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Spanned Sectoral Stock Returns Volatility on the Asset Pricing Conditions: Is there any significance?

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Abstract. The perception of sectoral stock return volatility carries meaningful information, especially for portfolio management, as its heterogeneity and periods of financial stress may alter the relevance of traditional asset pricing conditions. This raises the question of whether incorporating volatility into models improves their performance, particularly in emerging markets where risk dynamics are often unstable. Against this backdrop, this study analyses sectoral stock returns and their volatility dynamics in the Nigerian Stock Exchange using monthly data from periods before and after the global financial crisis. The study assesses the significance of spanning sectoral return volatility within asset pricing frameworks by evaluating the performance of the Capital Asset Pricing Model (CAPM) and the Arbitrage Pricing Theory (APT) through time-series and cross-sectional analyses. The findings indicate that while the CAPM explains expected returns through systematic risk (beta), the APT provides relatively stronger explanatory power when historical data are considered; however, no model consistently dominates across sectors. Incorporating sectoral volatility measures enhances the explanatory power of both models, indicating that volatility contains additional information relevant to asset pricing conditions. These results underscore the significance of time-varying risk and parameter uncertainty in explaining equity betas, and offer implications for sector-based portfolio selection in emerging equity markets. Accordingly, the study recommends that market regulators and policymakers should strengthen risk disclosure frameworks and promote volatility-sensitive pricing mechanisms to improve market efficiency in emerging equity markets.

Keywords: Capital Asset Pricing Models, Asset Pricing Theory, Nigerian Stock Exchange, Sectoral Stock Returns, Volatility

1. Introduction

Part of the role of the stock market is to assure investors of good market participation that can improve the overall economic well-being through stable stock prices. Chaudhary (1991) identified the availability of reliable information and accuracy in predicting market characteristics, especially price behaviour, as a significant constraint in investment management. The importance of pricing mechanisms to optimal investment decisions and resource allocation can never be overemphasized, which impacts the monetary policy of any nation (Caines & Winkler, 2021). The optimal allocation of capital depends on the efficient performance of stock market pricing and pricing methods. It also serves as a driving force for moving excess funds for investment management, which implies that an appropriate price mechanism reveals sustainable investment opportunities to both actual and potential investors (Zhang et al. 2024). Investors within the stock exchange need to identify factors affecting these returns to support their decision-making, and in most cases, such expected returns are often deduced from asset pricing models.

However, the theory has also shown that different investors are prone to different kinds of sentiments with special preferences for the particular sector(s) (Sakariyahu et al., 2023). In fact, investors would simply demand stocks that have the bundle of salient characteristics compatible with their sentiment (Baker & Wurgler, 2006; Chen et al., 2013) argued that sectoral returns react in different ways to market returns viz a viz global market returns which implies that movements of aggregate stock market volatility could be different from sectoral perspective with the focus on developed economies like the US and the European stock markets as demonstrated in (Sadorsky, 2001; Boyer & Filion, 2007). It is important for rational investors by nature to be regarded as risk averse, and the need to understand the volatility of such expected sectorial returns is paramount to them (Oke, 2013). The direction of measuring such uncertain returns is volatile even though the past stock prices reflect the future stock price, as in the case of most African Stock Exchange markets (Olowe et al., 2011). In line with the portfolio theory, proper investment management depends on efficient portfolios, and each investor will select efficient portfolios based on the degree of aversion from each sector (Treynor, 1961; Sharp, 1964; Lintner, 1965).

The input and output patterns of each sector are important and spur a deep understanding of returns and volatility dynamics among sectors within the Nigerian Stock exchange market to enable policy focus closely on smoothening out the effects of shocks on the transmission channel (Kpughur, Yila, & Chidozie, 2017). Selection of financial assets depends on the information readily available, and the asset allocation decision is the choice among broad asset classes known as sectors, while the security selection decision is the choice of which particular securities to hold within the portfolio. The important characteristics of each sector may interest investors in the persistence, endogeneity and conditional heteroscedasticity effects in the investment process, which may have implications on the forecast results (Dutta et al., 2017). The change in economic variables that affected stock returns may react to sectoral sensitivity, meaning the performance and correlations of sectors for portfolio diversification need to be discovered.

Hence, the essence of the study is to examine the predictive ability of the asset pricing models with volatility series for each sector of the Nigerian stock market.

