Uncontrollable Risk Factors and Investment Performance in the Nigerian Capital Market: An Impact Study

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Abstract

This paper analyses the impact of uncontrollable risk factors on investment performance in the Nigerian Capital market applying the Arbitrage Pricing Theory. The specific objective was 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 investment performance proxy by price earnings ratio. 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 also 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 uncontrollable risk factors do not have significant impact on investment performance for the period under review. We therefore recommended Policy motivations aimed at managing market realities in the capital market, government to pursue prudent and transparent macroeconomic policies for the single intent to develop the capital market. Regulators and government should embark on well calculated steps geared towards curtailing the negative influences from uncontrollable risk factors affecting 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 Rates.

Introduction

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 portfolios 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. 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 is 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 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 uncontrollable risk factors to be included in the model, rather left the identification of these factors to us as empirical matter. The primary advantages of using macroeconomic factors as stated by Azeez and Yonoezawa, (2003) and DeFusco, et al. (2004) are: (1) the factors and their prices in principle can be given economic interpretations, while with factor analysis approach it is unknown what factors are being priced; and (2) rather than only using asset-prices to explain asset-prices, observed macroeconomic factors introduce additional information, linking asset-price behavior to macroeconomic events. Groenewold and Fraser (1997) opined that this is both its strength and its weakness. It is strength in empirical work since it permits the researcher to select whatever factors provide the best explanation for the particular sample at hand. It is weakness in practical applications in contrast to the Capital Asset Pricing Model; it cannot explain variations in asset returns in terms of limited and easily identifiable factors, such as equity's beta. While there is no formal guidance choosing the right macroeconomic variables to the Arbitrage Pricing Theory model, Chen et al. (1986) suggest a discounted cash flow approach for their selection. They argue that because current opinion about these variables are incorporated in price, it is only innovation or unexpected changes that can affect returns.

Statement of The Problem

The advocates of the model propose infinite stream of uncontrollable risk factors with specific assumptions hence its effect on returns on capital asset is questionable to a large extent. Therefore, it is pertinent to evaluate empirically the relative impact of six most significant uncontrollable risk 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 an emerging market and explore national factors to measure the import of risk –return trade-off for predicting return on investment.

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.

Literature review

Conceptual framework

One of the most sought-after challenges throughout time has been the discovery of a model that can truly explain what determines a price of stock. There have been several studies, and researchers have come up with several proposals as to the determinants of value of stock. We can identify from previous studies a few of the determinants that affect the value of stock. A value of stock will be determined by the cash flows that investors seek from

owning a stock, whether these cash flows are in the form of dividends or capital gains return (Iqbal and Haider, 2005). Modigliani and Miller (1961) found that investors are keener and primarily focused on the dividends that they will get from a stock, as opposed to capital gains from increase in the price of the stock. Thus, anything that is expected to affect the income component as unanticipated changes in rates of inflation, or unanticipated changes in industrial production, would logically affect a stock valuation. Following the same logic any factor that would affect the discount rate and thus the present value of the stock and cash received through dividends, as the changes in structure of interest rates, would also logically affect the value of the stock (Chen et al., 1986).

