Effect Of Episodic Market Conditions On Beta Variability In Nigerian Stock Market

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ABSTRACT

The studies on beta variability have been fully documented in the literature with various empirical stances, meaning that a concession has not been reached. In view of this we employ the variable Mean Response Regression Model to investigate the random movement of beta coefficients over time and across market phases, using monthly stock returns from Nigerian Stock Exchange (NSE). Our findings based on this model show that beta coefficients move randomly around a trend line when the market is up-beat, whereas they tend to be less volatile in the down market. However, a long-run equilibrium relationship between the return on the individual security and beta components is evident in the two markets. Based on these findings we recommend that investors should arbitrage between these markets and take advantage of price differentials to earn riskless profit.

Keywords: Beta; Uncertainty; Bullish Market; Bearish Market

1. INTRODUCTION

The role of risk in portfolio management makes it a subject of considerable interest in finance literature. It features prominently in determining optimum portfolios, performance evaluation, and sustaining fair pricing for stocks. Market risk which is widely known as beta is perhaps the most crucial measure of risk. Its visibility started with the pioneering works of (Sharpe, 1964; Lintner, 1965; Mossin, 1966). Ever since it became extensively known, beta as a tool for making investment decisions has been increasingly recognized by investors all over the world. Indeed its variability over time and across markets has been subjected to serious theoretical debates.

The main thrust of the argument is that beta as a measure of non-diversifiable risk is not constant. Hirschey (2001) shows that for Dow Jones Stocks, the correlation between current year betas and previous year betas is only 0.34 which downplays any significant presence of multicollinearity in the series of betas. Furthermore, Fabozzi and Francis (1978) investigate about 700 stocks on the New York Stock Exchange (NYSE) and discover that the betas of many stocks in the exchange move randomly rather than remaining constant over time.

It is important to mention here that the conditional Capital Asset Pricing Model (CAPM) is deeply rooted on the premise that the total risk has two components: systematic (beta) and unsystematic risk. The latter has no practical relevance, since it can be eliminated through diversification; while the former is non-diversifiable but dynamic in nature. To account for this, the study of Andersen et al. (2006) advocates the use of conditional CAPM which explicitly models the dynamics of the portfolio betas. Huang and Chen (2005) and Wang et al. (2009) provide examples of sudden changes in the economic environment which in turn is capable of causing changes or variations in portfolio betas.

At this introductory stage, we have discovered that a test for portfolio beta variability has not been conducted in most of the African countries including Nigeria; this is why we are inspired to carry out this study here

in Nigeria so as to provide a fresh empirical stance and lamplight to researchers or practitioners in the Nigerian capital market. Therefore, in this paper, we take the view of portfolio holders, who are comfortlessly "sitting at the fence" thinking whether to hold or possibly sell their assets, into consideration by developing a new scheme to investigate the variability of portfolio betas over time and across market situations. The notion behind this is to point out the needs for investors to identify the two market phases characterizing the Nigerian capital market and arbitrage to earn riskless profit. Our work draws inference from Singh's, Nagen's Choudihry`s and Rap`s (SNCR, 1976) variable Mean Response Regression Model for estimating the parameters of CAPM; yet it goes beyond their contributions in that we state their model in a modified form to capture the changes in beta coefficients across the up and down market conditions. And we further estimate this model with an appropriate technique to determine if there is presence of a long-run relationship between beta as a measure of market risk and the returns of stocks held by investors in Nigeria. In achieving these objectives, we hope that the gap in the literature is going to be a little bit reduced and the existing knowledge shall be broadened. However, besides the introductory section which has been discussed, other parts of the paper are as follows: Section 2 deals with literature review and theoretical underpinning, Section 3 discusses stylized facts on the Nigerian stock market, Section 4 presents methodology and data, while empirical analysis, conclusion and policy recommendations are presented in Sections 5 and 6 respectively.