2. Literature Review

Asset pricing theory provides the analytical foundation for understanding the relationship between expected returns and risk under conditions of market equilibrium. The Capital Asset Pricing Model (CAPM) posits that expected returns are determined solely by exposure to systematic risk, as measured by beta, under the assumptions of frictionless markets, rational investors, and a mean–variance efficient market portfolio (Chen et al. 2013). Despite its simplifying assumptions, CAPM remains central to finance theory and continues to serve as a benchmark for evaluating alternative asset pricing models. However, extensive empirical evidence questions the model's ability to fully capture return dynamics, particularly in emerging markets characterised by structural breaks, market imperfections, and information asymmetry.

In response to these limitations, the Arbitrage Pricing Theory (APT) relaxes several restrictive assumptions of CAPM by allowing multiple systematic risk factors to influence asset returns. By linking expected returns to macroeconomic and financial factors, APT offers greater flexibility in explaining cross-sectional return variation. This multi-factor structure is particularly relevant for sector-based analyses, where differences in production technology, exposure to macroeconomic shocks, and leverage structures result in heterogeneous risk profiles across industries.

Building on these theoretical developments, a substantial body of empirical research documents the importance of volatility and macroeconomic risk factors in explaining stock return behaviour. Numerous studies examine the relationship between oil prices and stock market returns using aggregate stock market indices across different countries (Ghosh et al., 2016; Lean et al., 2017; Salisu et al., 2017; Sharma, 2017; Tursol et al., 2017; Wel et al., 2017). Although the magnitude and direction of the effects vary across markets and periods, the consensus is that oil price fluctuations exert a significant influence on stock returns.

Firm and sector-level studies provide deeper insight into return dynamics. Using GARCH-type models, Dutta et al. (2017) and Khalifa et al. (2017) show that oil price shocks affect individual firm stock prices and contribute to return predictability, even during periods of global financial crisis and geopolitical instability in Asian economies. Similarly, Mohite (2015) examines the dynamics of volatility in the Indian banking sector and finds that risk factors significantly influence stock returns. Meanwhile, Mallikarjuna et al. (2017) document strong persistence in banking stock returns, highlighting the significance of lagged effects.

The relationship between risk and returns has also been shown to depend on prevailing market conditions. Messis et al. (2006) demonstrate that risk–return dynamics vary with the state of the market, reporting a positive association during market booms. In contrast, Benjamin et al. (2007), analysing the

Brazilian stock exchange, find an inverse relationship between changes in volatility and stock returns, challenging the traditional assumption of a uniformly positive risk–return trade-off.

Comparative studies further highlight the heterogeneous nature of volatility across markets and sectors. Uyaebo et al. (2015) compare stock market behaviour in Nigeria with that of Kenya, the United States, Germany, South Africa, and China, using the All-Share Index. Their findings reveal pronounced volatility clustering and persistence in Nigeria, coupled with relatively lower market performance. Consistent with this evidence, Osudina et al. (2016), focusing on Nigeria's manufacturing sector, show that accounting information exerts a strong and positive influence on stock return volatility, underscoring the role of sector-specific factors beyond those emphasised in traditional asset pricing theory.

Additional empirical evidence underscores the role of volatility in investment decision-making and its interaction with broader financial variables. Rolle et al. (2014) find that stock return volatility has a significant influence on investment decisions and is closely linked to other stock market factors. Fapetu et al. (2017) document strong interdependencies among stock market volatility, oil price volatility, and exchange rate volatility, emphasizing the interconnected nature of financial risks. In a broader African context, Ismaila et al. (2017) show that portfolio returns depend not only on macroeconomic and microeconomic risks captured by risk-augmented CAPM models but also on equity mispricing.

Further theoretical and empirical research challenges the assumption that stock returns are normally distributed. Lewellen (2000) argues that asset pricing models provide more appropriate testing frameworks under realistic market conditions. The determinants of stock returns are also shown to vary across macroeconomic environments. Interest rates affect stock prices through their role as the cost of capital and their influence on investment decisions (Obura & Anyango, 2016; Olweny & Omondi, 2010). Meanwhile, the money supply acts as a key indicator of future stock market performance by shaping liquidity conditions (Barnor, 2014). Sirucek (2013) further notes that excess liquidity often flows into financial markets, driving stock prices when productive investment opportunities are limited.

Exchange rate movements constitute another important macroeconomic transmission channel, affecting relative prices, firm competitiveness, and export performance, with direct implications for stock returns. Currency appreciation may reduce export competitiveness and negatively affect domestic stock markets, while depreciation can stimulate exports and support stock prices, assuming elastic demand (Kirui, Wawire & Perez, 2014; Kuwornu, 2012). Consequently, exchange rate volatility has important implications for firm performance and overall stock market stability (Obura & Anyango, 2016).

