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Building a Coalescent Model for Sustainable Portfolio Risk Management – An Empirical Analysis

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Abstract

For more than five decades the global investment management industry focused mostly on portfolio diversification decisions as a sole source of added value. Mistaking portfolio diversification for risk diversification however proved devastating in the 2008 global financial crisis when many investors experienced sharp downturns in almost all asset classes, prompting new research into how optimal portfolio risk management analysis can be more effectively conducted to protect long-term investors against a rerun of 2007-2008 global financial crisis. Research is still on-going for a robust asset pricing model, and in this regard, the present study seeks to make a contribution by exploring the development and application of integrated MVRC (Market risk, Volatility, Risk-adjusted performance, and Company risk) model designed to capture the complex reality of multi-faceted behaviour of financial assets. Stock-market data spanning 1998 – 2011 from Nigeria's emerging real estate securities market are used for the analysis. The utility of the MVRC model by so sharpening the focus of risk analysis as to help uncover the several divergent attributes of investments even in the same asset class is demonstrated. The implications in terms of enhancing portfolio selection practice and maintaining sustainable wealth levels in developing economies like Nigeria are highlighted.

Key Words: Global financial crisis, MVRC, Nigeria, Portfolio risk management, Real estate securities, Sustainable housing finance
JEL Classification: C58, G11, 12, 32

1. Introduction

The trend towards liberalization and globalization has promoted such a free flow of capital within and across international borders that an investor considering investment in securities is increasingly faced with the problem of choosing from among a large number of securities, stocks or shares in the financial markets. Today's global institutional investors tend to have portfolios across various sectors, geographies, and asset classes. Each asset class or set of securities in the financial system puts investor's money to work in different ways by posing particular risks that may not be characteristic of the other assets. Optimal portfolio risk management will invariably depend on the investor's risk appetite and the risk-return behaviour of individual securities, thus making detailed investment analysis an imperative in asset management practice. A robust diversification strategy thus requires sound knowledge about how new securities are correlated to the existing holding and to what extent current market prices depicts information concerning the underlying security (Graham & Dodd, 2009; Parasuraman, 2014). In this regard, an overarching challenge in understanding the risk-return nature of a nascent asset class like Nigeria' real estate-backed securities has been, finding an integrated model with multiple valid and reliable performance measures, as opposed to the traditional piecemeal approaches such as cross-section, anticipatory, or margin-of-safety (Raji, 2003). It is suspected that the gap in knowledge probably accounts for the tendency to maintain a high concentration of risk arising from orthodox diversification strategy application to securities rather than to risk (Kiyosaki, 2011). Some operators tend to focus more on portfolio returns without giving adequate reflection to inherent risks involved in investment. Thus, by enhancing a holistic understanding of the investment behaviour of capital asset segments in the financial system through a more comprehensive empirical survey, investors and managers can be assisted to better manage portfolio investment risks, especially in the area of relatively new investment vehicles like real property-backed securities. Despite a widespread concern for the illiquidity in the primary property markets, it is pertinent to note that hardly there are any significant comprehensive research contributions that address the risk-return behaviour of real estate securities in the Nigerian context. The present paper is an attempt in filling this vacuum.

Performance measures for real estate securities are perhaps well-developed in the matured economies (Gyourko & Keim, 1992; Glascock & Davidson, 1995; Herring *et al*, 2010), but the same cannot be said of the emergent Nigerian market (Ugbo, 2011, Osamwonyi, 2006; Atufe, 2006; Ola, 2007; Walley, 2011), and in this context, two major facets of the research problem are noteworthy. The first is the acclaimed uniqueness of real estate securities which are canonically thought to 'behave' in contradiction to the risk-return trade-off assumption of finance (Young & Graff, 1995; Ebrahim & Hussain, 2010). The issue relates to the search for

empirical data regarding the extent to which the rate of return from real estate investments are uncorrelated with the broader market trend while outperforming the market in nominal or risk-adjusted terms (Sanya, 2011). The outcome of the study in this respect has practical implications, not only for sustainable real estate finance, but also for strategic asset management policy in terms of helping to establish real estate as a valuable asset class for achieving portfolio performance stability. The second research concern borders on the impact of the underlying business fundamentals on real estate security prices. This issue is not only pivotal to development and execution of business and investment strategy, but also has important implications for overall capital market growth and development in terms of efficient allocation of resources for societal well-being (Akinwale & Abiola, 2008; Abubakar, 2010). In both realms, the present paper attempts to contribute to the literature in terms of finding a robust model that more holistically captures most of the fundamental aspects of portfolio performance.

1.1 Need for the Study

While the pivotal role of stock-markets in advancing economic growth is perhaps no longer debated, research has paid sparse attention to the diverse behaviour of the constituent sectors or segment of capital markets, especially in emerging economies like Nigeria (Picketty, 2014). In this context, the present paper contributes to the literature in two ways. First, it proposes a new approach to investment portfolio decision-making analytics displayed through an empirical analysis of the behaviour of Nigeria's emergent real estate securities during different phases of the stock-market spanning fourteen recent years. In this context, the study is expected to go some way in enhancing understanding of the behaviour of the emerging real estate asset class that is crucial for harnessing the various ways in which the country's perennial US$300 billion housing finance deficit can be sustainably addressed (Moghalu, 2011). As of now the traditional asset management practices mostly assess portfolio performance in silos while the practical difficulties with other piecemeal approaches are already well-documented (Damodaran, 2006; Raji, 2003). Second, the need for deeper capital market studies, to provide detail analyses of downside market volatility by deriving portfolio variance/covariance parameters from historical market and asset data has been voiced (Adetunbi, 2006, Blaaw, 2009; Mensah, 2004 & 2009). In this regard, this paper may serve as some possible reinforcement to the pedagogical value of modelling of emerging African markets for post-2007 mathematical / statistical finance research and education (Ezepue & Solarin, 2015). Overall, the proposed approach and evidence provided in this paper can help financial managers, analysts, investors, government officials and regulators to develop more comprehensive approach to understanding risk-return characters of emerging financial instruments, assets and economic sectors, and markets in general.

1.2 Organization and Structure of the Paper

The rest of the paper is as follows: Section 2 discusses conceptual and empirical literature on the subject with emphasis on Nigeria's nascent real estate securities market. Section 3 highlights the model proposal and the associated methodology. Section 4 discusses the results and some of the implications, while the paper ends in Section 5 that contains the conclusion and suggestions for future research on the subject.

2. Literature Review

Portfolio management basically deals with making financial management decisions about investment mix and policy, matching investments to objectives, and balancing risk against performance. A review of the considerable amount of literature on the subject indicates that the investment risk-return characteristics of various types of capital assets covers a wide variety of concepts and theories, but with particular focus on four major recurring and interrelated themes, namely, (i) Market risk; (ii) Volatility; (iii) Risk-return trade-off, and (iv) Company-specific risk. The linear relationship between asset returns and returns of the market proxy index as basis of modern portfolio theory is well-established in the classical literature (Markowitz, 1953; Sharpe, 1964; Lintner, 1965). However, it has also been contended that the important risk-return correlation may not match empirical experience (Brealey *et al.,* 2014). The reality is that portfolio returns are impacted generally by a myriad of forces designated to exist in the realm of internal (firm-specific) on one hand, and external (systematic) on the other. The term "portfolio" generally refers to a collection or combination of securities such as stocks, bonds, derivatives, money market instruments, and non-financial assets like real estate, commodities and precious metals all held together as investment in the hope of making a profit or return. In this paper, the term "market portfolio" refers to all the listed common stocks on the Nigerian Stock Exchange (NSE). In view of the substantial foreign in the Nigerian capital market in recent times, the market portfolio is expected to reflect all the dynamics in the global markets (Onyema, 2013).