2.   LITERATURE REVIEW AND THEORETICAL UNDERPINNING

In finance theory, the thought of considering risk factors that significantly affects stock returns started with the a-priori work of Sharpe in 1964. He dependently shows the relationship between systematic risk (ie beta) and return using single indexed model (SIM) that is alternatively known as Capital Asset Pricing Model (CAPM). The CAPM is rooted on the Markowitz's (1952) mean-variance portfolio model and some assumptions such as: All investors have identical investment and consumption decisions; all investors are utility maximisers and risk-adverse in their decision rules; capital markets are efficient and completely free from man-made friction and the supply of risky assets is exiguously determined. These assumptions are considered to be unrealistic, meaning that the single factor CAPM is theoretically clouded with uncertainty, however, it is a valid model only on the ground of its mean-variance efficiency (Rose, 1976). In the spirit of sustaining a particular trade-off between beta and return, Lintner (1965) makes a significant contribution towards the development of the CAPM and its application in the determination of investment risk. In the same token, the studies of Mossin (1966), Black, Jensen, and Scholes (1972) extend the theoretical scope or acceptability of the CAPM in modern finance. However, beta is conceptually defined as that component of the total risk that is none diversifiable; it has therefore been variously referred to as non-diversifiable risk, relevant risk, systematic risk, residual risk, or market risk (Sharpe, 1964; Lintiner, 1965; Mossin, 1966). Generally, beta serves the purpose of estimating the return on any given asset in relation to the market return and thus offers a model for pricing risk. In this regard, beta can be used to examine an asset's volatility in relation to the market portfolio (Hirschey, 2001; Sharpe et al., 1999).

The nature and behavior of beta since its amplification by Sharpe in 1963 have occupied the attention of financial researchers. Baesel (1974) examines the impact of the length of the estimation interval on beta stability, using monthly data the author estimates betas over several intervals ranging from one year, two years, four years, six years, and nine years. He finds that the stability of beta increases significantly as the length of the estimation interval increases. Likewise, Blume (1971) in his study employs monthly prices and successive seven-year periods, which reveals that the portfolio betas are very stable whereas individual security betas are highly unstable in nature. He also illustrates that, the stability of individual beta increases as the time of estimation period increases. Similar results are also obtained by Altman et al. (1974). In both cases, initial and succeeding estimation periods are of the same length. Allen et al. (1994) consider the subject of comparative stability of beta coefficients for individual securities and portfolios. The usual perception is that the portfolio betas are more stable than those for individual securities. They argue that if the portfolio betas are more stable than those for individual securities, greater confidence can be placed in portfolio beta estimates over longer periods of time. But, their study concludes that larger confidence in portfolio betas is not justified. Beta instability can be reduced however as both portfolio size and sample duration increase (Fama & Macbeth, 1973; Odabasi, 2000). A study by Kapusuzoglu (2008) examines the alpha and beta values in the Istanbul Stock Market and highlights the variability of the beta parameter. It encourages investors to utilize the CAPM as a supplementary instrument in the process of portfolio information and to avoid relying on it as a sole indicator guiding investment strategy. He states that though in recent years, the

CAPM has been attacked as an incomplete model for explaining market pricing behavior, but academics and practitioners cannot up till now agree on a good alternative. Hence, the CAPM remains an important model in practical investment and financial management decision making.

Porter and Ezzell (1975) investigate the stability of beta using monthly data on returns for the period April 1996 to March 2000. Here beta stability test is done using two alternative econometric methods, including time variable in the regression and dummy variables for the slope coefficient. Both methods reject the stability of beta in majority of cases.

Likewise, many studies focus on the time varying beta using conditional CAPM (Jagannathan & Wang, 1996; Lewellen & Nagel, 2003). These studies conclude that the fluctuations and events that influence the market might change the leverage of the firm and the variance of the stock return which ultimately will change the beta. Haddad (2007) investigates the degree of return volatility persistence and time-varying nature of systematic risk of two Egyptian stock portfolios. He uses the Schwert and Sequin (1990) market model to study the relationship between market capitalization and time varying beta for a sample of investable Egyptian portfolios during the period January, 2001 to June, 2004. Haddad reports that the small stock portfolio exhibits difference in volatility persistence and time variability. The study also suggests that the volatility persistence of each portfolio and its systematic risk are significantly positively related, due to the fact that, the systematic risks of different portfolios tend to move in different directions during the periods of increasing market volatility. N'dri (2007) investigates the common Regional Stock Exchange (BRVM) of 8 countries of the French speaking West African Economic and Monetary Union between 1999 and 2005 and finds a positively and statistically significant asymmetric coefficient which indicates a non clustering of volatility and predictability risk. In a more recent study of equity price behavior in the Nigerian market, Amah (2011) discovers volatility asymmetry to be significant and skewed more towards positive. This suggests that for the developing markets, market booms induce greater volatility than market declines and is explained by the view that investors believe that booms behave more like speculative bubbles that could influence the nature of market beta.