The Arbitrage Pricing Theory asserts that the return on stocks should be described by the mean relationship as opposed to, say, a nonlinear relationship. This linearity is one of the most attractive features of the theory. Ross (1976) further states that if this relationship did not hold, and the factors were not able to explain the stock return, then people could enter into arbitrage opportunities by selling short the overpriced stocks, and simultaneously buying the underpriced stocks, thus granting the model its name "The Arbitrage Pricing Theory". The Arbitrage Pricing Theory is one of the most prominent theories in finance, and has been applied on different markets to see whether the theory holds or not. However, the Arbitrage Pricing Theory leaves unanswered the following two questions: The number of macro-economic factors to be included in the model. Whether there is only one set of -factors or there are different equivalent sets of factors. If the former case holds true: how can we recognize these factors? And if the latter circumstance holds true: what conditions determine equivalent factors. In most of the previous tests of the Arbitrage Pricing Theory, researchers focused on whether the Arbitrage Pricing Theory does apply in a certain market, and have used ad-hoc factors already determined from existing tests. There has not been much insight or testing into the number or identity of risk factors and their associated risk premiums that should be included in the model. Apparently, this should be crucial to find the factors that should be included, if the model is to be regarded as an accurate and easy to use model by professionals in the stock market. However, Berry et al., (1988) gave us a good idea of the characteristics the factors must fulfill to be included in the model, the following are the three characteristics: There have to be market wide factors that have a prevalent influence on the stock returns. The factors must also have an effect on the expected return, which can be identified through empirical analysis of statistical stock returns. The risk factor must be unpredictable or unforeseeable by the market, to allow it to become a risk factor. Thus Berry et al. (1988) gave us a guideline as to the factors that could be included in the model, and which could be used as a standard for later research.

Theoretical Review

The arbitrage model of capital asset pricing was proposed as an alternative to the mean variance capital asset pricing model developed independently by Sharpe, Lintner, and Treynor, that has become the major analytical tool for explaining phenomena observed in capital markets for risky assets (Ross, 1976). In efficient markets, assets with similar risk must have similar expected rates of return hence two bonds with same maturity and risk sold at different yields will result in arbitrage. In Arbitrage Pricing Theory language, assets with same sensitivity to identify factors in the economy must have the same expected return or arbitrage which set in (Osamwonyi, 2003). According to the Arbitrage Pricing Theory, the market return is determined by a number of factors. Hence, rather than specifying a security's return as a function of one factor alone (the returns on the market) one could specify required returns of individual securities to be a function of various fundamental economic factors (Osaze, 2007). With Arbitrage Pricing Theory, asset returns co-vary with movement of factors and this generates systematic risk hence these factors and asset's sensitivity to these factors determine expected and actual returns. Theoretically, an econometric test of the Arbitrage Pricing Theory demands the modeling of anticipated return of a financial asset as linear function of macroeconomic variables in return generating process Chen and Ingersoll (1983), taking into cognizance degree of responsiveness to changes in variables which are represented by a factor-specific coefficient subsequent to a return generating process, which is a mathematical computation of how the equity returns move with economic factors. Focusing on capital asset returns governed by a factor structure, the Arbitrage Pricing Theory is a one-period model, in which preclusion of arbitrage over static portfolios of these assets leads to a linear relation between the expected return and its covariance with the factors. The Arbitrage Pricing Theory, however, does not preclude

arbitrage over dynamic portfolios. Consequently, applying the model to evaluate managed portfolios is contradictory to the no-arbitrage spirit of the model. An empirical test of the Arbitrage Pricing Theory entails a procedure to identify features of the underlying factor structure rather than merely a collection of mean-variance efficient factor portfolios that satisfies the linear relation (Huberman and Zhenyu, 2005). The Arbitrage Pricing Theory was developed primarily by Ross (1976). It is a one-period model in which every investor believes that the stochastic properties of returns of capital asset are consistent with a factor structure. Ross argues that if equilibrium prices offer no arbitrage opportunities over static portfolios of the assets, then the expected returns on the assets are approximately linearly related to the factor loadings. Ross' (1976) heuristic argument for the theory is based on the preclusion of arbitrage. Ross' formal proof shows that the linear pricing relation is a necessary condition for equilibrium in a market where agents maximize certain types of utility. The subsequent work, derives either from the assumption of the preclusion of arbitrage or the equilibrium of utility-maximization. A linear relation between the expected returns and the betas is tantamount to an identification of the stochastic discount factor. The Arbitrage Pricing Theory is a substitute for the Capital Asset Pricing Model in that both assert a linear relation between assets' expected returns and their covariance with other random variables.

