Arbitrage Pricing and Investment Performance in the Nigerian Capital Market

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Abstract- This paper applied the multi factor Arbitrage Pricing Theory to explore the relationship between investment performance and selected macroeconomic variables in the Nigerian Capital market. Thus, the general purpose was to test the applicability of the Arbitrage Pricing Theory on investment performance in the Nigerian Capital market while the specific objective wa s to examine the effect of inflation rate risk, interest rate risk, exchange rate volatility risk, money supply rate of change, real gross domestic product and treasury bill rate on investment performance in the Nigerian Capital market. We extracted thirty-year (1988-2017) panel data from Central Bank of Nigeria Statistical Bulletin and published annual reports of five quoted companies in the Nigerian Stock Exchange for the dependent variable earnings per share which is proxy for investment performance. Five models were specified to express the relationship between the independent variables and the dependent variable for five quoted companies in the Nigerian Stock Exchange. The models were estimated using the Ordinary Least Square Regression analysis and the global utility of the models were evaluated. On the basis of our analysis, we found that investment performance for the Nigerian Capital market does not toe the line of the objectives of the Arbitrage Pricing Theory as the selected macroeconomic risk factors not strongly explain investment performance. We therefore recommended vibrant and stable macroeconomic policies aimed at managing market realities in the capital market, good governance free of corruption, interest rate stability, among others as panacea for investment performance in the Nigerian Capital Market.

Keyword: Arbitrage Pricing, Inflation Rate, Interest Rate, Exchange Rate Volatility, Money Supply Rate of Change, Real gross Domestic Product, Treasury Bill rate

1. Introduction

Arbitrage Pricing Theory developed by Ross in 1976 suggests that there are numerous sources of risk in the economy that cannot be eliminated by diversification. These sources of risk can be thought of as related to economy wide factors such as inflation and changes in aggregate output. Instead of calculating a single beta, like the Capital Asset Pricing Model, Arbitrage Pricing Theory calculates many betas by estimating the sensitivity of an asset's return to changes in each factor. Arbitrage pricing theory offers analysts and investors a multi-factor pricing model for securities based on the relationship between a financial asset's expected return and its risks. The theory aims to pinpoint the fair market price of a security that may be provisionally incorrectly priced. The theory assumes that market action is less than always perfectly efficient, and therefore occasionally results in assets being mispriced – either overvalued or undervalued – for a brief period of time. However, market action should eventually correct the situation, moving price back to its fair market value. To an arbitrageur, temporarily mispriced securities represent a

short-term opportunity to profit virtually risk-free. The Arbitrage Pricing Theory suggests that the returns on assets follow a linear pattern. An investor can leverage deviations in returns from the linear pattern using the arbitrage strategy. Arbitrage is a practice of the simultaneous purchase and sale of an asset, taking advantage of slight pricing discrepancies to lock in a risk-free profit for the trade. However, the Arbitrage Pricing Theory concept of arbitrage is different from the classic meaning of the term. In the Arbitrage Pricing Theory, arbitrage is not a risk-free operation but it does offer a high probability of success. What the arbitrage pricing theory offers traders is a model for determining the theoretical fair market value of an asset. Having determined that value, traders then look for slight deviations from the fair market price, and trade accordingly. The Arbitrage Pricing Theory provides analysts and investors with a high degree of flexibility regarding the factors that can be applied to the model. The number and different types of factors that are used are up to an analyst's choice. Therefore, two different investors using the Arbitrage Pricing Theory to analyze the same security may have widely varying results when it comes to their actual trading. Even among the most devoted advocates of the theory, there is no consensus agreement of finance professionals and academics on which factors are best for predicting earnings on securities. However, Ross suggests that there are some specific factors that have shown to reliably predict price. These include sudden shifts in inflation, gross national product, and the yield curve.

1. 2. Statement of the Problem

The Arbitrage Pricing Theory being a multifactor model, has no definite proof that specify the factors to be included in the model. Rather the proponents of the model postulates endless stream of macroeconomic factors with specific assumptions hence its effect on returns on capital asset is questionable to a large extent. Therefore, it is valid to evaluate empirically the relative impact of six most significant purely macroeconomic variables or factors in this study which include inflation rate risk, interest rate risk, exchange rate risk, money supply, Real gross domestic product and treasury bills on investment performance in the Nigerian Capital market. The Nigerian Capital market is an emerging market which has witnessed quite an impressive growth rate over the years despite the volatile nature of any developing market and has attracted the attention of both foreign and local investors. Consequently, it is imperative and interesting to study such a market and explore national factors to measure the import of risk –return trade-off for predicting return on investment.

1. 3. Research hypothesis

The following hypotheses were formulated in their respective null form:

H01: Inflation rate risk (retail price index) does not significantly affect investment performance.

H02: Term structure of Interest rate risk does not significantly affect investment performance.

H03: Exchange rate volatility risk does not significantly affect investment performance.