The risk of a well-diversified portfolio is thought to be, among other factors, a function of the market risk of the securities included in the portfolio. Therefore, if the contribution of a stock to the risk of a well-diversified portfolio is to be determined, its market risk needs to be measured to ascertain the stock's sensitivity to global markets' or economic movements. Market risk is a system-related macro risk that no business can escape from. Thus, there is no benefit from mere diversification when stock's returns in a portfolio are perfectly correlated; rather there are more benefits to be obtained from intelligent diversification when securities measured by their betas are negatively or weakly correlated. Real estate-backed securities are thought to possess such risk-diversification potentials (Appraisal Institute, 2001), but empirical support for this theory remain inconclusive in the Nigerian context, hence the

present attempt to fill the vacuum, particularly with regards to asset volatility and company risk where the dearth of literature was considered to be acute. Volatility generally refers to a phenomenon's aptness to sudden changes, or its level of unpredictability and instability. While there are many approaches in research and practice, the Standard deviation (SD) is regarded as the best measure of asset's inherent volatility (Vijayalakshmi & Sivapragasam, 2008; Bail, 2010). SD is important in finance, where it is used as a measure of the volatility**,** risk or uncertainty of an investment; a large standard deviation indicates that the data points can spread far from the mean and a small standard deviation indicates that they are clustered closely around the mean (Damodaran, 2006; Kothari & Garg, 2014). The theory suggests that asset-backed assets like real estate securities should be more volatile than the broad stock-market (Brealey *et al*., 2014; Iyiegbuniwe, 2007).

There are two major issues involved in portfolio risk analytics, namely (i) calculation of assets' risks and returns and (ii) the relationship between the two (Graham & Dodd, 2009). Rate of return on capital measures the yield on capital typically over the course of a year expressed as a percentage of the value of capital invested (Picketty, 2014). The central argument is that nearly every business activity ultimately involves investment - the commitment of present resources to an unknowable and uncertain future, a commitment to expectations (of future streams of income or capital appreciation) rather than to facts (Muth, 1961). In other words, the multiplicity and complexity of business environmental factors makes risk-taking a basic function of the business enterprise, and therefore managers cannot avoid coping with the phenomenon of time and uncertainty, thus underscoring the importance of robust security analysis for sustainable portfolio management. It is reckoned that most investors will want to avoid risk when they can do it without sacrificing return. In other words, an investor can get higher return (reward or income from investment) if the investor or analyst is willing to assume higher level of risk, an idea that conceptualized in finance as risk-adjusted return (RAR), a widely used risk management and performance evaluation concept.

The finance literature suggests that investment performance is influenced myriad of variables in the external and internal business environment (Ekundayo, 2010). Thus, besides the market risk mentioned in the foregoing section, rational investors, managers and market stakeholders, as a basis for 'sound investment' (Hagstrom, 1997 & 2001), will also want to ascertain the extent to which the market effectively reflects the business fundamentals in the prevailing stock-market prices from time to time (Collins, 2001; Drucker, 1994 & 2004; Myles, 2003; Malkiel, 2003; Graham & Dodd, 2009, Oteh, 2011). In this context, the efficient market hypothesis (EMH) is used to explain to what extent current market prices depicts the underlying security's fundamental business information (Parasuraman, 2014). This explains research attention on critically evaluating company risk, the unsystematic risk arising from business internalities – firm-specific issues such as management changes, net worth, dividend

policies, and earnings capacity. In this context, the concerns have been on value investing, business fundamentals, or the extent to which events specific to a firm or its industry will adversely or positively affect asset price or return, but much of other studies have been focused more on the broad market with limited or no attention paid to key constituent sectors such as emerging real estate segment (Natalwala, 2011; Buhari, 2011; Helfert, 2001; Ashamu, 2009; Oke & Azeez, 2012), a gap in knowledge that motivated the present contribution.

2.1 The Nigerian Real Estate Securities Market in Brief

In 2007, Securities and Exchange Commission of Nigeria (SEC Nigeria) issued the first set of guidelines of the registration and issuance requirements for the operation of REITs in Nigeria, as detailed in Investment and Securities Act (ISA), 2007. According to ISA (2007), REITs are incorporated companies for "the sole purpose of acquiring intermediate or long term interests in real estate or property developments" (Section 193). In order to distinguish them from other trust funds, it should be stressed that REITs are businesses conducted as collective investment schemes, "solely in properties" (Section 194 of ISA, 2007). In order to ensure transparency in the management of REITs in Nigeria, the SEC included in its rules: that a rating report by a registered rating company should be filed with the Commission every two years; for close-ended real estate investment fund, at least 75 percent of the fund's total assets should be in real estate (70% for open-ended real estate investment fund); the remaining 25 percent could be in real estate related assets, provided that not more than 10 percent should be in liquid assets; that the level of development activity by the fund manager should not exceed 20 percent of Fund's gross asset value; the fund manager is expected to hold on to any development for a minimum of 2 years before disposing off; and that the assets of REITs, whether close-ended or open-ended, shall not be invested outside Nigeria. Notably, Pension Funds' in Nigeria are permitted to invest in REITs to the tune of 35 percent of their total assets (Ugboh, 2011).

The emerging Nigerian publicly traded real estate securities market (RESM), comprising mostly REOC and REIT equities, is estimated to have an aggregate market capitalisation of US$ 300 million (₦60 billion) out which REITs account for some 70 percent as at August 2014 (NSE, 2010; SEC, 2014). The size of the Nigerian RESM is infinitesimal in a US$900 trillion global financial market (BII, 2014); nevertheless, the current status is indicative of the humongous potentialities for financial innovation in Africa's largest economy and most populous nation. Real estate operating companies (REOCs) are solely engaged in direct property development operations in contradistinction from other real estate-based businesses like REITs who may be involved in the real estate industry indirectly. A REIT is a business that raises money by selling shares to the public, much in the same manner as an investment trust, and owns property or provides mortgage lending to developers. Publicly traded REITs are relatively new investment vehicles in the country for which the Securities and Exchange

Commission (SEC) has provided some regulatory framework (SEC, 2006, p. 14; Paragraph 6 of the Second Schedule of ISA, 2007; SEC, 2013). After the Skye Shelter Fund was introduced as the first REIT publicly listed on the Nigerian Stock Exchange on 28 February 2008, the REIT market received further boost with ₦50 billion Union Homes Hybrid REIT launched in September 2008 as a vehicle to an alternative investment outlet, within a transparent and tradable structure to investors having a medium to long-term appetite for real estate. Currently, the third N-REIT is the UPDC REIT with approximately $145 million capitalization.

2.2 Empirical Evidence

With particular respect to the Nigerian financial landscape, hardly there are any significant current (post-2007) empirical research contribution that has addressed the crucial issue of the market risk of the country's emergent real estate securities in an integrated manner in which other related key parameters like volatility, risk-adjusted returns, and company risk are also incorporated. Notably, Emele and Umeh (2013) examined the performance and diversification benefits of Nigerian property stocks in comparison with some common stocks over a period 2003 to 2009, and found positive correlation of N-REOC with other shares. It is pertinent to observe the limited, largely pre-crisis data used by the authors and the fact that their correlation analysis was not progressed to further R-squared testing to determine the strength of the indicated correlation, a gap intended to be filled by a more comprehensive approach proposed in this paper. Amidu *et al.* (2008) focused largely on pre-2007 historical performance analysis of N-REOC in comparison with other securities in the Nigerian capital market. The study show, among other findings, that N-REOC is uncorrelated with the stock-market, and therefore a good choice for inclusion in investment portfolios. This work provides a basis for further empirical work to extend data beyond the 2007-2008 global financial crises to include evolving new samples like REITs and other risk-return parameters. As crucial as the volatility issue is to market performance and investor education, particularly in Nigeria, the dearth of empirical information in the Nigerian secondary real estate market context is observable from the literature review conducted for this paper. Much of the extant studies on the issue were focused on developments in the foreign stock markets or short-term gyrations of stock prices. Using standard deviation device for measuring the long-term volatility nature of capital assets is common in other studies, but very limited significant empirical work has been done on the real estate market segment. Methodologically, Agarwal (2000) and Ibbotson Associates (1995) use the standard deviation device to analyze the Indian and US stock markets respectively, spanning many years, which were found instructive for the analytical posture adopted for the present study in the Nigerian context.