Empirical review

Khurshid (2017) verified the arbitrage-pricing model and examined if the Arbitrage Pricing Model is valid for the Greek capital market. They examined 31 companies listed on the Athens stock exchange with the highest market capitalization. The Arbitrage Pricing Theory estimates that the macro-economic factors influence the Athens stock return. Their model was tested by performing principal factor and regression analysis. The principal factor analysis identifies the macro-economic factors, which will be used in the regression analysis. The regression analysis indicates the macro-economic factors influence on the expected stock return. The finding of the study is that the Arbitrage Pricing Theory model is invalid for the Athens Stock Exchange market. Fifield, Power and Sinclair (2002) tested the influence of domestic variables (Gross Domestic Product, money supply inflation, short term interest rate, exchange rate and trade balance) as well as global variables (world industrial production, world return, oil price United States interest rates world inflation and commodity prices) using cross-sectional data for thirteen emerging markets in explaining the stock market. Their results showed that interest rates, Gross Domestic Product, money supply and inflation as well as the world production and inflation, can explain the variability in equity returns in upcoming markets. Choo, Lee and Ung (2011) using Generalized Autoregressive Conditional Heteroskedasticity models found macroeconomic variables have no impact on the volatility of Japanese stock market. Sangmi and Hassan (2013) found a significant association between variables like inflation, exchange rate, interest rate and money supply in India. Khairi and Mai (2017) examined the Arbitrage Pricing Theory, which allows multiple sources of systematic risks to be taken into account, in the Egyptian Stock Exchange by using the Principal Component Analysis. For this purpose, the monthly return of all the shares included in the Egyptian Exchange 30 index from January 2007 to December 2013 of the Egyptian Stock Exchange is used as the dependent variable. The explanatory variables are growth rates of the value added of Industrial production, Consumer price index (inflation rate), Money supply (M1), Short-term interest rate, Discount rate, Exchange rate of the Egyptian pound with the United States $, Price of Brent crude petroleum, and the market Index (Egyptian Exchange 100). The results show that only the growth rates of Consumer price index (inflation rate), and Price of Brent crude petroleum have significant influence on the stock return and thus will be included in The Egyptian Arbitrage Pricing Model. Overall, the results suggest validity but weak applicability of Arbitrage Pricing Theory in the Egyptian Stock Exchange over the study period. Kuwomu and Owasu-Nantwi (2011) presented the Ghanaian evidence on stock returns and macroeconomic variables. Using the full information maximum likelihood estimation, they established that exchange rate and Treasury bill rate had significant effects on stock returns within the study period. Chakaza (2008) investigated the relationship between systematic factors and stock prices in Zimbabwe. He used systematic factors that are financial in nature with the expectation that these factors cause a unidirectional effect on stock prices. He concluded that those systematic factors have significant effects on stock returns.

Oyetayo and Adeyeye (2017) employed the error-correction model and the fully modified ordinary least squares methods for the short-run and long-run regressions in testing the Arbitrage Pricing Theory. Their short-run results seem to agree with existing theories on Arbitrage Pricing Theory thus confirming that Arbitrage Pricing Theory is relevant in Nigeria testing macroeconomic variables which include inflation, exchange rate, interest rate, Gross Domestic Product and domestic credit. However, the long-run relationship of stock returns and Real Gross Domestic Product was found to be contentious. Even though their result runs contrary to predictions on the relationship between the two, they found peculiar events and circumstances within the Nigerian macroeconomic context that provides logical reasons for the deviation. Arowohegbe and Imafidon (2010) tested the Arbitrage Pricing Theory model using macroeconomic variables on earnings per share. The results obtained shown that Inflation rate, Interest rate, money supply, Gross Domestic Product and Exchange rate were not significant for explaining Earnings per share of the Companies under review. This puts a question mark on the applicability of Arbitrage pricing theory in explaining stock returns in the Nigerian capital market. Arewa and Nwakanma (2013) employed the Principal Component Analytical technique to derive proxies for the factor likelihood Arbitrage Pricing Theory of Ross using monthly security returns of 53 companies listed in Nigerian Stock Exchange over the period 1 Jan 2003 to 31 Dec 2011. The results of the Principal Component Analysis methodology reveal that 17 latent factors are identified in the Nigerian equity market; while the estimated results of the cross-sectional Arbitrage Pricing Theory pricing model show that only 4 of the factors are priced. However, the evidence of systematic hypothesis is not ascertained in this study. Thus, the unsystematic risk associate with arbitrage portfolios in the market cannot be reduced/ eliminated no matter the level of diversification.