H04: Money supply rate of change does not significantly affect investment performance.

H05: Real Gross Domestic Product does not significantly affect investment performance.

H06: Treasury Bills rate does not significantly affect investment performance.

2. Literature review

2.1 Conceptual framework

Arbitrage pricing theory, as an alternative model to the capital asset pricing model, tries to explain asset or portfolio returns with systematic factors and asset/portfolio sensitivities to such factors. The theory estimates the expected returns of a well-diversified portfolio with the underlying assumption that portfolios are well-diversified and any discrepancy from the

equilibrium price in the market would be instantaneously driven away by investors. Any difference between actual return and expected return is explained by factor surprises (differences between expected and actual values of factors).

The drawback of arbitrage pricing theory is that it does not specify the systematic factors, but analysts can find these by regressing historical portfolio returns against factors such as real Gross Domestic Product growth rates, inflation changes, term structure changes, risk premium changes and so on. Regression equations make it possible to assess which systematic factors explain portfolio returns and which do not.

Security returns can be predicted by factor models such as the capital asset pricing model or the arbitrage pricing theory. Note that sufficient securities are required to diversify away unsystematic risk in a portfolio. Well-functioning markets do not allow for the persistence of arbitrage opportunities as applies to well diversified portfolios, violations of equilibrium for any asset cannot be ruled out as it can be in Capital Asset Pricing Model. Due to lack of other assumptions multifactor models like the Arbitrage Pricing Theory allows for other (risk) factors that an asset may co-vary with and therefore enjoy increased returns which will lead to other terms in the model and there are no guidance on appropriate factors to be included in the model. However, only risk from selected factors are priced. Each new factor is self-financing and as such has a zero net cost, the βeta on each factor represents the level of sensitivity to that particular factor.

The Arbitrage Pricing Theory implies that the return of an asset can be broken down into an expected return and an unexpected or surprise component. Thus, the Arbitrage Pricing Theory predicts that "general news" will affect the rate of return on all stocks but by different amounts. In this way the Arbitrage Pricing Theory is more general than the Capital Asset Pricing Model, because it allows larger number of factors to affect the rate of return (Cuthbertson, 2004)[1]. The assumption behind the Arbitrage Pricing Theory model is that securities prices/returns are generated by a small number of common factors, but our challenge is to identify each of the factors affecting a particular stock; the expected return for each of these factors; and the sensitivity of the stock to each of these factors. And Arbitrage Pricing Theory did not give us any formal theoretical guidance on choosing the appropriate group of macroeconomic factors to be included in the model, rather left the identification of these factors to us as empirical matter.

2.2 Three Underlying Assumptions of Arbitrage Pricing Theory

Unlike the capital asset pricing model, arbitrage pricing theory does not assume that investors hold efficient portfolios. The theory does, however, follow three underlying assumptions: Asset returns are explained by systematic factors. Investors can build a portfolio of assets where specific risk is eliminated through diversification. No arbitrage opportunity exists among well-diversified portfolios. If any arbitrage opportunities do exist, they will be exploited away by investors.

2.3 Factors in the Arbitrage Pricing Theory

The Arbitrage Pricing Theory provides analysts and investors with a high degree of flexibility regarding the factors that can be applied to the model. The number and different types of factors that are used are up to an analyst's choice. Therefore, two different investors using the Arbitrage Pricing Theory to analyze the same security may have widely varying results when it comes to their actual trading. Even among the most devoted advocates of the theory, there is no consensus agreement of finance professionals and academics on which factors are best for predicting returns on securities. However, Ross suggests that there are some specific factors that have shown to reliably predict price. These include sudden shifts in inflation, gross national product, and the yield curve.

2.4 Capital Asset Pricing Model and Arbitrage Pricing Theory

The Capital Asset Pricing Model allows investors to quantify the expected return on investment given the investment risk, risk free rate of return, expected market return and the beta of an asset or portfolio. The risk-free rate of return that is used is typically the federal funds rate or the 10-year government bond yield. An asset's or portfolio's beta measures the theoretical volatility in relation to the overall market. The formula used in Capital Asset Pricing Model is: $E(ri) = rf + \beta i * (E(rM) - rf)$, where rf is the risk-free rate of return, βi is the asset's or portfolio's beta in relation to a benchmark index, E(rM) is the expected benchmark index's returns over a specified period, and E(ri) is the theoretical appropriate rate that an asset should return given the inputs.

