury bill rate

* This data was downloaded from the website of Energy Information Administration (Official Energy Statistics of the United States Government).

Table 3. Descriptive Statistics of Level observation of Selected Macroeconomic Variables, 1986.4 - 2004.4

	SR	M1	M2	IND	INF	TR	EXH	OP
Mean	7.787	11.964	12.479	4.878	7.126	2.686	3.264	2.856
Standard error	0.182	0.173	0.169	0.014	0.151	0.027	0.138	0.035
Standard Deviation	1.555	1.476	1.446	0.116	1.291	0.234	1.177	0.298
Variance	2.419	2.179	2.092	0.014	1.666	0.055	1.385	0.089
Coefficient of Variation	0.200	0.123	0.116	0.024	0.181	0.087	0.361	0.104
Minimum	5.086	9.370	10.053	4.420	4.713	2.140	1.158	2.018
Maximum	10.271	14.101	14.632	5.058	8.814	3.332	4.918	3.703
Skewness	-0.336	-0.241	-0.156	-1.671	-0.478	0.605	0.044	0.223
Observations	73	73	73	73	73	73	73	73

SR, EXH, IND, INF, M1, M2, and TR denote the natural logs of Nigerian Stock Exchange index, exchange rate, industrial production, consumer price index, broad money supply, Narrow money supply and treasury bill rate.

Table 4. Descriptive Statistics of First Difference of Selected Macroeconomic Variables, 1986.4 - 2004.4

	SR	M1	M2	IND	INF	TR	EXH	OP
Mean	0.018	0.052	0.008	0.057	0.065	0.063	0.069	0.007
Standard Error	0.021	0.021	0.007	0.010	0.009	0.007	0.012	0.016
Standard Deviation	0.181	0.182	0.060	0.084	0.077	0.062	0.100	0.139
Variance	0.033	0.033	0.004	0.007	0.006	0.004	0.010	0.019
Coefficient of Variation	10.203	3.515	7.271	1.481	1.188	0.974	1.443	18.945
Minimum	-0.412	-0.099	-0.209	-0.128	-0.089	-0.070	-0.239	-0.806
Maximum	0.695	1.376	0.205	0.272	0.339	0.273	0.338	0.336
Skewness	0.667	5.851	-0.275	0.415	0.666	0.534	-0.366	-2.451
Observations	72	72	72	72	72	72	72	72

SR, EXH, IND, INF, M1, M2, and TR denote the natural logs of Nigerian Stock Exchange index, exchange rate, industrial production, consumer price index, broad money supply, Narrow money supply and treasury bill rate respectively.

nation of non-stationary time series that results in a stationary time series in the presence of cointegration among the variables. The presence of such a linear combination, conventionality indicates the long-term equilibrium relationship among the cointegrating variables (see Granger (1986)). Thus, Cointegration is a method of defining the long-term relationship amongst a group of time series variables. The presence of a cointegrating relation forms the basis of the VEC specification. This study is based on Johansen's (1991, 1995) cointegration tests. Consider a Vector Autoregression model (VAR) of order p as follows:

$$y_t = \alpha_1 y_{t-1} + \ldots + \alpha_p y_{t-p} + \beta x_t + \varepsilon_t \tag{4}$$

where y_t is a k -vector of non- stationary I(1) variables, x_t is a d-vector of deterministic variables, and ε_t is a vector of innovations. The VAR may be rewritten as:

$$\Delta y_t = \Pi y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-1} + \beta x_t + \varepsilon_t \tag{5}$$

where $\Pi = \sum_{t=1}^{p} \alpha - I, \qquad \Gamma_i = \sum_{j=i+1}^{p} \alpha_j$

Granger's representation theorem asserts that if the coefficient matrix Π has reduced rank r<k, then there exist k x r matrices α and β each with rank r such that $\Pi = \alpha\beta'$ and $\beta' y_t$ is I(0). r is the number of cointegrating relations (the cointegrating rank) and each column of β is the cointegrating vector (see Granger (1986), Quantitative Micro Software (2004)).