In oil-dependent economies such as Nigeria, the response of stock returns to oil price shocks is particularly pronounced. Oil price fluctuations influence government revenue, fiscal policy, investor sentiment, and expected returns, largely through demand and supply shocks driven by global economic conditions (Cui et al., 2023). While stock market reactions are shaped by firm-level risk considerations (Yu et al., 2023), oil prices may respond differently due to global demand dynamics (Xiuzhen et al., 2022). Moreover, sectoral responses to oil price changes are heterogeneous, reflecting differences in fiscal exposure, production structures, and policy regimes (Lou et al., 2024).

Despite the extensive literature on volatility, macroeconomic risk, and asset pricing, there is a limited research explicitly examining whether sectoral stock return volatility spans asset pricing conditions, particularly in emerging markets such as Nigeria. Existing studies often address volatility modelling and asset pricing tests separately, without assessing whether volatility provides additional explanatory power beyond conventional pricing factors. This study seeks to fill this gap by integrating sectoral volatility measures into asset pricing frameworks to evaluate their significance in explaining expected stock returns.

3. Data and Methodology

The stock price data used for the study were sourced from Nigerian Stock Exchange which house data for Nigerians firms across all sectors that are listed on the Exchange, while the data on selected exogenous variables such as consumer price index, treasury bill rate, and market price of stocks were sourced from the Central bank of Nigeria Statistical Bulletin (2019) and the Nigerian Stock Exchange. The data employed are monthly data covering the period from January 2007 to December 2021, which cater for shocks from the period before and after the 2008 financial crisis.

The sectoral stock returns are captured based on the Nigerian Stock Exchange's classification of sectoral stock indices, which consist of eleven primary stock sectors: Agriculture, Conglomerates, Construction, Consumer Goods, Financial Services, Health Services, Information and Communication Technology, Industrial Goods, Natural Resources, Oil & Gas, and Services. The firms' daily data, freely downloadable from www.cashcraft.com/plistorder.php, was averaged to form each sector. The selection was based on the consistency of data from the selected firms used to form each sector, as not all data met the range from 2007 to 2021 under study.

The sectoral stock prices are denominated in the domestic currency, naira. On the other hand, the consumer price index and market price (which is proxied by the All-Share Index) are in basis points, while the Treasury bill rate is expressed as a percentage. Meanwhile, since volatility analysis is usually done on the return's series, the required returns from the obtained data are computed as follows:

$$r_t = \left[log\left(\frac{P_t}{P_{t-1}}\right)\right] * 100$$
………………………………………..(1)

Where P_t^i is monthly stock price at the end of the day while P_{t-1}^i is the one-period lag stock price.

$$sr_t = \left[log\left(\frac{SP_t}{SP_{t-1}}\right)\right] * 100$$
………………………………………..(2)

Where SP_t is monthly sectoral stock price at the end of the month while SP_{t-1} is the one-period lag sectoral stock price.

The market returns (Rm_t) is calculated thus:

$$R_m = \left[log\left(\frac{Im_t}{Im_{t-1}}\right)\right] * 100$$
…………………………………..(3)

Where Im_t^i Monthly market index at the end and Im_{t-1}^i is the market index at the last day of operation of each sector.

The **Capital Asset Pricing Model** returns constructed for the study is computed thus:

$$(r_i - r_{ft}) = \alpha_i + \beta(R_t - r_{ft}) \quad (4)$$

Where r_i is determined from equation (1) and/or (2) above, r_{ft} is the monthly treasury bill rate (3 months), R_t is the stock market return determined in equation (4). The above equation (3) is examined on selected stocks listed on the NSE and β_i shall be generated for consideration.

On the other hand, the Arbitrage Pricing Model constructed for the study takes the form below:

$$(r_i - r_{ft}) = \alpha_i + \beta_1(R_t - r_{ft}) + \beta_2(cpl) + \beta_3\log(Mkvol_t) \quad (5)$$

Where r_i is determined from equation (3) above, r_{ft} is the treasury bill rate (3 months), R_t is the stock market returns determined in equation (4), *cpl* is the consumer price index under the period of consideration, and mkvol is the market volume. Since only the impact of returns is needed, only β_i (stock market returns factor) would be needed here, although cpl and mkvol are introduced in the model as other potential influencers of the dependent variable, following the doctrine of the Arbitrage Pricing Model. The selections were based on the literature that required both macroeconomic variables and market variables that could affect the expected returns other than the market premium.