The Arbitrage Pricing Theory serves as an alternative to the Capital Asset Pricing Model, and it uses fewer assumptions and may be harder to implement than the Capital Asset Pricing Model. Ross developed the Arbitrage Pricing Theory on the basis that the prices of securities are driven by multiple factors, which could be grouped into macroeconomic or company-specific factors. Unlike the Capital Asset Pricing Model, the Arbitrage Pricing Theory does not indicate the identity or even the number of risk factors. Instead, for any multifactor model assumed to generate returns, which follows a return-generating process, the theory gives the associated expression for the asset's expected return. While the Capital Asset Pricing Model formula requires the input of the expected market return, the Arbitrage Pricing Theory formula uses an asset's expected rate of return and the risk premium of multiple macroeconomic factors. In the Arbitrage Pricing Theory model, an asset's or a portfolio's returns follow a factor intensity structure if the returns could be expressed using this formula: $ri = ai + \beta i1 * F1 + \beta i2 * F2 + ... + \beta kn * Fn + \varepsilon i$, where ai is a constant for the asset; F is a systematic factor, such as a macroeconomic or company-specific factor; β is the sensitivity of the asset or portfolio in relation to the specified factor; and εi is the asset's idiosyncratic random shock with an expected mean of zero, also known as the error term. The Arbitrage Pricing Theory formula is $E(ri) = rf + \beta i1 * RP1 + \beta i2 * RP2 + ... + \beta kn * RPn$, where rf is the risk-free rate of return, β is the sensitivity of the asset or portfolio in relation to the specified factor and RP is the risk premium of the specified factor.

At first glimpse, the Capital Asset Pricing Model and Arbitrage Pricing Theory formulas look identical, but the Capital Asset Pricing Model has only one factor and one beta. On the contrary, the Arbitrage Pricing Theory formula has multiple factors that include non-company factors, which requires the asset's beta sensitivity in relation to each separate factor. However, the Arbitrage Pricing Theory does not provide insight into what these factors could be, so users of the Arbitrage Pricing Theory must analytically determine relevant factors that might affect the asset's returns. On the other hand, the factor used in the Capital Asset Pricing Model is the difference between the expected market rate of return and the risk-free rate of return. Since the Capital Asset Pricing Model is a one-factor model and simpler to use, investors may want to use it to determine the expected theoretical appropriate rate of return rather than using Arbitrage Pricing Theory , which requires users to quantify multiple factors

The Capital Asset Pricing Model, allows investors quantify the expected return on investment given the risk, risk-free rate of return, expected market return and the beta of an asset or portfolio. The Arbitrage Pricing Theory, is an alternative to the Capital Asset Pricing Model that uses fewer assumptions and can be harder to implement than the Capital Asset Pricing Model. While both are useful, many investors prefer to use the Capital Asset Pricing Model, a one-factor model, over the more complicated Arbitrage Pricing Theory , which requires users to quantify multiple factors.

2.5 Multi Factor Models for Returns Generation

Factor models are index models, and they seek to identify the forces that influence the returns on a large number of securities. Multi-factor models attempt to describe asset price returns and their covariance matrix as a function of a limited number of risk attributes. Factor models are thus based on one of the fundamental tenets of financial theory; no reward without risk. The Capital Asset Pricing Model first developed by Sharpe (1964)[2], Lintner (1965)[3] and Mossin (1966)[4] is a single factor model and remains one of the most popular empirical models of the return generation process. This model uses stock beta as the only relevant risk measure. But empirical studies could not confirm this restrictive statement (Bala-Subramanian and Bharatwaj, 2005)[5]. Ross (1976)[6] posits a more general multiple-factor structure for the returns generating process, known as the Arbitrage Pricing Theory . Further work carried out in this field by Chen et al., (1986)[7] attempts to explain some of these factors. Fama and French (1992)[8], find that the main prediction of Capital Asset Pricing Model is violated for the US stock market. Exposure to two other factors, a sized-based factor and a book-to-market-based factor, often called a "value" factor, explains a significant part of the cross-sectional dispersion in mean returns. Their paper was a foundation for a number of empirical studies in this direction.

2.6 Empirical review

Udegbunam and Eriki (2001)[9] conducted a study on the Nigerian Stock Market by examining the relationship between stock prices and inflation and their results provided a strong support for the proposition that inflation exerts a significant negative influence on the behaviour of the stock prices.

Li and Wearing (2002)[10], in their study of the effect of inflation on the stock prices on Kuwait Stock Exchange discovered that inflation significantly impacts on stock prices negatively. Similar to developed markets, Nishat and Shaheen (2004)[11] for Pakistan indicated that inflation is the largest negative determinant of stock prices.

Maghayereh (2002)[12] and Al-Sharkas (2004)[13] also shown reliable negative relationship between Jordan stock prices and inflation. Anari and Kolari (2001)[14] reported negative correlations between stock prices and inflation in the short run.

Javed, et al. (2014)[15] examined the possible impact of macroeconomic variables such as fiscal policies and monetary policies (interest rate) and inflation rates on stock market performance in Pakistan. They applied the Pearson correlation and regression analysis techniques, and reported that Pakistan stock market index is significantly affected by the fiscal policy, monetary policy and inflation. The results show that interest rate and government revenue have significant negative relationship with the stock market index in Pakistan, whereas inflation rate and the government expenditures have significant positive relationship with the stock market index in Pakistan.