Umoru and Iweriebo (2017) tested the o f validity of arbitrage pricing theory in Nigerian Stock Exchange Market and its volatility for the sample period of 2010 to 2014 using quarterly data on forty-two stocks listed in Nigerian Stock Exchange. Using the Exponential Generalized Autoregressive Conditional Heteroskedasticity model, General Least Square and the fixed effect panel data estimator with cross section specific coefficients, the study validates the Arbitrage Pricing Theory for Nigerian Stock Exchange Market. The policy implication is such that the study upholds the Arbitrage Pricing Theory for Nigerian Stock Exchange Market. Results show money supply had significant positive outcome on stock return; Treasury bill with inflation rates had significant negative outcome on return of Nigerian Stock Exchange Market. Above all, a significant Exponential Generalized Autoregressive Conditional Hetereskedasticity effect was found with indication of harmful market volatility on stock return. This indeed validates that Nigerian stock exchange is vulnerable to instability in the market. The study so recommends the need for stock investors to be cognizant of trend of both domestic macroeconomic fundamentals.

Methodology

Our research design is hypothetic – deductive and causal comparative. This strategy employs secondary data estimates, investigates effects/impacts and testing of hypothesis. We examined the relationship between uncontrollable risk factors such as inflation rate risk, interest rate risk, exchange rate volatility, money supply rate of change, real gross domestic product and treasury bill rate and investment performance (proxy by Price earnings ratio) based on the Arbitrage Pricing Theory utilizing the data of five quoted firms in the Nigerian Capital market within the period of 1988 to 2017 precisely.

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 price earnings ratio revealing 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 unit root test. 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.

Model specification

The **functional relationship** between investment performance indicators (price earnings ratio and the uncontrollable risk factors is stated as follows:

$P/E = f(INF, INT, EXCH, MS, RGDP, TB)$

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

$$P/E = \beta_o + \beta_1 Inf_t + \beta_2 Int_t + \beta_3 Exch_t + \beta_4 Ms_t + \beta_5 Rgdp_t + \beta_6 Tb_t + \mu_{it} \quad 1$$

$$P/E = \text{ɖ}_o + \text{ɖ}_1 Inf_t + \text{ɖ}_2 Int_t + \text{ɖ}_3 Exch_t + \text{ɖ}_4 Ms_t + \text{ɖ}_5 Rgdp_t + \text{ɖ}_6 Tb_t + \mu_{it} \quad 2$$

$$P/E = \gamma_o + \gamma_1 Inf_t + \gamma_2 Int_t + \gamma_3 Exch_t + \gamma_4 Ms_t + \gamma_5 Rgdp_t + \gamma_6 Tb_t + \mu_{it} \quad 3$$

$$P/E = \text{ɧ}_o + \text{ɧ}_1 Inf_t + \text{ɧ}_2 Int_t + \text{ɧ}_3 Exch_t + \text{ɧ}_4 Ms_t + \text{ɧ}_5 Rgdp_t + \text{ɧ}_6 Tb_t + \mu_{it} \quad 4$$

$$P/E = \alpha_o + \alpha_1 Inf_t + \alpha_2 Int_t + \alpha_3 Exch_t + \alpha_4 Ms_t + \alpha_5 Rgdp_t + \alpha_6 Tb_t + \mu_{it} \quad 5$$

Where: P/E = 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

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 variable. A-priori is therefore stated as:

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

Results and Discussion

Table 1: Descriptive Statistics

	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	0.00000	0.139183	0.00000	0.164243
Sum	628.22	573.5	620.95	783.3	160.2	383.14
Sum Sq. Dev.	10339.6	996.964	100789	8633.31	1153.53	665.703
Observations	30	30	30	30	30	30

INFR = Inflation Rate, INTR = Interest Rate, EXCR = Exchange Rate Volatility Change Rate, MSR = Money supply rate of Change, RGDP = Real Gross domestic Product, TBR = Treasury Bill Rate.