The two asset pricing models were tested in two stages of regression. The first stage of regression is time series regression, in which the beta of each security from each sector is calculated by regressing the return of security on both returns of the market and the volatility series of stock returns.

$$(R_{at} - R_f) = \alpha_1 + \beta_1(R_{mkt} - R_f) + \beta_2(V_{at}) + \varepsilon_t \quad (6)$$

$$(R_{at} - R_f) = \alpha_1 + \beta_1(R_{mkt} - R_f) + \beta_2(cpl_{at}) + \beta_3(Mktvol_{at}) + \beta_4(V_{at}) + \varepsilon_t \quad (7)$$

Equations (6 & 7) explain the first stage regression equation of CAPM & APT where is the return of individual assets and R_{mkt} is the market return of time "t" period of time, V_{at} is the volatility series of the asset at the time "t". α_1 and β_1, β_2 are intercept and slope coefficient of the regression equation. ε_t is the error term of the equation.

The second stage involved cross sectional regression using result from stage 1 slope ($\beta_1, \beta_2, \beta_3, \beta_4$) that was also regressed with the average excess returns of portfolio that is derived from each sector. The slope coefficient in this regression is the market risk premium of the portfolio. The equation goes thus:

$$\hat{R}_j = \gamma_0 + \gamma_1\beta_{mj} + \gamma_2\beta_{vj} + \mu_t \quad (8)$$

From the equation (7) created for both models meant for second stage regression of asset pricing, $\check{R}_j$ is the mean excess returns of portfolio from each sector while γ_0 is the intercept term, γ_1 is the market risk premium, γ_2 is the risk premium of volatility, β_{imj} and β_{vj} are estimated betas from the time series analysis which are systematic risk of portfolio with respect to each sector.

The decision rule is if the intercept term is equal to zero from result $\gamma_0 = 0$ and γ_1 is equal to average return of the market, ($\gamma_1 = \check{R}_m$ then the asset pricing is verified. In the case of the theory of the one or more one factors or zero beta model implies that, instead of the intercept α being equal to zero, the study verify with the hypothesis of $\varepsilon(\check{R}_z) = 0$ meaning if the expected excess return on the beta factor is equal to zero, the verification would prove a consistency with the standard unconditional asset pricing models.

4. Results and Interpretation

Factor Spanning Regressions of Volatility Series on the Asset Pricing Model

Table 1: Long-run Determination of Sectoral Returns from Asset Pricing

Sectors	ARDL Models	CAPM				APT					
		Level Equations			Adj R-Sqrd	Level of Equations					Adj R-Sqrd
		C	EMR	SRV		C	EMR	CPL	MTKvol	SRV	
Agriculture	1	-0.012	0.322***		0.269	3.105***	0.363***	0.001	-0.239***		0.309
	2	-0.020	0.295***	0.031	0.368	0.531	0.3722***	-0.0002	-0.0399	0.0568	0.410
Conglomerate	1	0.027	0.347***		0.287	-0.246	0.390***	0.001	0.017		0.360
	2	0.035	0.347***	-1.098	0.283	-0.303	0.390***	0.001	0.022	-0.439	0.356
Construction	1	-0.0007	0.370***		0.312	-0.350	0.4252***	-0.0005	0.0324		0.370
	2	-0.024	0.371***	1.326	0.308	-0.8759	0.4235***	-0.0003	0.0744	1.7909	0.371
Consumer goods	1	0.011	0.342***		0.331	-0.036	0.4290***	0.0005	0.0015		0.403
	2	-0.0434	0.337***	13.671	0.334	-0.124	0.4220***	0.0005	0.0043	13.3770	0.407
Financial Service	1	-0.0294	0.484***		0.353	-0.1404	0.5615***	0.0004	0.0064		0.416
	2	0.024	0.428***	-1.52***	0.381	0.6587	0.5085***	0.0007	-0.0449	-1.575***	0.447
Health Service	1	0.0138	0.343***		0.288	-0.454	0.439***	0.001	0.034		0.391
	2	-0.0655*	0.336***	9.606***	0.359	0.706	0.383***	0.001	-0.068	8.873***	0.444
ICT	1	0.0232	0.348***		0.241	-0.0052	0.3947***	0.0007	-0.0002		0.305
	2	-0.0002	0.346***	0.839**	0.264	0.951	0.396***	0.001	-0.085	0.838**	0.326
Industrial goods	1	0.0040	0.351**		0.268	-0.9063	0.4612***	-0.0001	0.0750		0.372
	2	0.0647	0.355***	-11.098	0.280	-0.608	0.4656***	-0.0005	0.0589	-14.5916	0.376
Natural service	1	0.040	0.329***		0.271	-2.049	0.424***	0.001	0.172		0.357
	2	-0.0057	0.323***	1.962***	0.313	-1.226	0.406***	0.001	0.095	1.176**	0.381
Oil and Gas	1	-0.0019	0.294***		0.260	-1.4395	0.3909***	-0.0001	0.1168		0.364
	2	0.0797*	0.270***	-10.09***	0.292	-0.2102	0.3774***	-0.0001	0.0231	-9.0653**	0.381
Services	1	-0.0203	0.357**		0.290	-1.0003	0.3937***	0.0006	0.0792		0.357
	2	0.0344	0.361***	-4.760**	0.308	-1.0554	0.3951***	0.0008	0.0853	-4.517**	0.372