Contributions from Bello (2003), Amidu and Aluko (2006) and Amidu *et al.* (2008) report mixed findings on the risk-adjusted return performance nature of the Nigerian real estate

securities, but there is some growing commonality with using the Sharpe device to conduct the requisite portfolio analysis, as evidenced in India and Nigeria by Kalpakam and Gopalakrishnan (2014) and Atuanya and Edozie (2015) respectively. However, the apparent methodological consensus for Sharpe Model has not necessarily yielded intellectual agreement on the actual risk-adjusted return nature of real estate securities in most markets including Nigeria, as research studies have rather so far produced mixed results regarding the empirical investment performance of property-backed securities across global markets. For example, Glascock and Davidson (1995), and Ooi and Liow (2004), observe the tendency of real estate securities to under-perform the market on nominal and risk-adjusted basis, but some subsequent studies (Harper, 2009) have produced different results. Harper (2009) compared equity REIT index to 10-year US Treasury bond and found that the median yields among all REITs was about 5.5 per cent, only slightly higher than the yield on long-term United States government treasuries of less than 5 per cent, but the question remains whether such superior REIT performance is obtainable in emerging markets like Nigeria, an enquiry that forms part of the present attempt to fill the gap. Additionally, recent empirical studies on the Nigerian market developments from 1986 to 2010 succeeded only in establishing the weak-form efficiency (Oke & Azeez, 2012), but the overarching specific evidence relating to crucial socio-economic sectors like real estate is lacking, a vacuum which this paper also tries to fill.

2.3 Theoretical Framework

This work takes its theoretical bearing from the interrelated mean-variance domain of CAPM-RWT-MPT-EMH (Capital Asset Pricing Model-Modern Portfolio theory-Random Walk Theory-Efficient Market Hypothesis) within the context of the broader quantitative management theory (Bachelier, 1900; Lo & Mackinlay, 1988; Hillier & Hillier, 2003). The quantitative approach is premised on the need for such multi-dimensionality that is unlikely to be obtainable by using just one approach or perspective, thus facilitating a better understanding of the subject-matter. CAPM is a model in which the cost of capital for any security or portfolio of stocks equals a risk-free rate plus a risk premium that is proportionate to the market risk of the security or portfolio. The risk-free rate is the rate of return available in a market free of default risk. Market risk is the risk that affects an entire market and not just the specific participants or assets; market risk cannot be diversified. There is a preponderance of literature supporting CAPM as probably the most apt device by which the relationship between expected return of a security and its avoidable risk can be measured relative to the market portfolio (Markowitz, 1952 & 1959; Lintner, 1965; Mossin, 1966; Olowe, 2011; Parasuraman, 2014). CAPM states that the proportion of wealth held in each stock is equal to the ratio of the market value of the stock to the market value of all securities, and provides a measurable beta metric that helps to answer the critical question as to a stock's

market risk. The *beta* theory is not without its criticisms, nonetheless, it is contended that CAPM's accuracy would suffice for many important applications (Ashamu, 2009). The often-cited alternative approach called Arbitrage Pricing Model (APM), as a multi-beta model, is rather prone to a lot of practical difficulties in its usage, due to the fact there is no consensus among scholars as regards its testability, the appropriate methodology, and which factors should be employed, if it is testable. In the context of modern portfolio theory, the Sharpe Model (also known as 'Sharpe Index' or 'Sharpe Ratio') is one of the widely used mathematical tools for evaluating risk-adjusted return of assets in the capital markets. The model is designed to measure how many excess units of returns an investor can be achieved over the risk-free rate for each risk taken (Edward, 2009). It adjusts returns by both the risk-free rate of return and the standard deviations of the returns, thereby evaluating stock behaviour on the basis of total risk; that is, rate of return performance and degree of diversification.

The usefulness of EMH in investment science is well-documented in a growing body of literature centred on market integrity postulating that ultimately, stock-market prices depend on meaningful, fundamental information about the business / industrial sector in question (Hagstrom, 2001; Malkiel 2003; Graham & Dodd, 2009). The concept of business fundamentals follows Fama (1965 & 1970)'s Efficient Market Hypothesis which postulates that current beliefs about future events concerning an asset are already incorporated in the prevailing asset prices, such that it is only unexpected changes that can affect the returns (Myles, 2003). A capital market is information efficient if stock-market prices fully adjust rapidly to the infusion of new information and current stock prices fully reflect all available information based forces of demand and supply. Over the long-term, common stock prices are thought to have a strong relationship to the underlying fundamentals of the business, and as many analysts observed in the 2008-2009 global meltdowns, stocks cannot continue to outperform their business fundamentals indefinitely (Okereke-Onyiuke, 2010). The company risk fundamental evaluation approach is thus consistent with the orthodox thinking suggesting that investing is most intelligent when it is most business-like (Graham 2004).

2.4 Research Gap

What is clear from the foregoing literature review and theoretical framework is the existence of a multiplicity of viewpoints attempting to characterize and explain investment behaviour of capital assets. Findings on the empirical impact of systematic and unsystematic forces on the rate of return of capital assets in the Nigerian context are observably mixed; specifically, evidence of the company risk and long-term volatility of real estate stock-market prices in Nigeria is currently lacking, while empirical findings on the acclaimed superior nominal and risk adjusted return performance of property-backed securities remain largely

inconclusive. The multifarious nature of risk-return behaviour of capital market assets and inadequacy of the current analytical frameworks or approaches to comprehensively characterize it constitutes the motivation for the present research study in the Nigerian context.

2.5 Objectives

Thus, the main objective of this study is to explore the use of a new proposed integrated approach for effective portfolio risk-return analysis with emphasis on Nigeria's emerging real estate securities market. The specific objectives are:

1. To determine the nature of the market risk of Nigeria's nascent real estate securities.
2. To determine the long-term volatility of real estate securities' returns relative to the market portfolio.
3. To assess the competitiveness of nominal and risk-adjusted return performance of real estate securities relative to the market portfolio.
4. To determine the nexus between stock-market prices of real estate securities and their underlying business fundamentals.

3. Methodology

3.1 Research Hypotheses

The following four hypotheses are developed to meet the stated objectives of the present study:

(i) $H_1: R^2(\beta_i) < 0.70$: The market risk (β_i) of real estate securities in Nigeria is not significant.

(ii) $H_2: \delta_i < \delta_{Rm}$: Rates of returns from real estate securities are not as volatile as the rates of returns from market portfolio.

(iii) $H_3: R_i, SR_i > R_m, SR_m$: Real estate securities outperform the stock market in nominal and risk-adjusted return terms.

(iv) $H_4: R^2(r_{NAV}, r_{EPS}) < 0.70$: There is no significant relationship between real estate stock-market prices and their underlying business fundamentals in terms of net asset values (NAV) and earnings per share (EPS).

NAV, defined as net value of equity divided by the number of ordinary shares or units, is a firm-specific factor often used by value investors. EPS is based on net profit after tax divided by the number of ordinary shares. The statistical tool employed for testing the H_1 and H_4 was the paired Student's t-ration and R^2 at 95 percent confidence level, following the standard procedure (Kothari & Garg, 2014). R^2 values lying between 0 and 1 are indicative of the level of the variance in the dependent explained by the independent variable, NAV or EPS. A higher R^2 (≥ 0.70) will indicate more useful β and r figures, while a low R^2 value (< 0.70)

means the β and *r* values should be ignored. H_2 and H_3, being *ex-post-facto*, are not testable, the evidence simply illustrates the hypotheses (Sidhu, 2006).