Terfa (2011)[16] examined the relationship between the stock market activities and selected macroeconomic variables in Nigeria. The All-share index was used as a proxy for the stock market while inflation, interest and exchange rates were the macroeconomic variables selected. Employing ordinary least square regression method, it was found that Treasury-bill and inflation rates exhibit weak influence on All Share Index. The study reported that they were negatively related to the stock market in the short run. Thus, achieving low inflation rate and keeping the Treasury Bill Rate low could improve the performance of the Nigerian stock market.

Mohammad, et. al. (2012)[17] examined the validity of Arbitrage Pricing Theory in Karachi Stock Exchange . Utilizing monthly data from

January 1985 to December 2008 and employing Johansen co-integration technique in the study. They found that, bullion price and inflation rate are weakly related to Karachi Stock Exchange 100 index returns.
According to Humpe and Macmillan (2007)[18], US and Japan stock prices are negatively correlated to a long term interest rate.

Al-Sharkas (2007)[19] for Jordan stock prices and Adam and Twenebboah (2008)[20] for Ghana stock prices indicated that the relationship between stock prices and interest rates is negative and statistically significant.
Mishra (2004)[21], and Apte (2001)[22], found a significant positive relationship between stock prices and exchange rates. Slavarek (2004)[23] found that a rising stock market leads to the appreciation of domestic currency through direct and indirect channels. Adjasi and Biekpe (2005)[24] showed that in the long-run exchange rate depreciation leads to increase in stock market prices in some of the countries, and in the short-run, exchange rate depreciations reduce stock market returns. On the other hand, some studies, such as Choi, Fang and Fu (2008)[25] showed the possibility of a very weak or no relationship between stock prices volatility and exchange rates movement. Using quarterly data, Adaramola (2011)[26] studied the impact of macroeconomic variables on stock prices in Nigeria between 1985 and 2009. He found that exchange rates exhibit strong influence on Nigeria stock prices.

Rasool, Hussain, Aamir, Fayyaz, and Mumtaz (2012)[27] examined the causal relationship between the stock price index of Karachi Stock Exchange and Exchange Rate, Foreign Exchange Reserve, Industrial Production Index, Interest Rate, Imports, Money Supply, Wholesale Price Index and Exports. The study revealed that exchange rate exhibit strong impact on stock market index. The relationship between industrial production index, wholesale price index, money supply, treasury bills rates, exchange rates and Indian Stock Index was examined by Naik and Padhi (2012)[28] applying Johansen's co-integration and Granger Causality model. The result, in line with the Arbitrage Pricing Model, reveals that macroeconomic variables and the stock market index are co-integrated and hence, a long-run equilibrium relationship exists between them. Stock prices related positively to money supply and industrial production index but negatively relate to inflation while exchange rate and interest rate are insignificant determinants. The causality test reveals that macroeconomic variable granger causes the stock prices in the long-run. It was revealed that macroeconomics variables and stock prices related even in the long-run as support by Naik and Padhi (2012).
Quadir (2012)[29] investigated the effects of macroeconomic variables of treasury-bill, interest rate and industrial production on stock returns on Dhaka stock exchange for the period between January 2000 and February, 2007. Utilizing monthly time series data, and applying Autoregressive Integrated Moving Average model. The results show that although Autoregressive Integrated Moving Average model reveal positive relationship between treasury-bill, interest rate, industrial production and market stock returns respectively, their impact are statistically insignificant.

3. Methodology

This study adopts hypothetic – deductive and causal comparative research design strategy. This approach utilizes secondary data estimates, analyses effects/impacts and testing of hypothesis. We intend to investigate the applicability of the Arbitrage Pricing Theory and investment performance using inflation rate risk, interest rate risk, exchange rate volatility, money supply rate of change, real gross domestic product and treasury bill rate on five quoted firms earnings per share in the Nigerian Capital market within the period of 1988 to 2017 precisely.

3.1 Estimation Techniques

To test the models, the data estimates collected were subjected to Ordinary Least Square regression analysis in the form of Multiple Linear Regressions to the relative regression coefficients to show the direction of the relationship between the independent and dependent variables. We estimated the regression model for earnings per share showing the results of the global statistics which include the F-statistics (Fisher statistics), Prob. F-Statistics, Durbin Watson statistics, the Loglikelihood, Akaike Info Criterion and Schwarz Criterion. We subjected the estimates to data stationarity. The Co-integration tests was utilized to determine the long run relationship of the study. Descriptive statistical analysis was also conducted to ascertain the variability of the variables in the model. The T-statistics test was used to test the hypotheses in this study in order to determine their relative effects on the explanatory variables. For test of effects/impacts among the variables we utilized the Granger Causality test.