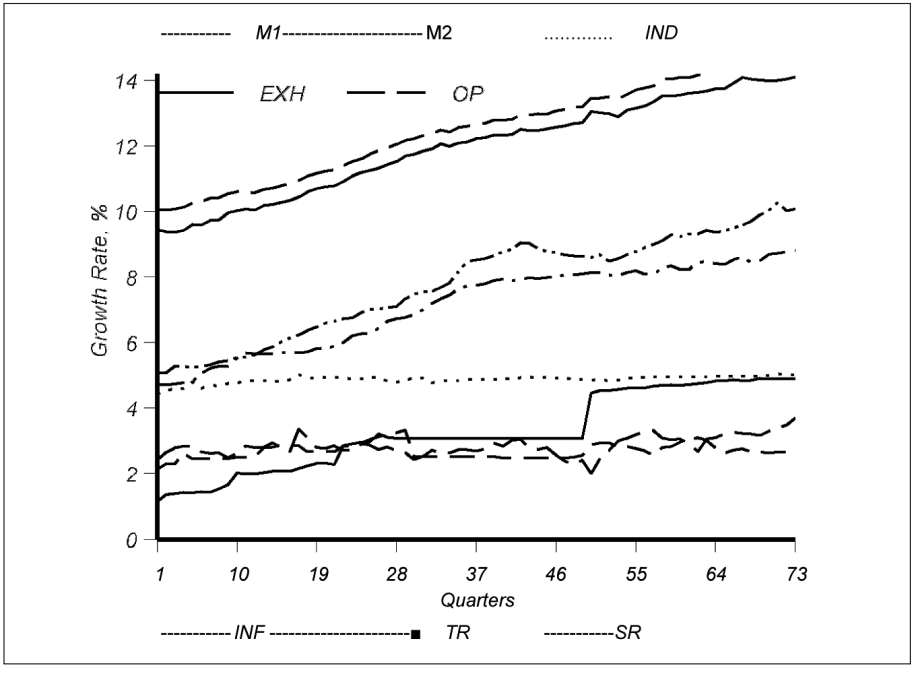
In carrying out cointegration tests, unit root tests will first be carried out on all the variables to determine whether they are stationary and integrated of the same order.

5. THE RESULTS

5.1. Unit Root Test

Figure 2 shows the plot of all the variables. All the variables appear to be non-stationary except IND. The Augmented Dickey Fuller (1981) tests and the Phillips and Perron (1988) tests are employed to determine the presence of a unit root. Table 5 reports the results of the unit root tests. The appropriate lag length is selected using the Akaike Information Criterion (AIC). Us-

Figure 2. Trend in Selected Macroeconomic Variables, 1986.4 - 2004.4



ing the Augmented Dickey Fuller and Phillips and Perron tests, the result shows that all the variables are non-stationary in the level form, although Table 5 reported the result for only industrial production (IND). When a constant (c) and a trend (t) are included in the test equations, Table 5 still shows that all the variables are non-stationary with the exception of IND. Table 5 also shows that, with the exception of INF, all the variables are first difference stationary. Al-Sharkas (2004) also found that INF is not first difference stationary. Even though the result of the unit root test is inconclusive, the variables are non-stationary and are integrated of order one; that is consistent with the existing literature for other countries, including the U.S.A. (see Al-Sharkas (2004) among others).

5.2. Cointegration Test for Long-run Equilibrium Relationship

Table 6 presents the result of the Trace test and Maximum Eigenvalue statistics for determining the number of cointegrating relations. The cointegration analysis test was done with linear deterministic trend assumption in the