3.2 Model Proposal

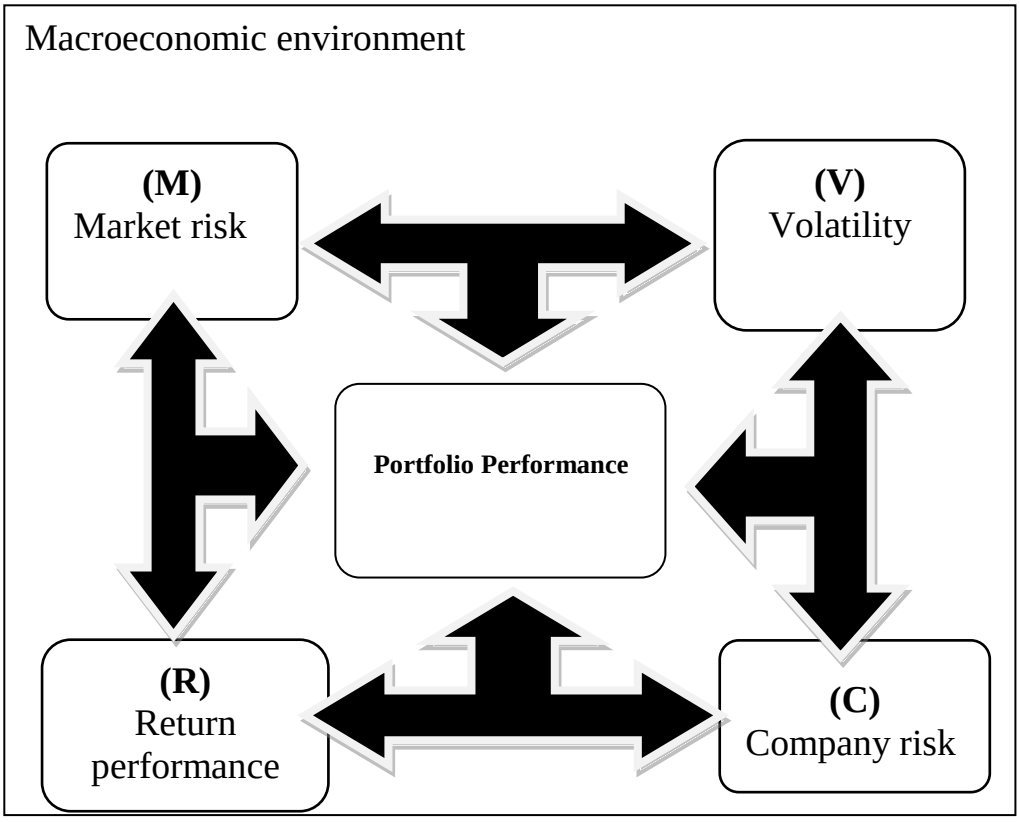
The present study was designed to explore the use of a new proposed integrated approach for effective portfolio risk-return analysis with particular application to Nigeria's emerging real estate securities market. The proposed analytical approach is expected to enhance understanding of African emerging markets and to aid quality decision-making process towards optimal portfolio management, post-2007 global financial crisis. To this end, this paper is concerned with modeling how market-driven (systematic) and non-market (unsystematic or company-specific) forces contribute to stock-market price behaviour in the context the Nigerian financial landscape.

Based on the literature (Graham & Dodd, 2009; Brealey *et al*, 2014), investment portfolio performance is a function of market (systematic) and non-market (unsystematic) risk factors. This is symbolically represented thus:

$$Y_i = f(M, N) \quad \ldots (3.1)$$

Where,
Y_i = Investment overall performance (market price or rate of return of asset *i*)
M = Market risk factors
N = Non-market risk factors

Figure 1: A Conceptual Model for Inclusive Investment Portfolio Characterization



Source: Developed by author (2015)

The literature reviewed point to four major recurring independent variables – Market risk, Volatility, Return, and Company risk (MVRC) –selected for critical analysis. In essence, the model specification as shown in Fig. 1 draws substantially from the analytical framework provided by existing literature. The additive format to be detailed in the next level of the research considers the total implications of the quartet resulting in *Y* values of the overall time series of *M*, *V*, *R*, and *C*, and can be stated as

$$Y = M + V + R + C \quad \ldots (3.2)$$

3.3 Data Sources and Analytical Techniques

In this paper, published annual data for the period 1998 to 2011 were used for the analysis. Data were obtained from the Nigerian Stock Exchange (NSE) on listed securities' published audited accounts as well as the NSE's various statutory publications. Some highlights of the key statistics are given below.

3.3.1 Appraisal of Market Risk

Beta coefficient was used to measure asset's market risk, given as follows (Olowe, 2011):

$$\beta = \frac{\frac{1}{N-1}\sum(Ri - \overline{Ri})(Rm - \overline{Rm})}{\delta 2\,(Rm)} \quad \ldots (3.3)$$

Where,

Ri = Average return of the asset or portfolio

Rm = Market portfolio return, a derivative of the market's price-earnings ratio (PER)

σ^2 = Variance measure

N = Number of observations

Sampled securities were ranked according to how much they deviated positively or negatively from the market portfolio, using market indexes.

3.3.2 Assessing Volatility of Portfolio Returns

The long-term volatility question was addressed using the statistical device of Standard Deviation, *SD*, as a measure of volatility (Kothari & Garg, 2014), as follows:

$$SD = \sqrt{\frac{\sum(x - \bar{x})^2}{N}} \quad \ldots (3.4)$$

Where,

SD = Standard deviation

N = Number of observations

x = Respective values of the subject asset stock-market / market portfolio returns

To help in making meaningful comparison between sample asset returns and market portfolio returns data sets, the relative standard deviation or Coefficient of Variation (*CV*), expressed in percentage, was deployed. The greater the volatility, the larger the *SD* or *CV* will be.

3.3.3 Measuring Competitiveness of Asset's Nominal and Risk-Adjusted Return Performance

Determining stock's risk-adjusted return performance of real estate stocks was addressed using the device of Sharpe Ratio, S_R We first determined the asset's nominal rate of return (*Ri*) as follows:

$$Ri = EPS/P \quad \ldots (3.5)$$

Where,

Ri = Earnings yield or nominal rate of return

EPS = Earnings per share

P = Stock-market price of the asset or portfolio

Stock-market price, *P*, was annualized data extracted from the Nigerian Stock Exchange Daily Official List published by the Exchange. Following Durand *et al* (2010), optimality property of a maximum SR portfolio, that is, a portfolio that achieves the maximum value in equation (3.6):

$$SR_{(x)} = \frac{(R_x - R_f)}{\delta_{(x)}} \quad \ldots (3.6)$$

Where,

x is asset or portfolio

R_x is the average rate of return for asset or portfolio *x*

R_f is the average rate of return of a 'risk-free' security, that is the Nigerian 91-day Treasury Bills

δ is the standard deviation of R_x

The greater an asset's SR, the better its risk-adjusted performance

3.3.4 Assessing Portfolio Company Risk

Determining the company-specific risk was conducted by reference to the extent of correlation between stock-market prices and business fundamentals represented by N-REOC

/ N-REIT's EPS and NAV, was addressed using the Pearson Product Moment Correlation coefficient (PPMC) denoted by *r*, defined as*:*

$$r = \frac{N\sum XY - (\sum X)(\sum y)}{\sqrt{[N\sum X2 - (\sum X)2][N\sum Y2 - (\sum Y)2]}} \quad \ldots (3.7)$$

Where,

r = Pearson Product Moment Correlation coefficient

$\sum X$ = Sum of X values (EPS, NAV)

$\sum Y$ = Sum Y values (current stock-market prices)

$(\sum X)(\sum y)$ = Product of X value and its corresponding *Y* value

N = Number of pairs of values or observations

3.4 Model Validity and Reliability

The Microsoft Excel software was used for the statistical analysis in this paper. The software is a widely used robust computer package in global financial markets (Proctor, 2009; Parasuraman, 2014). The model's major parameters, R_i, β, R_f, and R_m, *r*, R_2, are consistent with contemporary theoretical and empirical literature (Brealey *et al*., 2014; Prasanna, 2008; CRSP, 2009; Principal Global Investors, 2009). R_f and R_m are best practice benchmarks for measuring superior performance of investments as business environment changes (Camp, 2006). Standard *t* and R^2 tests conducted on equations 3.3 and 3.7 to demonstrate the validity of the statistical models employed for the analysis.

3.5 Population and Sampling

The real estate common stocks in the REOC/REIT sub-sectors traded in the Nigerian Stock Exchange (NSE) within a study period of 14 years (December 1998 – December 2011) constitute the population for study. All the listed real estate-backed companies on the Nigerian Stock Exchange were stratified into N-REOCs and N-REITs and the top rated stocks (in terms of length of trading of their shares) were selected as samples for the study, using annual opening and closing market prices of shares, as well as the related year-end Earnings per Share (EPS), and Net Asset Value per share (NAV) of the selected companies.