3.3 Model specification

The **functional relationship** between investment performance indicators (earnings per share and the macroeconomic risk factors is stated as follows:

EPS=ƒ(INF, INT, EXCH, MS, RGDP, TB)

The **econometric model** to be estimated in a **linear form** is stated as follows:

$$EPS = \beta_o + \beta_1 Inf_t + \beta_2 Int_t + \beta_3 Exch_t + \beta_4 Ms_t + \beta_5 Rgdp_t + \beta_6 Tb_t + \mu i t \quad 1$$

$$EPS = \alpha_o + \alpha_1 Inf_t + \alpha_2 Int_t + \alpha_3 Exch_t + \alpha_4 Ms_t + \alpha_5 Rgdp_t + \alpha_6 Tb_t + \mu i t \quad 2$$

$$EPS = \gamma_o + \gamma_1 Inf_t + \gamma_2 Int_t + \gamma_3 Exch_t + \gamma_4 Ms_t + \gamma_5 Rgdp_t + \gamma_6 Tb_t + \mu i t \quad 3$$

$$EPS = \eth_o + \eth_1 Inf_t + \eth_2 Int_t + \eth_3 Exch_t + \eth_4 Ms_t + \eth_5 Rgdp_t + \eth_6 Tb_t + \mu i t \quad 4$$

$$EPS = \alpha_o + \alpha_1 Inf_t + \alpha_2 Int_t + \alpha_3 Exch_t + \alpha_4 Ms_t + \alpha_5 Rgdp_t + \alpha_6 Tb_t + \mu i t \quad 5$$

Where: EPS = Earnings per share
Inf = Inflation rate
Int = Interest rate
Exch = Exchange rate volatility
Ms = Money Supply rate of change
Rgdp = Real Gross Domestic Product
Tb = Treasury Bill rate
μ_i = error term
t = Time Period
β_o = Constant or intercept in the model
β_1- β_6 = Coefficients of the independent variables

3.4 A-priori expectation

Following the Arbitrage Pricing Theory and empirical studies reviewed in our research, we expect the variables to have a negative effect on the dependent variables. A-priori is therefore stated as:

$\beta_1 < 0$ $\beta_2 < 0$ $\beta_3 < 0$ $\beta_4 < 0$ $\beta_5 < 0$ $\beta_6 < 0$

4. Results and Discussion

Table 1: Descriptive Statistics Result

	INFR	INTR	EXCR	MSR	RGDP	TBR
Mean	20.94067	19.11667	20.69833	26.11	5.34	12.77133
Median	12.94	18.135	2.615	20.64	4.65	12.55
Maximum	72.8	36.09	321.46	64.92	33.7	26.9
Minimum	5.38	5.8	-5.77	3	-1.5	4.48
Std. Dev.	18.88222	5.86328	58.95331	17.25399	6.306898	4.791166
Skewness	1.473834	0.431391	4.646543	0.884375	3.102043	0.6847
Kurtosis	3.748763	4.807295	24.18604	2.836693	14.82256	4.007471
Jarque-Bera	11.56174	5.013385	669.0123	3.94393	222.8296	3.612817
Probability	0.003086	0.081537	0	0.139183	0	0.164243
Sum	628.22	573.5	620.95	783.3	160.2	383.14
Sum Sq. Dev.	10339.61	996.9635	100789.3	8633.309	1153.532	665.7027
Observations	30	30	30	30	30	30

Source: E-Views 10 Output

Inflation rate recorded the highest mean value of 20.94067 followed by exchange rate volatility with a mean value of 20.69833, interest rate 19.11667 and 12.77133 for treasury bill rate while its standard deviation values are 18,88222, 58.95331, 5.86328 and 4.79116 respectively. However, the standard deviation is relatively low for treasury bill rate,

interest rate and real gross domestic product variability or dispersion is minimal, which implies that the variables sustained a closed growth trend within the period under survey. Though the observed high value of standard deviation at 58% in exchange rate volatility, explains the high exchange rates witnessed in the year 1999 as against the low rates of exchange for the preceding years.

4.1 Augmented Dickey- Fuller Unit Root Test for Data Stationarity

The Augmented Dickey-Fuller test surveys the null hypothesis of a unit root compared to the alternative of stationarity.

Table 2: Augmented Dickey- Fuller Unit Root Test Result

Variables	Probability	T-Statistics	Order/Level of Integration
Inflation Rate	0.0362	-2.101295	I(0)
Interest Rate	0.0035	-3.079658	I(1)
Exchange Rate Volatility Rate Of Change	0.0000	-4.931360	I(0)
Money Supply Rate Of Change	0.0001	-4.476989	I(1)
Real Gross Domestic Product	0.0038	-3.025810	I(0)
Treasury Bill Rate	0.0000	-6.614568	I(1)

Source: E-Views 10 Output

The rule of thumb for the Unit Root test is either at 5% or 10%. The probabilities indicates that the variables are all stationary at level (i(0) and at 1st difference (I(1). Therefore the hypothesis of non-stationarity is thus rejected at level and first difference respectively. The variables were all included in the co-integration test.

4.2 Johansen Multivariate Co-Integration Test

The study examines the nature of the long run relationship between six macroeconomic risk factors and investment performance in the Nigeria Capital market using the Johansen multivariate co-integration test.