Table 5. Unit Root test of Selected Macroeconomic Variables, 1986.4 - 2004.4

Series	Augmented Dickey-Fuller test			Phillips-Perron test		
	Test statistic	Critical Values		Test statistic	Critical Values	
		1% level	5% level		1% level	5% level
EXH(c)	-1.166	-3.524	-2.902	-1.164	-3.524	-2.902
EXH(t)	-2.392	-4.091	-3.473	-2.469	-4.091	-3.473
DEXH	**-8.363**	-3.526	-2.903	**-8.363**	-3.526	-2.903
INF(c)	-2.097	-3.530	-2.905	-1.993	-3.524	-2.902
INF(t)	-2.502	-4.099	-3.477	-0.832	-4.091	-3.473
DINF	-2.123	-3.530	-2.905	**-6.750**	-3.526	-2.903
M1(c)	-1.172	-3.524	-2.902	-1.623	-3.524	-2.902
M1(t)	-1.324	-4.091	-3.473	-1.192	-4.091	-3.473
DM1	**-9.433**	-3.526	-2.903	**-9.560**	-3.526	-2.903
M2 (c)	-0.978	-3.524	-2.902	-1.078	-3.524	-2.902
M2(t)	-1.328	-4.091	-3.473	-1.123	-4.091	-3.473
DM2	**-9.898**	-3.526	-2.903	**-9.910**	-3.526	-2.903
IND	1.506	-2.597	-1.945	1.506	-2.597	-1.945
IND (c)	-4.282	-3.524	-2.902	-4.420	-3.524	-2.902
IND(t)	**-5.049**	-4.091	-3.473	**-5.073**	-4.091	-3.473
DIND	**-6.155**	-3.529	-2.904	**-13.547**	-3.526	-2.903
OP(c)	-2.121	-3.524	-2.902	-2.317	-3.524	-2.902
OP(t)	-2.677	-4.091	-3.473	-2.940	-4.091	-3.473
DOP	**-9.279**	-3.526	-2.903	**-9.352**	-3.526	-2.903
SR (c)	-1.048	-3.524	-2.902	-0.967	-3.524	-2.902
SR(t)	-1.075	-4.091	-3.473	-1.384	-4.091	-3.473
DSR	**-6.618**	-3.526	-2.903	**-6.611**	-3.526	-2.903
TR (c)	-3.215	-3.524	-2.902	-3.268	-3.524	-2.902
TR(t)	-3.066	-4.091	-3.473	-3.129	-4.091	-3.473
DTR	**-8.434**	-3.526	-2.903	**-8.436**	-3.526	-2.903

Notes: The appropriate lags are automatically selected employing AIC. (c) after a variable indicates the result of the unit root test by including a constant in the test equation for that variable. (t) after a variable indicates the result of the unit root test by including a constant and trend in the test equation for that variable. D represents the first difference in natural logarithm. The first difference result included a constant in the test equation. The bolded item indicates stationary.

Table 6. Numer of Cointegration Equations using M1 as a proxy for Money Supply

Hypothesized No. of CE(s)	Eigenvalue	Trace Test		Max-Eigen Test	
		Statistic	Critical Value	Statistic	Critical Value
None	0.500983	139.3827	125.6154	49.3531	46.23142
At most 1	0.3981	90.02959	95.75366	36.04419	40.07757
At most 2	0.240858	53.9854	69.81889	19.56524	33.87687
At most 3	0.19369	34.42016	47.85613	15.28541	27.58434
At most 4	0.143094	19.13475	29.79707	10.96434	21.13162
At most 5	0.078218	8.170407	15.49471	5.782704	14.2646
At most 6	0.03307	2.387703	3.841466	2.387703	3.841466

CE denotes cointegration equation. The cointegration test specification is based on the assumption of intercept but no trend in the cointegration equation and test VAR. The critical values at 5% level are taken from Osterwald-Lenum (1992). * indicates significant at the 5% level. Both Trace test and Maximum eigenvalue tests indicate one cointegration at the 5% level.

Table 7. Numer of Cointegration Equation using M2 as a proxy for Money Supply

Hypothesized No. of CE(s)	Eigenvalue	Trace Test		Max-Eigen Test	
		Statistic	Critical Value	Statistic	Critical Value
None	0.441787	134.4922	125.6154	41.39409	46.23142
At most 1	0.438319	93.09806	95.75366	40.95432	40.07757
At most 2	0.243616	52.14374	69.81889	19.8236	33.87687
At most 3	0.200602	32.32014	47.85613	15.8966	27.58434
At most 4	0.132228	16.42354	29.79707	10.06967	21.13162
At most 5	0.070037	6.353875	15.49471	5.155358	14.2646
At most 6	0.016739	1.198518	3.841466	1.198518	3.841466

CE denotes cointegration equation. The cointegration test specification is based on the assumption of intercept but no trend in the cointegration equation and test VAR. The critical values at 5% level are taken from Osterwald-Lenum (1992). * indicates significant at the 5% level. Trace test indicate one cointegration equation while maximu eigenvalue indicate no cointegration.

level data but the cointegration equations have intercept and no trend. A lag interval of first differences of 1 to 1 was specified. Both Trace test and Maximum Eigenvalue statistics show that there exists only one cointegrating relation at the 5% level of significance using M1 as a proxy for Money supply. However, Table 7 shows that with M2 as a proxy for money supply, the Trace tests indicate that there is one cointegration relation, whereas Maximum Eigenvalue statistics show that there is no cointegration relation. Results from most studies show the existence of one cointegration relation (see Al-Sharkas (2004) among others). This study will also base the analysis on the existence of one cointegration equation for both M1 and M2 proxies for money supply.