The resultant samples for analysis comprise the following:

- UACN Property Development Company Plc: N-REOC
- Skye Shelter Funds Plc: N-REIT

4. Results and Discussion

Appendix A displays the empirical dataset obtained for the study period 1998 to 2011, including market-wide data for portfolio returns and business-specific fundamentals of EPS and NAV for each sample stock. From Table 1, it is observed that the respective β

coefficients of the property-backed assets are too far off unity to convince us of any strong relationship between the assets' rates of return and the rate of return from market portfolio.

Table 1: Market Risk: *Beta* Coefficients and R^2 Matrix of Selected Nigerian Real Estate Securities (2000 - 2011)

S/No	Asset	Beta	t-Test	Critical Value @ 0.05 significance level	R^2
1	N-REOC	32.87	0.0066	1.80	0.42
2	N-REIT	3.73	0.2795	2.35	0.10

Source: MS Excel software analysis (2015)

The results of the statistical tests show that, contrary to the findings in previous studies, notably, (Emele & Umeh, 2013), none of the real estate assets has a $\beta = 1$ that could have assured us of the presence of a strong correlation between the real estate asset class and the market portfolio. Notwithstanding the stratospheric betas, the validity of the test result was reinforced by the $t < \alpha$ and the relatively low R^2 values, which, in both cases, are less than the 0.70 minimum thresholds to assure us of significant positive relationship. Thus, the H_1 is accepted and it is therefore concluded that the market risk of the real estate investments is not significant. At a time when the macroeconomic environment is full of uncertainties, the results of the statistical analysis presented in Table 1 with a wider coverage involving post-2007 trading years, suggest that the real estate asset class is a type of capital asset that has a tendency to be minimally impacted by externalities. In other words, real estate stocks' rate of return were uncorrelated with the market portfolio, thus revalidating the portfolio risk-diversification value of certain asset classes as predicted by theory and the literature (Markowitz, 1952 & 1959; Brealey *et al*, 2014).

The H_2 on asset volatility was rejected because the resultant portfolio *SDs* and *CVs* as displayed in Table 2 indicated that, at approximately between 40-65 percent *CV* level, the annual rate of returns from the sample real estate securities were relatively more volatile than the rates of returns from market portfolio that has 12-27 percent *CV* during the same period. The evidence reinforces not only the inherent volatility of the underlying property investment itself (Oyedele, 2013), but also those of stock markets as espoused in the literature (Shiller, 2005; Roos, 2001; Bail, 2010; Akurunwa, 2011; Olowe, 2011), but it also demonstrates the higher level of volatility that prevalent in emerging markets unlike what is obtainable in the more developed economies (Appraisal Institute, 2001).

Table 2: Volatility of the Returns of Market Portfolio and Real Estate Securities in the Nigerian Capital Market (2000 – 2011)

Asset	Variance	SD	CV (%)
N-REOC	50.84 *(2.88)	7.13 *(1.70)	65.67% *(27.35%)
N-REIT	9.33 *(0.81)	3.05 *(0.90)	36.09% *(12.40%)

Source: MS Excel software analysis (2015)
*(Market Portfolio Variances, *SD*, and *CV* for the same period are shown in parentheses)

The H_3 on asset return performance is accepted for both real estate portfolios on risk-adjusted basis only as N-REIT underperformed the market portfolio performance during the same period. Table 3 presents the nominal and risk-adjusted (Sharpe Ratio) performance of both securities alongside the market averages. The results of the analysis for the study period demonstrate that N-REOC outperforms the market portfolio at the nominal mean annual rate of return of 13.49 percent compared with the market average of 6.21 percent and the risk-free asset of 11.34 percent.

Table 3: Nominal Return and Risk-Adjusted Return Performance of Real Estate Securities in The Nigerian Capital Market (2000 – 2011)

S/NO	ASSET	NOMINAL RATE OF RETURN (%)	SHARPE RATIO (SR)
1	N-REOC	13.49 *(6.21)	2.15 *(-0.02)
2	N-REIT	8.08 *(8.01)	-1.29 *(-0.86)
3	Risk-free portfolio	11.34	0.00

Source: MS Excel software analysis (2015)
*(Market yield and *SR* for the same period are shown in parentheses)

Interestingly, the exhibited market rate of return at 6.21- 8.01 percent compares favourably with the 6-8 percent experienced in many countries of the world and provides some credence to the recent rating of Nigeria as the country with 4th highest returns on investment in the world [Picketty, 2014: 54; http://www.vanguardngr.com/2015/09/paris-to-abuja-we-are-happy-with-the-visit-is-your-president-happy/ - 19/09/2015]. Further analysis revealed that N-REOC provided the highest risk-adjusted return with its SR of 2.15, outperforming the market portfolio's -0.02, followed by N-REIT with SR of -1.29. This means that the direct property development sub-sector in Nigeria (N-REOCs) probably remains relatively superior on risk-adjusted performance basis as predicted in the literature (Ooi and Liow, 2004; Ling & Archer, 2005; Amidu & Aluko, 2006).

It is noteworthy that the superior return performance associated with Nigerian real estate-backed securities (8-13.49%) in nominal terms not only corroborates the findings from other studies like Stutes (2004), but also indicates that N-REOC provides competitive returns perhaps better than direct prime property investments (Ikoyi/VI, Lagos) whose rental yield currently averages 5.30-6.50 percent (UPDC REIT, 2014; Bello, 2003; KFRR, 2006; Ifediora, 2009). With Nigeria's huge housing deficit estimated at 17.45 million units, the superior performance is in itself a reflection of the supply and demand dynamics reflected in the generally shortage of accommodation and high property prices particularly in biggish cities of Lagos, Port Harcourt, Kano, and Abuja (Mabogunje, 2008; Okoya-Thomas, 2010; Onukwuli, 2012; Eleh, 2007). In this scenario, ensuring a good mix-portfolio of income-generating

commercial and residential properties across target income-segments is a critical success factor for REOCs and REITS. The challenges of doing real estate development business in Nigerian are compounded by myriads of factors including overlapping taxes, complicated rules, excessive approvals, confusing bureaucracy and lengthy land and building permits, and poor infrastructure (Odunlami, 2001; Odusholu, 2009; Ogu & Ogbuozobe, 2001; Ebie, 2011). Additionally, N-REIT's risk-adjusted underperformance performance (-1.29) relative to the market port-folio (-0.86) and N-REOC's 2.15 perhaps may be explained by REITs' infancy and its structured difficulties in sustainably funding growth strategies with retained earnings, which REOCs could find easier to achieve by issuing new securities.

Table 4 displays the results of Pearson Product Moment Correlation analysis on the subject assets in matrix of the related earnings (EPS) and net asset values (NAVs) at the critical values at 0.05 significance and R^2 levels. The test results on EPS indicate $R^2 < 0.70$ values for both portfolios, suggesting the acceptance of H_4 on EPS dimension, notably, with a negative correlation (r = -0.5577) in the case of N-REIT. Expectedly, H_4 for NAV is rejected because the test results on NAV significance in Table 4 shows approximately $R^2 = 0.70$.

Table 4: Company Risk: Pearson Product Moment Correlation Coefficient, *R*, And R^2, EPS, NAV Matrix of Real Estate Securities in The Nigerian Capital Market NAV (1998 – 2011)

VARIABLE	N-REOC *r*	R^2	N-REIT *r*	R^2
EPS	0.5894 *(0.0002)	0.3474	- 0.5577 *(0.9.89116E-05)	0.3110
NAV	0.91 *(0.00)	0.82	0.8124 *(0.0008)	0.6599
Critical Value @ 0.05 Significance Level	1.77		2.35	

Source: MS Excel software analysis (2015)
*Calculated t-Test values are shown in parentheses.

The resultant significant relationship between stock-market prices and NAVs in comparison with the weaker correlation with earnings provides support for the conceptual basis for building diversified investment portfolios and for operating sound business model based more on 'values' rather than profits as asserted in some literature (Drucker, 1994 & 2004; Imafidon & Amos, 2008; Porter & Kramer, 2011).