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 which means that variability or dispersion is minimal, this 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. The probability values of the Jarque_bera statistic are significant at the 5% level of significance this is an indication that the variables are properly distributed.

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.

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 *	0.920822	206.9528	125.6154	0.0000
At most 1 *	0.822439	135.9433	95.75366	0.0000
At most 2 *	0.767869	87.54699	69.81889	0.0010
At most 3	0.617295	46.65427	47.85613	0.0645
At most 4	0.390581	19.76054	29.79707	0.4392
At most 5	0.164683	5.893552	15.49471	0.7081
At most 6	0.030079	0.855136	3.841466	0.3551

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. This result confirmed the existence of long run relationship among the variables.

Presentation of the Regression Result

Regression Model Estimation Result

Table 4.: Regression results

Dependent Variable: Price/earnings ratio – Model 1
Method: Least Squares
Date: 11/07/19 Time: 19:34
Sample: 1988 2017
Included observations: 30

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INFR	-0.002126	0.004931	-0.431230	0.6703
INTR	-0.004290	0.019883	-0.215743	0.8311
EXCR	-0.000529	0.001405	-0.376782	0.7098
MSR	0.002580	0.004966	0.519436	0.6084
RGDP	-0.003402	0.013810	-0.246324	0.8076
TBR	0.012486	0.021942	0.569062	0.5748
C	0.135824	0.286079	0.474779	0.6394

R-squared	0.038534	Mean dependent var	0.207000
Adjusted R-squared	-0.212284	S.D. dependent var	0.381993
S.E. of regression	0.420588	Akaike info criterion	1.306638
Sum squared resid	4.068570	Schwarz criterion	1.633584
Log likelihood	-12.59957	Hannan-Quinn criter.	1.411231
F-statistic	0.153632	Durbin-Watson stat	2.086268
Prob(F-statistic)	0.986358		

Source: E-Views 10 Output

Dependent Variable: Price/earnings ratio-Model 2
Method: Least Squares
Date: 11/07/19 Time: 19:44
Sample: 1988 2017
Included observations: 30

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INFR	0.000658	0.001046	0.628621	0.5358

INTR	-0.011385	0.004219	-2.698627	0.0128
EXCR	0.000273	0.000298	0.917548	0.3684
MSR	-0.001007	0.001054	-0.955725	0.3491
RGDP	0.010961	0.002930	3.740633	0.0011
TBR	0.003510	0.004656	0.753843	0.4586
C	0.346490	0.060703	5.707916	0.0000

R-squared	0.527068	Mean dependent var	0.225333
Adjusted R-squared	0.403695	S.D. dependent var	0.115572
S.E. of regression	0.089245	Akaike info criterion	-1.793893
Sum squared resid	0.183189	Schwarz criterion	-1.466947
Log likelihood	33.90839	Hannan-Quinn criter.	-1.689300
F-statistic	4.272133	Durbin-Watson stat	0.698234
Prob(F-statistic)	0.004920		

Source: E-Views 10 Output

Dependent Variable: Price/Earnings Ratio –Model 3
Method: Least Squares
Date: 11/07/19 Time: 19:24
Sample: 1988 2017
Included observations: 30

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INFR	-0.001427	0.001231	-1.159004	0.2583
INTR	0.008059	0.004965	1.623213	0.1182
EXCR	0.000298	0.000351	0.848344	0.4050
MSR	-0.002195	0.001240	-1.769670	0.0900
RGDP	-0.002300	0.003448	-0.666946	0.5114
TBR	-0.002591	0.005479	-0.472969	0.6407
C	0.131342	0.071432	1.838707	0.0789