The variability of beta is also examined with reference to security market conditions. For example, Fabozzi and Francis (1977) in their seminal paper considered the differential effect of bull and bear market conditions for 700 individual securities listed in NYSE. Using a Dual Beta Market Model (DBM), they established that estimated betas of most of the securities are stable in both market conditions. They express it with three different sets of bull and bear market definitions and conclude with the same results for all these definitions.

Fama and French (1992, 1996), Jegadeesh (1992) and others reveal that betas are not statistically related to returns. In the same vein, French et al. (1983) merge forward-looking volatility with historical correlation to improve the measurement of betas. Siegel (1995) notes the improvement of a beta based on forward-looking option data, and proceeds to propose the creation of a new derivative, called an exchange option, which would allow for the calculation of what he refers to as "implicit" betas. Unfortunately, the exchange options discussed by Siegel (1995) are not yet traded, and therefore his method cannot be applied in practice to compute forward-looking betas. Chen (1981) investigates the connection between variability of beta coefficient and portfolio residual risk. If beta coefficient changes over time, OLS method is not suitable to estimate portfolio residual risk. It will lead to an inaccurate conclusion that larger portfolio residual risk is associated with higher variability in beta. A Bayesian approach is proposed to estimate the time varying beta so as to provide a precise estimate of portfolio residual risk. Other studies conducted on beta variability include for example, Vipul (1999) which examines the effect of company size, industry group and liquidity of the scrip on beta. He considered equity shares of 114 companies listed at Bombay Stock Exchange from July 1986 to June 1993 for his study. He finds that size of the company affects the value of betas and the beta of medium sized companies is the lowest which increases with increase or decrease in the size of the company. The study also concludes that industry group and liquidity of the scrip do not affect beta. Also, Gupta & Sehgal (1999) examined the relationship between systematic risk and accounting variables for the period April 1984 to March 1993. There is a confirmation of relationship in the expected direction between systematic risk and variables such as debt-equity ratio, current ratio, and net sales. The association between systematic risk and variables like profitability, payout ratio, earning growth, and earnings volatility measures is not in accordance with expected sign. However, the study employs correlation analysis in its investigation.

Therefore, research into beta is broad and has highlighted a number of limitations particularly with regards to the stability of the beta coefficient over time which has been found in both advanced and emerging markets (Harvey, 1989; Ferson & Harvey, 1991; Fama & French, 1992; Ferson & Korajczy, 1995; Huang, 2001; Oran & Soytas, 2009; Mollik & Bepari, 2010). Apparently, the literature survey does not reveal the existence of empirical works on beta uncertainty or variability in Nigeria and other sub-Sahara African countries. This perceived gap in literature inspired this study which is designed to shed some rays of light on the extension of the beta variability cum stability hypothesis in the Nigerian context. It would likely stimulate the interest of other researchers on the stock markets of sub-Saharan Africa in the subject.

3.   STYLIZED FACTS ON THE NIGERIAN CAPITAL MARKET

A capital market plays a central role to the growth, development, and strength of any country because it serves as a medium through which funds that would have been otherwise kept idle, are mobilized and channeled to productive uses which in turn enhance the growth of a nation. Thus, Akinbohungbe (1996) and Adebiyi (2005) stress that the capital market of a nation facilitates the mobilization and channeling of funds into productive constituents and ensuring that the funds are used for the pursuit of socio-economic growth and development without being idle.

In Nigeria, a well-functioning capital market came into existence precisely in 1960 with the establishment of Lagos Stock Exchange (LSE). Since then the market has witnessed phenomenon growth, particular periods of the indigenization degrees of 1972 and 1977 respectively. The LSE was later changed to Nigerian Stock Exchange (NSE) while other Stock Exchanges such as Kaduna, Port-Harcourt, and Abuja Stock Exchange were established concurrently. Also, the number of stocks listed increased from 8 in 1961 to about 301 in 2008 before the global economic/financial crises rocked the Exchange. Over the years, the Nigerian capital market has been seen as a viable source of funds to both state and local governments. The first state to use the capital market was the defunct Bendel State which issued a ten year N20 million 7% Bendel State of Nigeria Loan Stock in 1978. Subsequently, Ogun State and Oyo State raised N15 million 12% Loan Stock in 1986 and N30 billion 16.5% Revenue Bond in 1999 respectively. Kaduna State Government also went into the market to raise N30 million each year in 1989 and 1993 to mention but a few.