4.1 Summary and Findings

After conducting series of descriptive and inferential statistical tests, Appendix B provides a panoramic view of the major results and some implications for sustainable portfolio risk management. Specifically, the following major findings emerge from the study:

Hypothesis	Results	Decision and major implication on asset behaviour
$H_1: R^2(\beta_i) < 0.70$: The market risk (β_i) of real estate securities in Nigeria is not significant.	$R^2 < 0.70$ for both N-REOC and N-REIT	H_1 is accepted: Securitized real estate is un-correlated with the general market.
$H_2: \delta_i < \delta_{Rm}$: Rates of returns from real estate securities are not as volatile as the rates of returns from market portfolio.	The Coefficients of Variation (CVs) of N-REOC and N-REIT (36.09-65.67%) indicated higher level of volatility in comparison to 12.4-27-35% for market portfolio	H_2 is rejected: Real estate-backed equities are as volatile as, if not more volatile than, other common stocks.
$H_3: R_i, SR_i > R_m, SR_m$: Real estate securities outperform the stock market in nominal and risk-adjusted return terms.	(i) $SR_{N\text{-}REOC}(2.15) > SR_{Rm}$ (-0.02) (ii) $SR_{N\text{-}REIT}(-1.29) < SR_{Rm}$ (-0.86)	H_3: Accepted in the case of N-REOC, but rejected in the case of N-REIT. Based on the N-REOC that had more observations, securitized real estate is considered to be high-yielding asset on risk-adjusted basis.
$H_4: R^2(r_{NAV}, r_{EPS}) < 0.70$: There is no significant relationship between real estate stock-market prices and their underlying business fundamentals in terms of net asset values (NAV) and earnings per share (EPS).	(i) $R^2 > 0.70$ for both N-REOC and N-REIT with respect to Net Asset value (NAV) (ii) $R^2 < 0.70$ for both N-REOC and N-REIT with respect to Earnings	H_4: Rejected in the case of NAV, but accepted in the case of EPS, hence, the Nigerian Capital market is deemed semi-strong efficient enough to reflect NAV in stock-market prices.

In essence, the coalesced test results on H_1 (significantly uncorrelated asset), H_2 (high return volatility), H_3 (superior risk-adjusted return) and H_4 (significant company-specific risk with respect to NAV) go to revalidate finance and investment theory of higher risk-for-higher return, contrary to the 'special case' arguments about the real estate asset class made in some sections of the literature (Young & Graff, 1995; Mandelbrot, 2004; Ebrahim & Hussain, 2010). Thus, this study has gone some way to demonstrating the usefulness of integrated CAPM-RWT-MPT-EMH theoretical framework in so sharpening the focus of empirical portfolio risk analysis as to uncover the divergent risk-return characteristics of securities, not only within the stock market as a whole, but also within the same asset class.

5. Conclusion

In this paper, using publicly available stock-market data, an attempt was made to explore application of a new proposed integrated approach (MVRC) for conducting effective portfolio risk-return analysis with emphasis on Nigeria's emerging real estate-backed securities market. It was shown that the MVRC model proposal offered a wider perspective of the risk-return characterization of the nascent secondary real estate market in the developing economy; the relatively new asset class demonstrated insignificant correlation with the general market, higher-level volatility, but high-yields that investors could leverage for building optimal

portfolios, as predicted by the Capital Asset Pricing Model (Markowitz, 1952 & 1959; Brealey *et al*, 2014). Additionally, the results of the test of efficient market hypothesis showed that the Nigerian Capital Market was semi-strong enough to depict underlying asset-backed securities' net worth, and the current evidence in the Nigerian context did not show any significant uniqueness attachable to real estate as advanced in some previous works (Young & Graff, 1995; Ebrahim & Hussain, 2010). These MVRC-based observations are not entirely inconsistent with the literature, but many other studies have employed the traditional piecemeal tools to derive these results, hence the motivation for the more comprehensive MVRC approach adopted in this paper. Based on the current findings, the following recommendations are apposite:

1. Investors, managers, and analysts should consider the MVRC four-factor approach in analyzing emerging market instruments such as real estate securities so as to obtain more comprehensive and empirical picture of asset risk-return performance needed for intelligent risk diversification strategy, portfolio design, selection and revision.
2. As a way of deepening the market further through continuous investor education and sustainable housing finance, stock-market prices should continue to be monitored closely by market regulators and policy makers as, for instance, the evolving real estate-backed stock prices have been shown in this paper to have some significant positive linkage to business fundamentals.

5.1 Scope for Future Research

Public accounts are disclosed months after the year-end dates, meaning that public data used in this paper are already out of date. This makes continuous research on the subject-matter imperative to keep data up to date. Future study should also tackle the need for more market data in terms of increasing the number of spot prices so as to make the results in this paper more conclusive. Also, the methodological literature on MVRC can be enriched with further application to other segments of the financial markets in Nigeria and similar emerging market economies.

References

Abubakar, M., 2010, Stock Market Development and Economic Growth Linkage in Nigeria: An Autoregressive Distributed Lag Approach. *Journal of Management Studies, Usmanu Danfodiyo University*, 3, 1 - 15.

Adetunbi, S. 2006, May 15, Imperative of Asset-Backed Securities. *Financial Standard*, p. 11.

Agarwal, R.N., 2000, Financial Integration and Stock Markets in Developing Countries: A Study of Growth, Volatility and Efficiency in the Indian Stock Market. *Delhi, India, Institute of Economic Growth Discussion Paper Number 21.*

Akinwale, S.O., and R. O. Abiola, 2008, Mathematical Basis of Asset Portfolio Decision Making: A Study in a Developing Economy. *Finance and Banking Review*, 2 (1), 48 – 68.

Akurunwa, E. I., 2011, March 7, Impact of International Economic Meltdown on Nigerian Banking System. *The Guardian*, p. 58.

Amidu, A., B. T. Aluko, M. B. Nuhu, and M. O. Saibu, 2008, Real Estate Security and other Investment Assets: A Comparison of Investment Characteristics in the Nigerian Stock Market. *Journal of Property Investment and Finance, 26, 2*, 151-61.

Amidu, A., & B. T. Aluko, 2006, Performance Analysis of Listed Construction and Real Estate Companies in Nigeria. *Journal of Real Estate Portfolio Management*. *12, 2*, 177-85.

Appraisal Institute, 2001, *The Appraisal of Real Estate*. (12th Ed.). Chicago: Appraisal Institute.

Ashamu, S.O., 2009, *Financial Investment and Management Analysis*. Lagos: Molofin Nominees.

Atuanya, P., and I. Edozie, 2015, March 11, Retirement Savers Lose as Pension Funds Fail to Beat Inflation. *Businessday*, pp. 1 & 4.

Atufe, F., 2006, May 15, Challenges and Prospects of Introducing Asset-Backed Securities in Nigerian Capital Market. *Financial Standard*, pp. 19 & 22.

Bachelier, L., 1900, *Theorie De La Speculation*. Paris, Gauthier – Villars. Reprinted In English by Cootner, P. H., Ed., 1964, *The Random Character of Stock Market Prices*, Cambridge, Mass.: MIT Press.

Bail, M., 2010, Measuring Stock Market Volatility: The VIX. Http://Www.Dailyreckoning.Com [March 14, 2010]. .

Bello, O. M., 2003, Comparative Analysis of the Performance of Residential Property Investment and Investment in Securities in Lagos, Nigeria. *The Estate Surveyor and Valuer, 26 (1)*, 7 – 14.

Business Insider India, 2014, http://www.businessinsider.in/CHART-OF-THE-DAY-The-Rise-Of-The-156-Trillion-Market-For-Global-Financial-Assets/articleshow/32681342.cms [18/09/2015]**.**

Blaaw, A. J., 2009, August 3, Market Risk Management in Nigeria", *Thisday*, 14 (5216), P. 53.

Branson, R., 2010, May 16, The Opportunity of Risk. *Sunday Punch*, p. 22.