R-squared	0.224445	Mean dependent var	0.159000
Adjusted R-squared	0.022126	S.D. dependent var	0.106199
S.E. of regression	0.105018	Akaike info criterion	-1.468411
Sum squared resid	0.253661	Schwarz criterion	-1.141465

Log likelihood	29.02616	Hannan-Quinn criter.	-1.363818
F-statistic	1.109362	Durbin-Watson stat	1.071908
Prob(F-statistic)	0.387249		

Source: E-Views 10 Output

Dependent Variable: Price/earnings ratio-Model 4
Method: Least Squares
Date: 11/07/19 Time: 19:54
Sample: 1988 2017
Included observations: 30

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INFR	-0.001270	0.000756	-1.679694	0.1066
INTR	0.002574	0.003049	0.844192	0.4073
EXCR	0.000142	0.000215	0.657584	0.5173
MSR	0.000545	0.000762	0.715353	0.4816
RGDP	0.000324	0.002118	0.152773	0.8799
TBR	-0.000861	0.003365	-0.255940	0.8003
C	0.121505	0.043869	2.769750	0.0109

R-squared	0.189782	Mean dependent var	0.152000
Adjusted R-squared	-0.021579	S.D. dependent var	0.063810
S.E. of regression	0.064495	Akaike info criterion	-2.443499
Sum squared resid	0.095671	Schwarz criterion	-2.116553
Log likelihood	43.65248	Hannan-Quinn criter.	-2.338906
F-statistic	0.897905	Durbin-Watson stat	1.474820
Prob(F-statistic)	0.513085		

Source: E-Views 10 Output

Dependent Variable: Price/Earnings Ratio-Model 5
Method: Least Squares
Date: 11/07/19 Time: 18:13
Sample: 1988 2017
Included observations: 30

Variable	Coefficient	Std. Error	t-Statistic	Prob.

INFR	5.63E-05	0.000263	0.214175	0.8323
INTR	0.000168	0.001060	0.158215	0.8757
EXCR	-8.97E-05	7.49E-05	-1.198437	0.2430
MSR	-0.000244	0.000265	-0.920734	0.3667
RGDP	0.000274	0.000736	0.372008	0.7133
TBR	-0.000363	0.001170	-0.310801	0.7588
C	0.058017	0.015249	3.804726	0.0009

R-squared	0.128908	Mean dependent var	0.051000
Adjusted R-squared	-0.098333	S.D. dependent var	0.021391
S.E. of regression	0.022418	Akaike info criterion	-4.556911
Sum squared resid	0.011559	Schwarz criterion	-4.229965
Log likelihood	75.35367	Hannan-Quinn criter.	-4.452318
F-statistic	0.567276	Durbin-Watson stat	1.219044
Prob(F-statistic)	0.751980		

Source: E-Views 10 Output

The Coefficient of determination which is the R-squared **indicates** that 3%, 52%, 22%, 18% and 12% of the variations of Price Earnings Ratio are accounted for by the interactions of the explanatory variables. The negative coefficient of the uncontrollable risk factors shows that there is an inverse relationship between dependent variable and the independent variables while the positive coefficient 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 0.004920 is significant for price earnings ratio, which implies that the regression model fitted the data, therefore there is goodness of fit. We also evaluated the Akaike info Criterion and Shcwarz Criterion, the rule of thumb 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 thumb 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 of 0.698234, 1.071908, 0.474820 and 1.219044 in the tables above shows that there is a positive first order serial correlation., that is, we suspect the presence of auto correlation.

Table 4: Multicolinearity Test For The Macroeconomic Risk Factors

	INFR	**INTR**	**EXCR**	**MSR**	**RGDP**	**TBR**
INFR	1.000000	0.443099	-0.061299	0.171623	-0.203295	0.421773
INTR	0.443099	1.000000	0.156363	0.397674	0.058668	0.617901
EXCR	-0.061299	0.156363	1.000000	0.078621	-0.194813	0.086922
MSR	0.171623	0.397674	0.078621	1.000000	-0.069672	0.235553
RGDP	-0.203295	0.058668	-0.194813	-0.069672	1.000000	-0.190998
TBR	0.421773	0.617901	0.086922	0.235553	-0.190998	1.000000

Source: E-Views 10 Output

Interpretation

The correlation matrix above shows that the explanatory variables are not related in a significant manner which implies that there is no perfect relationship among the uncontrollable risk factors.