Another fact about the market is that it has potentially played a prominent role in the privatization of the state owned enterprises by giving creditability and transparency to the exercise, in an equal vein, the bank recapitalization to N25 billion in 2004 received the backing of the market as banks sourced about $650 million from the market in 2005 (Soludo, 2006). Al Faki (2006) however put the figure at N406 billion. The first major step taken towards the internationalization of the Nigerian capital market was the deregulation of securities' prices; until 1993 the pricing of new securities were actually fixed by the Security and Exchange Commission (SEC) (Onoh, 2002). Secondly, the obnoxious laws such as The Exchange Control Act 1962 and The Nigerian Enterprises promotion Decree of 1972 were repealed in 1988 to give room for more friendly ones. Thirdly, another landmark effort towards the reform of the Exchange is the proposal to split shares into small denominations in order to enhance their sales. The modernization of the trading floor facilities such as the introduction of Automated Trading System (ATS) in 1998 has interfaced with the Central Security Clearing System (CSCS) to speed up trading, clearing, and settlement of claims. This has also enhanced the Exchange to reduce the T + 5 trading cycle to T + 3 trading cycle in 2001.

4.   DATA AND METHODOLOGY

4.1   Data

The study utilizes monthly stock prices of randomly selected stocks to compute their returns and the returns on market portfolio respectively. The investigation spans the period from 2002 to 2009. The data relating to stock prices are sourced from Monthly Stock Review and Daily Official List of Nigerian Stock Exchange. Return for individual security is computed using Equation 1, while the market return is calculated using Equation 2 as given below:

$$r_{it} = \frac{p_{i,t} - p_{i,t-1}}{p_{i,t-1}} \tag{1}$$

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where:

r_{it} is return on security (i) at period (t)
$P_{i,t}$ is price of security (i) at period (t)
$P_{i,t-1}$ is price of security (i) at period (t-1), i.e. previous price of security (i)

$$r_{mt} = \frac{omi - cmi}{cmi} \qquad (2)$$

where:

r_{mt} is return on market at period (t)
omi is opening market index
cmi is closing market index

4.2   Methodology

The relationship between stock returns and beta specified by the Capital Asset Pricing Model (CAPM) of Sharpe (1964) is based on the tenet of asset pricing theory. The CAPM version of asset pricing theory is analogously referred to as single index model which shows a trade-off between systematic risk (i.e. beta) and return and it is expressed as:

$$r_{it} - r_f = r_f + \beta_{it}(r_{mt} - r_f) \qquad (3)$$

where:

$r_{it} - r_f$ represents excess return of security I at time (t)
$r_{mt} - r_f$ is the market risk premium at time (t)
B_{it} is the beta or systematic risk of security I at time (t)
r_f is the risk free rate

Equation 3 is known as one-pass or time series regression model which is used to estimate the value beta, and then the beta measure of risk can now cross-sectionally priced in the two-pass regression model stated below:

$$\overline{r_{it}} = \alpha_0 + \alpha_1 \hat{\beta}_{it} + \mu_{it} \qquad (4)$$

where:

$\overline{r_{it}}$ represents average return i'th securities at time (t)
$\hat{\beta}_{it}$ is the estimated value of beta for i'th securities at time (t)
α_0 is the intercept
μ_{it} is the residual term.

Equation 4 was later modified by Singh, Nagen, Choudihry, and Rap (1976) as variable Mean Response Regression Model. Thus, their specification is stated as:

$$Y_{(t)} = B_{(t)} X_{(t)} + \varepsilon_{(t)} \qquad (5)$$

where:

$Y_{(t)} = r_{it} - r_{ft}$
$X_{(t)} = r_{mt} - r_{ft}$

They standardize return on security at time (t) r_{it}, return on market portfolio at time (t) r_{mt}, and risk free rate by adding one (1). Therefore:

$r_{it} = 1$ + rate of return on ith security
$r_{mt} = 1$ + rate of return on market portfolio
$r_{ft} = 1$ + rate of return on the risk free security

$$B_{(t)} = \overline{B} + \alpha_1 t + \alpha_2 t^2 + \mu_{(t)} \qquad (6)$$

where $B_{(t)}$ is the beta coefficient at period t; $\overline{B}$ is the constant component of the beta coefficient; t is the time trend; $\mu_{(t)}$ is the random stock associated with $B_{(t)}$; and α_1 α_2 are the regression parameters associated with the trend.