Brealey, R. A., S. C. Myers, and F. Allen, 2014, *Principles of Corporate Finance*, 11th Edn. London: McGraw-Hill.

Camp, R. C. 2006, *Benchmarking: The Search for Industry Best Practices that Lead to Superior Performance.* Productivity Press.

Carricko, R., 2008, REITS Battered Down to Eye-Catching Levels. *The Globe Mail.* Www.Reportonbusiness.Com [May 26, 2013].

Center for Research in Security Prices [CRSP], 2009, Http://Www.Crsp.Com/Documentation/Product/Stkind/Calculations [June 8, 2009].

Collins, J., 2001, *Good to Great: Why Some Companies Make the Lead… and others don't.* London: Random House Business Books.

Damodaran, A., 2006, *Damodaran on Valuation: Security Analysis for Investment and Corporate Finance*, 2nd Ed. New Delhi, Wiley India Pvt. Ltd.

Drucker, P.F., 2004, *Management: Tasks, Responsibilities, Practice*. New Delhi: Allied Publishers, PVT. Limited.

Drucker, P.F., 1994, The Theory of Business. *Harvard Business Review*. September/October.

Durand, R. B., H. Jafarpour, C. Kluppelberg, and R. Maller, 2010, Maximize the Sharpe Ratio and Minimize a VaR. *The Journal of Wealth Management*, 91 – 102.

Ebie, S. P. O. F., 2011, August 8, State of the Nigerian Housing Market. A Presentation at the International Housing Finance Workshop Organized by Pison Housing Company, held in Lagos on 8-10 August, 2011.

Ebrahim, M. S., and S. Hussain, 2010, Financial Development and Asset Valuation: The Special Case of Real Estate. *Journal of Banking And Finance, 34* (1), 150-162.

Ekundayo, F., 2010, *Corporate Finance: An Anchor for Development.* Lagos: Resort Consult Limited.

Eleh, E., 2007, July 2, Appreciating Quest for Affordable Housing in Nigeria. *Financial Standard*, pp. 38 & 39.

Emele, C. R., and Umeh, O. L. (2013). A fresh look at the performance and diversification benefits of real estate equities in Nigeria: Case study of real estate equity and some selected common stocks. *The Estate Surveyor and Valuer, 38 (1),* 16 – 23. ISSN: 1597 – 653X.

Ezepue, P. O. and A. R. T. Solarin, 2015, The Metaheuristics of the 2007 Global Financial Crisis: Implications for Finance-Economics Research in Emerging African Markets, *Programme Details and Initial Book of Abstracts, International Symposium on Mathematical and Statistical Finance, Training the Next Generation of African Financial Mathematicians*, Ibadan, September 1-3, 2015, Paper 39, p. 28.

Fama, E.F., 1970, Efficient Capital Markets: A Review of Theory and Empirical Work. *Journal of Finance, 25,* 383 -417.

Fama, E.F., 1965, The Behaviour of Stock Market Prices. *The Journal of Business, 38 (1),* 34 -105.

Glascock, J. L., and W. N. Davidson, 1995, Performance Measures of Real Estate Firm Common Stock Returns. *Alternative Ideas in Real Estate Investment, 4,* (4), 363-373.

Graham, B., and D. Dodd, 2009, *Security Analysis.* 6th Ed. New York: Mcgraw-Hill.

Graham, B. (2004). *The Intelligent Investor.* New York: Harper and Brothers.

Gyourko, J., And D. B. Keim, 1992, *What the Stock Markets tell us about Real Estate Returns*. Philadelphia: The Wharton School, University Of Pennsylvania.

Hagstrom, R. G., 2001, *The Essential Buffet: Timeless Principles for the New Economy.* New York: John Wiley & Sons.

Hagstrom, R. G., 1997, *The Warren Buffet Way: Investment Strategies of the World's Greatest Investor.* New York: John Wiley & Sons.

Herring, R., Diebold, F. X., and N. A. Doherty, 2010, *The Known, The Unknown, and the Unknowable in Financial Risk Management: Measurement and Theory Advancing Practice.* Princeton, N. J: Princeton University Press.

Ibbotson Associates, Inc., 1995, *Stocks, Bonds and Inflation.* Chicago: 1995 Yearbook.

Ifediora, G. S. A., 2009, *Appraisal Framework*. Enugu: Iwuba Ifediora & Associates.

Imafidon, K., and A. O. Amos, 2008, Company Fundamentals as Determinants of Stock Prices. *Finance and Banking Review,* 2 (1), 69 – 80.

Investment and Securities Act (2007). Lagos: The Federal Government Printer.

Iyiegbuniwe, W. C., 2007, *The Essence of Finance: Maximizing Life-Time Happiness*, in University Of Lagos Press. <Http://Www.Unilag.Edu.Ng/Publication/Ope... > [May 11, 2010].

Kalpakam, G., and P. G. Gopalakrishnan, 2014, Do Indian Mutual Funds with High Risk Adjusted Returns Show More Stability During an Economic Downturn? *Proceedings of the First Middle East Conference on Global Business, Economics, Finance and Banking (ME14 Dubai Conference), Dubai, 10-12 October 2014.* ISBN: 978-1-941505-16-8.

Kiyosaki, R. T., 2011, *Unfair Advantage: The Power of Financial Education – What Schools will Never Teach you about Money.* Scottsdale: Plata Publishing LLC.

Knight Frank Residential Research [KFRR], 2006, The Case for Indirect Investment in Residential Property. Http://Www.Resources.Knightfrank.Com/Getresearchreource.Ashx.Id=10830 **[**June 30**,** 2009].

Kothari, C. R., and G. Garg, 2014, *Research Methodology: Methods and Techniques. Third Edition.* New Delhi: New Age International (P) Limited, Publishers.

Ling, D.C., and W. R. Archer, 2005, *Real Estate Principles: A Value Approach.* New York: McGraw-Hill Companies, Inc.

Lintner, J., 1965, Security Prices, Risk, and Maximal Gains from Diversification. *Journal of Finance, 20,* 4, 587 - 616.

Lo, A., and C. Mackinlay, 1988, Stock Market Prices do not follow Random Walks: Evidence from a Simple Specification Test. *The Review of Financial Studies, 1,* 1, 41 – 46.

Mabogunje, A. L., 2008, Addressing Finance and Resource Constraints for Housing and Urban Development, in Africa.
Htthttps://www.Housing.Gov.Za.Amchud/Content/2008%20updates/AMCHUD%20-%20-%20pdf%20files/07%20Addre [July 3, 2009].

Malkiel, B.G., 2003, *The Efficient Market Hypothesis and its Critics*. Princeton, N.J.: Centre for Economic Studies, Princeton University.

Mandelbrot, B. B., 2004, *The Misbehaviour of Markets: A Factual View of Risk, Ruin, and Reward.* New York: Basic Books.

Markowitz, H. M., 1959, *Portfolio Selection: Efficient Diversification of Investments*. New York: John Wiley.

Markowitz, H. M., 1952, Portfolio Selection. *Journal of Finance*, 7, 77-91.

Mensah, S., 2009, Capital Market Development in Africa: Selected Topics - A Training Manual for Policymakers, Regulators and Market Operators. http://www.scholar.google.com [November 13, 2009]

Mensah, S., 2004, The Behaviour of Stock Prices. *Presentation at Ghana Stock Exchange Seminar on Securities Pricing*. http://www.semfinancial.com [November 13, 2009].

Moghalu, K., 2011, August 12, FG Needs ₦60 Tn to Address Housing Deficit. *The Punch*, P. 19.

Muth, J., 1961, Rational Expectations and the Theory of Price Movements. *Econometrica*, *29*, 315 – 335.

Myles, G. D., 2003, *Investment Analysis.* Retrieved November 1, 2011, From Http://People.Exeter.Ac.Uk/Gymyles/Books/IA.Pdf.

Natalwala, C. H., 2011, July 4, Business Valuation Needs and Techniques. Lecture Notes presented at Financial Modeling Seminar held at The *Lagos Business School, Pan-African University*, in Lagos on Monday, July 4, 2011.