Table 5: Pairwise Granger Causality Tests

Date: 11/08/19 Time: 21:50
Sample: 1988 2017
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
INFR does not Granger Cause P_ER	28	2.52302	0.1022
P_ER does not Granger Cause INFR		0.28930	0.7515
P_ER does not Granger Cause INTR	28	1.00024	0.3832
INTR does not Granger Cause P_ER		0.65664	0.5280
EXCR does not Granger Cause P_ER	28	0.43420	0.6530
P_ER does not Granger Cause EXCR		0.03016	0.9703
TBR does not Granger Cause P_ER	28	0.52817	0.5967
P_ER does not Granger Cause TBR		1.79312	0.1889
RGDP does not Granger Cause P_ER	28	0.18531	0.8321
P_ER does not Granger Cause RGDP		0.02015	0.9801
MSR does not Granger Cause P_ER	28	0.55440	0.5819
P_ER does not Granger Cause MSR		6.80493	**0.0048**

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 uncontrollable risk factors and price earnings ratio. It shows a unidirectional causality flowing from money supply rate of change to price earnings ratio, 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 price earnings ratio, at the lag length of two years. However, the causality results of inflation rate, interest rate, real gross domestic product, treasury bill rate and exchange rate reveal no feedback relationship or causality between price earnings ratio.

Discussion of findings

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

The analysis above reveals that inflation rate risk has no significant effect on price earnings ratio, for all the models 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 price earnings ratio confirm the findings of Akbar et. al. (2012), Maysami and Koh (2000), Mohammed et. al (2012). 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 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 not actually affect returns or investment performance in practice.

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 price earnings ratio at 5% level of significance in model two. Therefore, we reject the null hypothesis at this instance. Examining the result of this analysis with related past studies results such as Humpe and Macmillan (2007) for United States and Japan stock markets and Maysami and Koh (2000) for Singapore 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. Similarly, if investors think the Central Bank Nigeria is lowering rates because of declining economy, stocks may seem less attractive and market prices could go down.

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

The result reveals that the effect of exchange rate volatility risk on price earnings ratio is negatively significant at the 5% level of significance. Therefore, we accept the null hypothesis. The results above differ 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), Bhattacharya et. al (2001), Doong et. al. (2005) 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.

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

The results above reveal that money supply rate of change risk has no significant effect on price earnings ratio, for the companies under review, therefore, we accept the null hypothesis and reject the alternate. Our results to a large extent corroborate the findings of Humpe and Macmillan (2007) who found an insignificant relationship between US stock prices and the money supply.

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

The results reveal that real gross domestic product growth rate risk has no significant effect on price earnings ratio. 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.

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 price earnings ratio for the models under review, therefore, we accept the null hypothesis and reject the alternate. The results above corroborated the findings of Quadir (2012) and Kuwomu (2011) who found a statistically insignificant result between stock market returns and treasury bill rates for Dhaka stock exchange.

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 price earnings ratio 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 uncontrollable risk factors could not explain price earnings ratio. 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 wellbeing of the economy.

Recommendations

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

1. Policy motivations: Government should endeavor to articulate appropriate incentives and policies to encourage investors in the capital market.
2. Government to pursue prudent and transparent macroeconomic policies for the single intent to develop our capital markets.
3. Regulators and government should embark on well calculated steps geared towards curtailing the negative influences from uncontrollable risk factors affecting investment performance in the Nigerian capital market.
4. 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.
5. 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.
6. 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.
7. And finally, for the capital market to explore the huge opportunities in its operating environment and beyond and cope with market challenges, uncontrollable risk factors must be properly monitored to ensure macroeconomic stability and sustainable economic flow of returns.

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