Furthermore, they estimated the variance of the residual (μ) in Equation 6 denoted by $\delta^2 \mu$ to develop Equation 7 as stated below:

$$B_{(t)} = \overline{B} + \alpha_1 t + \alpha_2 t^2 + \delta^2 \mu_{it} + W_t \qquad (7)$$

where W_t is defined as white noise; other variables had been defined above.

$\delta^2 U$ can be used to measure the degree of variability of $B_{(t)}$; the sign and magnitude of the estimated values for α_1 and α_2 test for the existence of beta tendency.

The specification of Equation 7 can be used to estimate the beta coefficient and the random risk. If for example, the estimated values of α_1, α_2, and $\delta^2 U$ are all significantly different from zero; it means the beta coefficients are moving randomly around a trend line; and as a result the SNCR's Variable Mean Response Regression Model can be used to estimate explicitly the constant component, the trend component, and the random component, of beta coefficients, in the same token, if the estimated values of α_1 and α_2 and $\delta^2 U$ are not significantly different from zero; it implies that Equation 7 can be reduced to $B_t = B$ and then the fixed coefficient Ordinary Least Square (OLS) estimator is taken to be an acceptable method for estimating the betas. But if however, the value of $\delta^2 U$ is significantly different from zero but the trend components are not, then the random coefficient model developed by Theil and Mennes (1959), and Hildreth and Houcks (1968) could be used to analyze the degree of variability of beta and to estimate it. These are the three reasons for considering the specification of Equation 7 as a general case of previous research.

In this study, we attempt to refine Equation 5 by substituting Equation 6 into it as follows:

$$Y_{(t)} = \overline{B} x_{(t)} + \alpha_1 t x_{(t)} + \alpha_2 t^2 x_{(t)} + w_{(t)} \qquad (8)$$

where:

$$W_{(t)} = \mu_{(t)} + \varepsilon_{(t)}$$

Equation 8 can be regarded as a special case of the arbitrage process of Capital Asset Pricing Model which we have adopted in this study. However, for simplicity purpose, Equation 8 can be expressed in matrix notation as follows:

$$Y = XB + W \qquad (9)$$

where:

$Y = nx1$ matrix
$X = nxk$ matrix
$B = kx1$ matrix
$W = nx1$ matrix

$B = [\overline{B}, \alpha^1]$

where $\overline{B}$ and α^1 are column vectors such that $\alpha^1 = (\alpha_1, \alpha_2)$ and it is a row vector. Equation 8 is further modified to show the degree of uncertainty or variability of beta based on market phases (i.e. whether the market is bullish or bearish). Thus, Equation 8 becomes:

$$Y_{(2)} = \overline{B}*\delta*X_t + \overline{B}_1*(1-\delta)* X_t + \alpha_1^{\ *}\delta^* tX_t + \alpha_2^{\ *}(1-\delta)^* tX_t + \alpha_3*\delta*t^2 X_t + \alpha_4*(1-\delta)*t^2X_t + W_t \qquad (10)$$

Also, Equation 10 can be expressed in matrix notation form:

$$Y = XB + V \qquad (11)$$

where

$\overline{B} = [B^1, \alpha^1]$
B^1 and $\overline{\alpha^T}$ are column vectors such that $\overline{B} = \overline{(B, B_1)}$ and $\alpha^1 = (\alpha_1\ldots\ldots\alpha_4)$ and they are row vectors.

Note that $\delta = 1$, when $(r_{mt} - r_{ft}) > 0$ which implies that the market is bullish or upbeat, since the market risk premium is positive. $\delta = 0$, when $(r_{mt} - r_{ft}) < 0$ which means that the market is bearish or down, since the market risk premium is negative (See Fletcher, 1997).