Table 3: Johansen Multivariate Co Integration Test Result

Series: INFR INTR EXCR MSR RGDP TBR

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.945255	202.7442	125.6154	0.0000
At most 1 *	0.773975	121.4023	95.75366	0.0003
At most 2 *	0.704214	79.76325	69.81889	0.0065
At most 3	0.510541	45.65593	47.85613	0.0793
At most 4	0.422783	25.65121	29.79707	0.1395
At most 5	0.218105	10.26419	15.49471	0.2609
At most 6	0.113561	3.375212	3.841466	0.0662

Source: E-Views 10 output

The above table indicates 3 co-integrating equations at the 0.05 level as the trace statistics is greater than the critical value at 0.05%. Therefore, we reject the null hypothesis at the 0.05% level of no co-integrating regressors. The classification suggest that there is a long run correlation between all the variables employed and that the variables share joint stochastic trend.

4.3 Presentation of the Regression Result

Regression Model Estimation Result

Table 4.: Regression results

Dependent Variable: Earnings Per Share – Model 1
Method: Least Squares
Date: 11/07/19 Time: 19:30
Sample: 1988 2017

Included observations: 30

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INFR	-0.057589	0.032263	-1.784979	0.0875
INTR	0.257716	0.130103	1.980856	0.0597
EXCR	-0.014716	0.009191	-1.601204	0.1230
MSR	-0.031817	0.032498	-0.979070	0.3377
RGDP	0.003567	0.090365	0.039475	0.9689
TBR	-0.359196	0.143576	-2.501786	0.0199
C	7.179009	1.871972	3.834999	0.0008

R-squared	0.413081	Mean dependent var	5.196000
Adjusted R-squared	0.259971	S.D. dependent var	3.199239
S.E. of regression	2.752143	Akaike info criterion	5.063600
Sum squared resid	174.2087	Schwarz criterion	5.390546
Log likelihood	-68.95400	Hannan-Quinn criter.	5.168193
F-statistic	2.697944	Durbin-Watson stat	0.852647
Prob(F-statistic)	0.039290		

Source: E-Views 10 Output

Dependent Variable: Earnings Per share – Model 2
Method: Least Squares
Date: 11/07/19 Time: 19:40
Sample: 1988 2017
Included observations: 30

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INFR	-0.039161	0.025636	-1.527599	0.1402
INTR	-0.041609	0.103377	-0.402494	0.6910
EXCR	-0.004922	0.007303	-0.673958	0.5071
MSR	-0.039720	0.025822	-1.538219	0.1376
RGDP	-0.080559	0.071802	-1.121968	0.2735
TBR	0.007758	0.114083	0.068005	0.9464
C	5.814543	1.487432	3.909115	0.0007

R-squared	0.300377	Mean dependent var	2.729000
Adjusted R-squared	0.117866	S.D. dependent var	2.328315
S.E. of regression	2.186799	Akaike info criterion	4.603718
Sum squared resid	109.9881	Schwarz criterion	4.930664
Log likelihood	-62.05578	Hannan-Quinn criter.	4.708311
F-statistic	1.645807	Durbin-Watson stat	1.306840
Prob(F-statistic)	0.179858		

Source: E-Views 10 Output

Dependent Variable: Earnings Per Share Model 3
Method: Least Squares
Date: 11/07/19 Time: 19:10
Sample: 1988 2017
Included observations: 30

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INFR	-0.024207	0.022335	-1.083799	0.2897
INTR	0.034248	0.090068	-0.380252	0.7072
EXCR	-0.005841	0.006363	-0.918098	0.3681
MSR	-0.011572	0.022497	-0.514383	0.6119
RGDP	-0.011109	0.062558	-0.177576	0.8606
TBR	-0.019956	0.099395	-0.200780	0.8426
C	4.768542	1.295928	3.679636	0.0012

R-squared	0.179420	Mean dependent var	2.869667
Adjusted R-squared	0.034644	S.D. dependent var	1.873082
S.E. of regression	1.905252	Akaike info criterion	4.328069
Sum squared resid	83.48966	Schwarz criterion	4.655015
Log likelihood	-57.92104	Hannan-Quinn criter.	4.432662
F-statistic	0.838159	Durbin-Watson stat	2.044025
Prob(F-statistic)	0.553272		

Source: E-Views 10 Output

Dependent Variable: Earnings Per Share – Model 4
Method: Least Squares
Date: 11/07/19 Time: 19:50
Sample: 1988 2017
Included observations: 30

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INFR	-0.00682	0.063580	-0.107344	0.9154

	5			
	-0.974386		-3.800423	0.0009
INTR		0.256389		
	-0.013157		0.726444	0.4749
EXCR		0.018112		
	-0.026248		-0.409853	0.6857
MSR		0.064042		
	-0.156651		-0.879679	0.3881
RGDP		0.178078		
	0.695589		2.458441	0.0219
TBR		0.282939		
	23.24019		6.299831	0.0000
C		3.689017		