Nigerian Stock Exchange [NSE] (2012). *2011/12 Fact Book*, Lagos: NSE, ISBN 978 0262 – 1 – 6

Odunlami, G., 2011, July 25, Challenges Faced by Developers in Real Estate Practice. *The Guardian*, P. 43

Odusholu, J., 2009, May 19, Developers' Perspective of Estate Development in Lagos. *Daily Trust*, P. 37.

Ogu, V. I., and J. E. Ogbuozobe, 2001, Housing Policy in Nigeria: Towards Enablement of Private Housing Development. *Habitat International*, *25*, 4, 473 – 92.

Oke, M. O., and B. A. Azeez, 2012, A Test of Strong-Form Efficiency of the Nigerian Capital Market. *Business Systems Review*. ISSN: 2280 – 3866. DOI: 10.7350/Bsr.A03.2012 –URL.

Okereke-Onyiuke, N., 2010, January 15, Managing your Stock Portfolio in a Recession. *The Punch*, p. 4.

Okoya-Thomas, M., 2010, April 5, Real Estate did well in the last 50 Years. *Daily Trust*, p. 48.

Ola, O., 2007, February 2, Using Structured Finance to Stimulate Housing. *Financial Standard*, pp. 35-36.

Olowe, R. A., 2011, *Financial Management: Concepts, Financial System, and Business Finance.* 3rd Ed. Lagos: Brierly Jones Nigeria Limited Lagos: Brierly Jones Nigeria Limited.

Onukwuli, P., 2012, May 6, High Poverty Level is Responsible for Low Demand for Housing. *Sunday Vanguard*, p. 50.

Ooi, T. L .J. and K. H. Liow, 2004, Risk-Adjusted Performance of Real Estate Stocks: Evidence from Developing Markets. *Journal of Real Estate Research*, *26*, 4, 371-95.

Osamwonyi, I. O., 2006, Utilization of the Capital Market for Housing Industry Development in Nigeria, *Securities Market Journal*, 75-96.

Oteh, A., 2011, The Role of the Real Estate in Capital Market Development. Opening Speech at the Nigerian Institution of Estate Surveyors and Valuers (NIESV) Seminar and Fellows Night On January 28th 2011. www.sec.gov.ng**. [**December 16, 2011].

Oyedele, O. A. (2013). Assessment of property management practices in Nigeria. *The Estate Surveyor and Valuer, 38 (1),* 103-114. ISSN: 1597 – 653X.

Picketty, T., 2014, *Capital in the twenty-first century*, London, The Belknap Press of Harvard University Press.

Porter, M. E., and M. R. Kramer, 2011, Creating Shared Value. *Harvard Business Review, 89*, 1/2, 62 – 77.

Prasanna, C., 2008, *Investment Analysis and Portfolio Management.* Tata Mcgraw-Hill.

Parasuraman, N. R., 2014, *Financial Management: A Step-By-Step Approach* Delhi: Centage Learning India Pvt Ltd.

Principal Global Investors, 2009, U.S. Real Estate Equity Securities. Http://Www.Principalfunds.Com **[**June 8, 2009].

Proctor, S., 2009, *Building Financial Models with Microsoft Excel: A Guide for Business Professionals*. 2nd Ed., Hoboken, NJ: Wiley.

Raji, A., 2003, Securities Analysis and Evaluation: Enhancing the Role of Stock-Brokerage and Issuing House Analysts. In Ndanusa, S. A. and Ezenwe, S., Ed. (2003). *Nigerian Capital Market and the Globalization Challenges: Proceedings of the First Annual National Capital Market Conference*, Abuja, Securities and Exchange Commission, 33-44.

Sanya, O. A., 2011, Real Estate Investment Trust: A Veritable Tool for Housing Development in an Emerging Market. *Presentation at the International Housing Finance Workshop Organized by Pison Housing Company*, held in Lagos on 8-10 August, 2011.

Sharpe, W.F., 1994, The Sharpe Ratio. *Journal of Portfolio Management, 21* (1), 49 - 58.

Shiller, R.J., 2005, *Irrational Exuberance.* (2nd Ed.). Princeton University Press.

Sidhu, K. S., 2006, *Methodology of Research in Education*. New Delhi: Sterling Publishers Private Limited.

Souza, L. A., 2011, Modern Real Estate Portfolio Management: Applications to Western Regional Apartment Portfolios. *A Paper on Corporate Finance, Golden Gate University, San Francisco*, CA,.

Ugboh, E., 2011, Trends in the Nigerian Capital Market and its Impact on Housing – Post-Crisis Outlook. *Paper Presented at the International Housing Finance Workshop Organized By Pison Housing Company* Held In Lagos on 8-10 August, 2011.

UPDC REIT, 2014, *UPDC Real Estate Investment Trust Financial Statements for the 19 Months Ended 31 December 2014.* Lagos, UPDC Property Development Company.

Vijayalakshmi G., and C. Sivapragasam, 2008, *Research Methods: Tips and Techniques*, Chennai: MJP Publishers.

Walley, S., 2011, Expanding Housing Finance in Nigeria. Presentation at the International Housing Finance Workshop Organized by Pison Housing Company, held in Lagos on 8-10 August, 2011.

Young, M. S., and Graff, R. A., 1995, Real Estate is not Normal: A Fresh Look at Real Estate Return Distributions. *The Journal of Real Estate Finance and Economics*, *10*, 3, 225 -259.

Appendix A

Empirical data for portfolio risk-return appraisal of the Nigerian real estate securities (1998-2011)

		N-REOC			***N-REIT***		***BENCHMARK PORTFOLIOS***		
END - DECEMBER	**EPS (NAIRA)**	**NAV/SHARE (NAIRA)**	**PRICE (NAIRA)**	**EPS (NAIRA)**	**NAV/SHARE (NAIRA)**	**PRICE (NAIRA)**	**MARKET PRICE-EARNINGS RATIO**	**MARKET RETURN (*Rm*) (%)**	**TB RATE (*Rf*) (%)**
1998	0.13	4.80	3.80						
1999	0.15	6.29	1.64						
2000	0.49	6.53	1.52				12.25	8.16	15.25
2001	0.57	6.69	4.62				14.01	7.14	18.38
2002	0.74	14.03	4.00				12.52	7.99	18.35
2003	0.91	13.27	6.60				19.76	5.06	15.03
2004	0.45	16.27	8.90				28.99	3.45	14.25
2005	0.77	15.03	8.75				22.32	4.48	7.00
2006	0.88	19.07	13.80				17.92	5.58	8.80
2007	0.97	19.28	23.37				27.78	3.60	7.00
2008	3.23	30.2	26.84	5.73	129.22	111.10	15.95	6.27	4.50
2009	2.21	28.19	19.86	8.73	122.76	100.00	11.45	8.73	6.10
2010	1.69	21.74	16.51	11.75	120.51	97.00	14.25	7.02	7.50
2011	1.48	21.96	12.00	4.48	116.03	100.00	14.33	6.98	14.00

Source: Author's research survey, 2015

APPENDIX B

The MVRC model: A panoramic view of current applications, results and some implications for sustainable portfolio risk management

ASSETS AND IMPLICATIONS	KEY RESULTS AND IMPLICATIONS					
	(M) Market Risk	(V) Volatility	(R) Return performance		(C) Company risk	
			Nominal return	Risk-adjusted return	Earnings per share	Net asset value
(i) (N-REOC)	Weak	High	Superior		Not significant	Significant
(ii) (REIT)						
Area of theoretical importance	Capital Asset Pricing Model (CAPM)	Random Walk Theory (RWT) – Standard Deviation	Modern Portfolio Theory (MPT)		Efficient Market Hypothesis (EMH) / Benjamin Graham School of Fundamental Analysis and Value Investing	
Some key areas of implications.	Intelligent portfolio-diversification	The need for modern investment strategy to focus more on risk-diversification rather than asset-diversification	Development of Real Estate Securities Markets (RESMs) for inclusive housing finance and sustainable portfolio risk management.		Quantity Management Theory / Market Price versus Intrinsic Value / Investor-Manager relationship management.	

Source: Author's summary of research results, 2015