4.3   Estimation Technique

Firstly, we investigate the stationarity of variables, since non stationarity could lead to spurious or nonsensical regression results and thus, spurious relationship between/among variables may be evident in time series data. It is true that most of the macroeconomic time series contain unit roots caused by the stochastic trends; therefore, variance and covariance of series change over time. In view of this, we employ Augmented Dickey-Fuller (ADF) (1981) technique to check or test whether the time series of the data employed in this study are free from the presence of unit roots. The ADF test is based on the following regression:

$$(1-L)x_t = a + b_0 x_{t-1} + \sum\nolimits_{j-1}^{k} b_j (1-L)x_{t-j} + \mu_t \qquad (12)$$

where:

x is the series being tested
L represents the Lag operator
μ_t represents the stochastic error term
k represents the number of lagged differences

The hypotheses to be tested are as follows:

H$_0$: x_t is non-stationary or $b_0 = 0$
H$_1$: x_t is stationary or $b_0 \neq 0$

Note: the null hypothesis is rejected on the ground that the absolute value of the calculated ADF test statistics is larger than the absolute value of the Mackinnon critical value at a given significance level.

The study also examines the long-run equilibrium relationship between beta and stock return. To achieve this it becomes inevitable to test for the presence of long-run between these specified variables in the model stated above. Thus, we adopt the Johansen's (1991) multivariate co integration technique. Usually, applying this technique two statistics are involved: Trace statistic and Maximum Eigen statistic. When the sample size is smaller than forty (i.e. n < 40), the Maximum Eigen statistic provides the more sophisticate results.

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The hypotheses to be tested under these statistics are as follows:

For the Trace Statistic:

Null hypothesis

H$_0$:   r = 0
H$_0$:   r = 1
H$_0$:   r $\leq$ n

Alternate hypothesis

H$_1$:   r $\geq$ 1
H$_1$:   r $\geq$ 2
H$_1$:   r = n

For the Maximum Eigen Statistic:

Null hypothesis

H$_0$:   r = 0
H$_0$:   r $\leq$ 0
H$_0$:   r $\leq$ n

Alternate hypothesis

H$_1$:   r =1
H$_1$:   r = 2
H$_1$:   r = n

Maximum Eigen Statistic can only check co integration one by one.

Note: The null hypothesis is rejected on the ground that the values of either the Trace or Maximum Eigen Statistics are greater than the Mackinnon critical value at a prescribed level of significance usually 5% or 1% for studies in management and social sciences.

5.   DISCUSSION OF EMPIRICAL RESULTS

Our investigation of beta uncertainty over time and over market phase begins with the test for the presence of a unit root of the series of return on the ith security and return on market portfolio. The results of this test are reported in Table 1.

Table 1: Unit Root Test based on Augmented Dickey and Fuller (ADF) Approach

Variable	Down Market Phase			
	ADF-Stat	Mackinnon Critical Value		
		1%	5%	10%
$Y_tI(0)$	-7.23	-3.62	-2.94	-2.61
$Y_tI(1)$	-7.54	-3.63	-2.95	-2.61
(1-δ)$X_tI(0)$	-4.81	-3.62	-2.94	-2.61
(1-δ)$tX_tI(1)$	-6.97	-3.63	-2.95	-2.61
(1-δ)$tX_tI(0)$	-1.81	-3.68	-2.97	-2.62
(1-δ)$tX_tI(1)$	-10.21	-3.63	-2.95	-2.61
(1-δ)$t^2X_tI(0)$	-2.07	-3.68	-2.97	-2.62
(1-δ)$t^2X_tI(1)$	-9.89	-3.63	-2.95	-2.61

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	Table 1 cont.			
Variable	**Up-Market Phase**			
	ADF Stat	**Mackinnon Critical Value**		
		1%	**5%**	**10%**
$Y_tI(0)$	-4.90	-3.71	-2.98	-2.63
$Y_tI(1)$	-4.12	3.77	-3.00	-2.64
$*(\delta)*X_tI(0)$	-5.54	3.71	-2.98	-2.63
$*(\delta)*tX_tI(1)$	-5.88	-3.74	-2.99	-2.64
$*(\delta)*tX_tI(0)$	-0.61	3.72	-2.97	-2.63
$*(\delta)*tX_tI(1)$	-8.19	-3.72	-2.99	-2.63
$*(\delta)*t^2X_tI(0)$	2.53	-3.74	-2.99	-2.64
$*(\delta)*t^2X_tI(1)$	-7.35	-3.72	-2.99	-2.63

Note: when the ADF Statistics is greater than the Mackinnon critical value, it means the series is stationary but if not otherwise. Source: computed from E-view program.