	0.515265	Mean dependent var	12.10433
R-squared			
Adjusted R-squared	-0.388813	S.D. dependent var	6.937377
S.E. of regression	5.423534	Akaike info criterion	6.420336
Sum squared resid	676.5386	Schwarz criterion	6.747282
Log likelihood	-89.30504	Hannan-Quinn criter.	6.524929
F-statistic	4.074775	Durbin-Watson stat	1.571342
Prob(F-statistic)	0.006286		

Source: E-Views 10 Output

Dependent Variable: Earnings Per Share Model 5
Method: Least Squares
Date: 11/07/19 Time: 00:55
Sample: 1988 2017
Included observations: 30

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INFR	-0.003665	0.006613	-0.554255	0.5848
INTR	-0.013908	0.026669	-0.521517	0.6070
EXCR	-0.001503	0.001884	-0.797866	0.4331
MSR	0.019528	0.006661	2.931482	0.0075
RGDP	0.003869	0.018523	0.208900	0.8364
TBR	-0.057600	0.029430	-1.957168	0.0626
C	1.705845	0.383719	4.445558	0.0002

R-squared	0.427688	Mean dependent var	1.127000
Adjusted R-squared	0.278389	S.D. dependent var	0.664100
S.E. of regression	0.564138	Akaike info criterion	1.893927
Sum squared resid	7.319780	Schwarz criterion	2.220873
Log likelihood	-21.40890	Hannan-Quinn criter.	1.998519
F-statistic	2.864639	Durbin-Watson stat	1.726862
Prob(F-statistic)	0.031119		

Source: E-Views 10 Output

The value of R-squared or the Coefficient of determination indicates that 41%, 30%, 17% , 51% and 42% of the variations of Earnings Per Share are accounted for by the interactions of the explanatory variables. The negative signs of the macroeconomic risk factors Coefficient shows that there is an inverse relationship between dependent variable and the independent variables while the positive signs shows a direct relationship. The F-statistics (Fisher statistics which is a measure of overall goodness of fit of the regression) are not significant, it however failed the significance test at 5% level. However, the Prob(F-statistics) of 0.039290, 0.006286 and 0.031119 are highly significant for Earnings Per Share, which implies that the regression model fitted the data , therefore there is goodness of fit. The rule of thumb for the Log Likehood Criteria is that it must be very low in value, therefore, with the observed values of log Likelihood in our models indicate that the models have performed well and are very reliable. We also evaluated the Akaike info Criterion and Shcwarz Criterion, the rule of thump here is that it must very low in value also. The observed figures in the table above are very low in value, therefore the

models have very strong forecasting power. The rule of thump for the Durbin Watson-statistics is 2, when the Durbin Watson -statistics approaches 2 the problem of autocorrelation is non-suspect, in this case the Durbin Watson -statistics in the tables above shows that there is a positive first order serial correlation., that is, we suspect the presence of auto correlation.

Table 5: Pairwise Granger Causality Test
Date: 11/08/19 Time: 21:45
Sample: 1988 2017
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
INFR does not Granger Cause EPS	28	0.08127	0.9222
EPS does not Granger Cause INFR		2.13335	0.1415
INTR does not Granger Cause EPS	28	0.09766	0.9073
EPS does not Granger Cause INTR		1.63165	0.2174
EXCR does not Granger Cause EPS	28	0.04293	0.9581
EPS does not Granger Cause EXCR		0.44643	0.6453
MSR does not Granger Cause EPS	28	1.92371	0.1688
EPS does not Granger Cause MSR		4.97170	**0.0161**
RGDP does not Granger Cause EPS	28	0.53895	0.5905
EPS does not Granger Cause RGDP		2.79561	0.0819
TBR does not Granger Cause EPS	28	0.23435	0.7930
EPS does not Granger Cause TBR		1.91894	0.1703

Source: E-Views 10 Output

The pairwise causality test is estimated by the probability of the F-statistics as against the accepted 5% level of significance in this study when lagged by 2. Table 5 displays the test result of the pairwise causality between six macroeconomic risk factors and earnings per share. It shows a unidirectional causality flowing from money supply rate of change to earnings per share, in the Nigerian Capital. This proof of causality is confirmed by the probability which is less than 0.05. This implies that money supply rate of change granger causes earnings per share, at the lag length of two years. However, the causality results of inflation rate, real gross domestic product and exchange rate reveals no feedback relationship or causality between earnings per share.