The Vector error correction model is estimated on the basis of one cointegration equation with 1 to 1 lag interval of first difference terms. The long-run equilibrium relationship among the tested variables is based on the following cointegrating vector using M1 as a proxy for money supply:

$$\beta = [1, 1.312, 2.150, -0.625, -1.432, -1.466, -1.238, 6.534] \quad (7)$$

Whereas, using M2 as a proxy for money supply, the long-run equilibrium relationship among the tested variables is based on the following cointegrating vector:

$$\beta = [1, 1.610, 0.624, -0.700, -1.589, -1.121, -1.701, 16.500] \quad (8)$$

Using M1 as a proxy for money supply, the long-run equilibrium relationship can be expressed as:

$$SR = -6.534 - 1.312EXH - 2.150IND + 0.625INF + 1.432M1 + 1.466OP + 1.238TR \quad (9)$$

Using M2 as a proxy for money supply, the long-run equilibrium relationship can be expressed as:

$$SR = -16.500 - 1.610EXH - 0.624IND + 0.700INF + 1.589M2 + 1.121OP + 1.701TR \quad (10)$$

With the exception of M2, all the variables are statistically significant at the 5% level. The likelihood ratio test shows that SR contributes to the above cointegrating relation. The result shows that the exchange rate negatively influences stock prices. The result could be due to the high devaluation of the naira since the introduction of the SAP. As stated in Section 4, between 1986 and 2004, after the introduction of SAP, the rate of devaluation of the naira was 6,506.97%. The import dependency of the economy, which exerted great pressure on the naira, contributed to this high devaluation. Stock market prices could not adjust to this high devaluation of the naira. It appears that

there is a reliable positive relationship between stock prices and inflation. This is inconsistent with Chen, Roll and Ross (1986) for US data, Mukherjee and Naka (1995) for Japanese data and Al-Sharkas (2004) for Jordanian data. The positive relation between stock prices and inflation could have been due to the perception market investors had that the stock market is a perfect hedge against inflation in the post Structural adjustment period. If inflation rate changes, stock market investors adjust their perception of stock prices. The result shows that the level of real economic activity, IND negatively affects stock prices. This is inconsistent with the work of Al-Sharkas (2004), Fama (1990), Cheske and Roll (1983) among others. An explanation could be the neglect of industrial production in Nigeria in favor of financial investment. The liberalization of trade, import dependency of Nigerian economy, high devaluation of the naira, poor infrastructure and high cost of local production in Nigeria made it unattractive to engage in manufacturing of goods and services in Nigeria. Money supply has a positive effect on stock prices, supporting the results of Friedman and Schwartz (1963), Bulmash and Trivoli (1991) and Al-Sharkas (2004). The result shows that Oil prices have a positive impact on stock prices. Interest rates (TB) have a positive relationship with stock prices, supporting the work of Mukherjee and Naka (1995).

6. CONCLUSIONS

This paper examines the dynamic equilibrium relationships between a group of macroeconomic variables and the Nigerian Stock Exchange index using Johansen's (1991) vector error correction model. The macroeconomic variables investigated include exchange rates, industrial production index, the consumer price index, money supply, oil prices and treasury bill rate. The estimation of the vector error correction model was done under two alternative definitions of money supply: M1 and M2. Unlike most research focusing on developed countries, this study is a contribution to research focusing on developing countries. The findings of this paper have important policy implications for stabilization and adjustment programs. Policies should be geared toward moderating exchange rates against adverse fluctuation. The Government should also design programs that will increase industrial production and thus, real output, in Nigeria.

The results show that a cointegrating relation exists among macroeconomic variables. The cointegration relationship is consistent with earlier studies, however the signs of some of the variables are inconsistent with earlier studies.

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Résumé

L'article examine la relation d'équilibre dynamique entre un groupe de variables macroéconomiques et l'index du marché boursier du Nigeria en utilisant le modèle *vector error correction* de Johansen (1991). Les variables utilisées comprennent l'index de production industrielle, l'index des prix à la consommation, l'offre de monnaie, les prix du pétrole et le taux sur les bons du trésor. L'estimation a été faite en considérant les deux définitions alternatives de l'offre de monnaie : M1 et M2. Les résultats montrent qu'il y a une relation cointegrée parmi les variables macroéconomiques qui est cohérente avec les études précédentes, tandis que les signes de certaines variables ne le sont pas.