The results reported in Table 1 is based on the ADF test and they show identical remark for both down and up market conditions. A quick view of Table 1 reveals that the ADF statistics for the series of returns on ith security in both down and up markets are larger than the Mackinnon critical values at 1%, 5%, & 10% respectively. This means that these series are stationary both at level I (0) and at first difference I (1). This same evidence is noticed in the series of the constant component of beta. However, the series of the trend components are not stationary at level I (0) for both bearish and bullish markets, but they are found to be stationary at first difference I (1) for the market conditions. The output of this ADF test makes us proceed to the co-integration test using Johansen and Jesulius approach, later we adopt Vector Error Correction technique for the estimation of the parameters of the modified variable mean Response Regression Model that was first estimated by (Singh et al., 1976).

5.1   The Long-Run Relationship between Return and Various Components of Beta

As we have stated earlier, the study employs Johansen and Jesulius co-integrating mechanism to test for the long-run relationship between return on ith security and beta components. The results obtained from this test are reported on Table 2.

Table 2: Co-Integration LR Test Based on Trance and Maximum Eigen Value of the Stochastic Matrix

Null	**Alternate**	**Up-Market Phase**	
		Trace Stat	**Critical Value (@ 5%)**
r = 0	r ≥|1	997.33	47.86
r ≤|1	r ≥|2	78.91	29.80
r ≤|2	r ≥|3	15.38	15.49
r ≤|3	r ≥|4	1.41	3.84
Null	**Alternate**	**Max-Eigen Stat**	**Critical Value (@ 5%)**
r = 0	r ≥|1	918.42	27.58
r ≤|1	r ≥|2	63.53	21.13
r ≤|2	r ≥|3	13.97	14.26
r ≤|3	r ≥|4	1.41	3.84
Null	**Alternate**	**Down- Market Phase**	
		Trance Stat	**Critical Value (@ 5%)**
r = 0	r ≥|1	69.77	47.86
r ≤|1	r ≥|2	26.82	29.80
r ≤|2	r ≥|3	11.82	15.49
r ≤|3	r ≥|4	0.16	3.84
Null	**Alternate**	**Max-Eigen Stat**	**Critical Value (@ 5%)**
r = 0	r ≥|1	42.96	27.58
r ≤|1	r ≥|2	15.35	21.13
r ≤|2	r ≥|3	11.30	14.26
r ≤|3	r ≥|4	0.16	3.84

Source: computed from E-view program

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Table 2 depicts the results of the co-integration LR test based on trance and maximum Eigen value of the stochastic matrix. Evidence from the table shows that in the down market, the Null hypothesis of which there is no co-integrating vector (r = 0), is rejected at 5 percent level of significance since the trance statistics (69.77) and maximum Eigen statistic (42.96) are larger than the critical values 47.86 and 27.58 respectively.

In other words, there is at least one co-integrating equation (r ≥|1), which means in the down market phase or bearish market condition, a long-run equilibrium relationship is observed between return on i'th security and the components of beta. That is the constant and trend components maintain co-integrating relationship with return. However, the same result is found to be evident in the up-market or bullish market with little difference. In the up-market, the null hypothesis of at most two co-integrating vectors (r ≤|1) is not rejected. Alternatively, there are at least two co-integrating equations (r ≥| 2), see Table 2 where the trace statistics (78.91) and the maximum Eigen Statistics (63.53) are respectively larger than the critical values 29.80 and 21.13. This obviously means that there are two co-integrating vectors in the up-market, still implying a long-run relationship between return and beta components. Therefore, on the basis of the co-integration LR test, much difference has not been found between the bearish and bullish market. The literal interpretation of these findings is that two market conditions (the up and down markets) are identified in Nigeria depending on the state of the economy. In each of these markets, our findings show that the proportion of total risk that cannot be eliminated through diversification maintains a long-run relationship with stock returns.

Furthermore, the study employs vector error correction technique to estimate the coefficients of the constant and trend components of beta. It also adopts Breusch- Pagan-Godfrey Heteroskedasticity test to check for the significance of the random component of beta. The results obtained from these test are reported in Tables 3 and 4 respectively.