5. Discussion of findings

5.1 Inflation rate Risk and investment performance in the Nigerian Capital market.

The analysis above reveals that inflation rate risk has no significant effect on earnings per share, for all the companies under review. Therefore, we accept the null hypothesis and reject the alternate at this instance. The negative relationship displayed above between inflation rate risk and the earnings per share confirm the findings of Arowohegbe and Imafidon (2010)[30], Umoru and Iweriebo (2017)[31], Choo, Lee, and Ung (2011)[32]. Udegbunam and Eriki (2001) opined that inflation exerts a significant negative influence on the behavior of stock prices in the Nigerian Stock Market. Besides, the negative coefficients in this study strongly affirm the negative impact of inflation rate risk on the investment performance ratios depicting a reverse direction, this negative direction might be linked to the fact that the Arbitrage pricing theory is a more general model as it allows larger number of factors to affect returns which, in the real sense, some factors may affect returns or investment performance practice.

5.2 Interest rate risk and investment performance in the Nigerian Capital market.

The result reveals that the effect of interest rate risk is positively significant on earnings per share at 5% level of significance in models one and four. Therefore, we reject the null hypothesis at this instance.

Examining the result of this analysis with result related past studies such as Hume and Macmillan (2007) for United States and Japan stock markets and Adam and Twenneboah (2008) for Ghana stock market their studies established more grounds of agreement in the results. It should be noted that rising interest

rates do not automatically result in dropping stock prices, and falling interest rates do not necessarily mean more cash and profits for companies, and therefore higher stock prices. If investors perceive that the Central Bank Nigeria raises interest rates to keep inflation down, that can be good for businesses. Stock might rise in that circumstance

5.3 Exchange rate volatility Risk and investment performance in the Nigerian Capital market.

The result reveals that the effect of exchange rate volatility risk on earnings per share ratios is negatively significant at the 5% level of significance. Therefore, we accept the null hypothesis. The results above differs from the findings of Mishra (2004) and Apte (2001), who found a significant positive relationship between stock prices and exchange rates. The study of Adaramola (2011) supported the findings of Mishra (2004) and Apte (2001) that exchange rates volatility exhibit strong influence on the Nigeria Capital market. However, the studies of Choi, Fang and Fu (2008) on the other hand showed the possibility of a weak or no relationship between stock prices volatility and exchange rates movement which corroborates our findings above.

5.4 Money Supply rate of change Risk and investment performance in the Nigerian Capital market.

The results above reveals that money supply rate of change risk has no significant effect on earnings per share, for the companies under review, therefore, we accept the null hypothesis and reject the alternate.. However, we observed a significant effect of money supply rate of change in model 5.

Our results to a large extent corroborates the findings of Humpe and Macmillan (2007) who found an insignificant relationship between US stock prices and the money supply.

5.5 Real Gross Domestic Product Risk and investment performance in the Nigerian Capital market.

The results reveals that real gross domestic product growth rate risk has no significant effect on earnings per share, Therefore, we accept the null hypothesis and reject the alternate.

The growth rate of gross domestic product is the most important indicator of the performance of the economy. According to Chandra (2004) the growth rate of the gross domestic product and the stock market returns have positive relationship, the higher the growth rate other things being equal, the more favourable it is for the stock market. However, this postulation differs from the results above probably owing to the fact that the Nigerian real gross domestic product has not really witnessed sustainable growth over the years due to uncoordinated and unproductive government policies.

5.6 Treasury Bill rate Risk and investment performance in the Nigerian Capital market.

The estimation result reveals that treasury bill rate risk has no significant effect on earnings per share for the companies, therefore, we accept the null hypothesis and reject the alternate. The results above corroborated the findings of Quadir (2012) who found a statistically insignificant result between stock market returns and treasury bill rates for Dhaka stock exchange. However, we observed a significant effect of treasury bill rates on earnings per share in models one and four at the 5% level of significance. Therefore, we reject the null hypothesis and accept the alternate at this instance.

6. Conclusion

From the foregoing, and on the basis of our model specification and findings, it is evident that the independent variables in the study do not have significant impact on earnings per share of the selected companies under review. In other words, the findings suggest that the investment performance for the Nigerian Capital market does not toe the line of the stimulus of the Arbitrage Pricing Theory as the

selected macroeconomic risk factors could not strongly explain earnings per share. In the drift of economic events and interactions, it is certain that the capital market is operated under the influence of market forces while consistent and sustainable government fiscal and monetary policies will be used to checkmate extraneous events that might jeopardize the capital market operations for the general well being of the economy.

6.1 Recommendations

On the basis of our analysis and findings, we recommend the following strategies:

1. Stability of macroeconomic resolutions: It is therefore suggested that the government should design sound and stable macroeconomic policies aimed at keeping the macrocosmic risk factors such as inflation rate, interest rate, exchange rate, gross domestic product and treasury bill rate at a manageable level that is helpful and consistent with economic trends in the Capital market.

2. Good Governance: The Nigerian Capital market development in no doubt has suffered from macroeconomic policies instability over the years due to bad governance, despite the few progress made so far, economic volatility has continued to be a foremost risk to the development of the capital market we therefore, suggest corruption free governance and strategic policies to drive the capital market.

3. Interest rate stability for emerging stock markets is very crucial in order to avoid monetary policies that will drive investments in fix income and adversely affect equity investors.

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