Table 3: Result of Vector Error Correction (VEC) Estimates

Down-Market			
Variable	**Coefficient**	**St Error**	**t-statistics**
$*(1-\delta)*X_t$	-227.01	43.22	(-5.25)*
$*(1-\delta)*t^2X_t$	117.50	20.40	(5.76)*
$*(1-\delta)*tx_t$	-1.47	4.41	-0.33
Up-Market			
Variable	**Coefficient**	**St Error**	**t-statistics**
$*(\delta)*X_t$	87.74	9.30	(9.43)**
$*(\delta)*tx_t$	-72.21	6.98	-(10.34)**
$*(\delta)*t^2X_t$	-13.69	3.04	(-4.51)**

Note: $*(1-\delta)*X_t$ and $*(\delta)*$ are the constant component of beta for down and up market respectively. $*(1-\delta)*tx_t$, $*(1-\delta)*t^2X_t$ and $*(\delta)*tX_t$, $*(\delta)*t^2X_t$ are the trend component of beta for the down and up market respectively. While ** means significance both at 1% and 5%. Source: computed from E-view program.

Table 4: Result of the Test for the Significance of the Random Component
of Beta based on Breusch-Pagan-Godfrey Heteroskedasticity Test

Down Market		Up Market	
F-Statistic	**Probability Value**	**F-Statistics**	**Probability Value**
1.74	0.18	7.58	0.001

The results reported on Tables 3 and 4 show the coefficients of the constant, trend and random components of beta for the two market conditions. The observed t-values (9.43, -10.34, and -4.51) for the up-market are found to be larger than the critical t-value (2.06) at 5% and 2.73 at 1%. Also, the f-statistic obtained from the heteroskedasticity test is pegged at 7.58 which are obviously larger than the critical f-statistic (4.72) at 1%. Thus, our findings indicate that in the up-market, the coefficients of the constant, trend, and random components of beta are significantly different from zero, it therefore, means that the coefficients of beta are moving randomly around a trend line. In other words, beta coefficients are not constant over time in the bullish market.

In comparison the results of the down market are different since the observed t-values -0.33 for the trend component of beta is less than the critical t-value 2.04 and the f-statistic 1.74 is also less than the critical f-value

(4.51), which means that the coefficients of the trend component of beta and random component of beta are not significantly different from zero. Though the constant component of beta is found to be significant since the observed t-value (-5.25) of this variable is larger than the critical t-value (2.73) at 1%. Thus, in the down market the coefficients of beta are not moving randomly around a trend line. The betas in the down market are less volatile since their coefficients are not statistically different from zero. Investors in Nigeria should now be aware that trading in the bullish market is riskier than trading in the bearish market since the changes in the systematic risk (i.e. beta) cannot be predicted with certainty in the bullish market. Therefore, in order to have optimum or efficient diversification, market participants can arbitrage between the two markets until equilibrium position is attained.

6.   CONCLUSION AND RECOMMENDATIONS

The study presents a fresh insight on the behavior of beta coefficients over time and across market phases. Two phases are identified in the Nigerian stock market, which is synonymous with the situations in other countries. Thus, our investigation reveals that the Nigerian stock market is characterized with two phases – the down-market and the up-market phases. It is discovered that the long-run equilibrium relationship between return on ith security and components of beta is evident in both market conditions and phases, but however, the variance in the two markets is manifested in the uncertainty of beta coefficients around a trend line. In the up-market or bullish market phase where the estimated returns on securities are positive, beta coefficients are found to be moving randomly over time. Conversely, in the down-market or bearish market where securities have negative values beta coefficients are less volatile. These results imply that a market period with positive returns is associated with unpredictable market risk, and such market can be said to be highly volatile as in case of Nigerian stock market before the outbreak of the 2008 world financial crises. Thus, based on these results we recommend that investors should increase their holdings when the stock market is bearish to take advantage of price differential in the bullish market. Also, when the market is bullish, investors should sell off part of their holdings and then diversify into real estate or possibly trade on forward market to take advantage of hedging. Further research should seek to examine the duration of bullish and bearish market conditions in Nigeria. This is important in guiding investors on the appropriate trading strategy for each market phase. An extension of the scope of the study to include other sub-Saharan African countries is also recommended in order to gain further insight into the behavior of those stock markets.

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