****, **, * imply significant at 1%, 5% and 10% significance level respectively, in parenthesis are standard errors*
ARDL Model 1 & 2 = Model without volatility series and Model with volatility series respectively. ESR= Expected Sectoral Stock Return (R_{st} - R_{ft});, EMR= Expected Market Return (R_{Mt} – R_{ft}), SRV= Sectoral Stock Return Volatility

Table 1 shows a regression for both CAPM and APT where volatility is included as part of factors explaining returns that produced that Agriculture, Natural resource, Oil and Gas, Financial service, ICT, health and Service sectors improved after incorporating returns volatility in the CAPM & APT framework. Though Adjusted R-Square will always increase with the inclusion of more factors, the intercept of *(R_{st} - R_{ft});* is statistically significant for both models across sectors, a unit change in the expected stock return in the previous year for all the considered sectors results in more than a unit inverse change in the expected return in the present year. This implies sectoral stock returns by themselves are recursive as present expectations about return negatively impact future expectations, while that of volatility series are not the same with Conglomerate, Financial Services, Industrial goods, Oil & Gas and Services that are negative, meaning volatility factor would not hurt the mean-variance-efficient tangency produced by combing the remaining factor in the long run (level equation).

Furthermore, it is revealed that a positive relationship exists between the expected stock returns of all the sectors considered and the expected market returns under the CAPM framework in both short-run (see Table 2) and long-run and not only is the relationship contemporaneous alone, while the positive influences of the overall stock market return's variation extend into the following year. It is being revealed that a shock to aggregate stock market return exerts a positive but inelastic impact on all sectors' stock return both in the short-run and long-run. Specifically, the table shows that a unit increase (decrease) in the expected market return causes a positive but less than a unit increase (decrease) in each of the sectors' stock return both in the short-run and long-run. Likewise, a unit change in the one-year lagged value of the expected stock market return causes positive but less than a unit change in the expected stock returns of each of the selected sectors.

Factor Spanning Regressions of Volatility series on the application of Asset Pricing Model

Table 2: Testing results of Asset pricing models on sectoral portfolio with intercept

SECTORS	Asset Pricing Models	CAPM (1) & APT (2) C	MRP	VOL	CPL	MTKvol	Adj R-Sqrd	F Stat.
Agriculture	1	-0.0282	0.6470	-0.0628	-	-	-0.301	0.420
	2	-0.01789	0.470**	-0.0797**	250.47**	-1.5298**	0.977	54.942
Conglomerate	1	0.2361	-0.5612	0.0040	-	-	-0.582	0.080
	2	0.6477	-0.9385	0.0152	-481.15	-0.2644	-0.191	0.799
Construction	1	0.0089	-0.017	0.0067**	-	-	0.819	10.063*
	2	-0.0327	0.0427	0.0109	159.87	0.0468	-0.395	0.645
Consumer goods	1	0.0283	-0.0556	0.0028	-	-	-0.097	0.242
	2	0.0474	0.0455	0.0025	-51.49	-0.5280*	0.103	1.489
Financial Service	1	-0.0434	0.2553	7.17E-06	-	-	-0.012	0.774
	2	0.0302	0.2089	-0.0015	-130.62*	-0.1124	0.076	1.767
Health Service	1	0.0988	0.0578	-0.0540	-	-	0.183	1.675
	2	0.0052	0.0263	0.0051	61.72	0.3428	0.083	1.136
ICT	1	1.1501	-2.5228	-0.2102	-	-	-0.898	0.290
	2	-0.2248	0.7261	-0.0381	292.56	-1.4699	0.887	12.778*
Industrial goods	1	-0.0752	0.4881**	0.0013***	-	-	0.726	10.317**
	2	-0.2117	0.5344*	0.0014**	84.08	-0.2742	0.777	7.100*
Natural service	1	-0.4043	1.1492	0.0251	-	-	0.182	1.556
	2	1.2234	-1.9997	0.0245	-521.97	0.2623	0.398	1.829
Oil and Gas	1	-0.1446	0.5687	-0.0018	-	-	0.003	1.009
	2	0.2947	-0.6309	-0.0003	532.65	0.1540	0.036	1.047
Services	1	0.0864	-0.0546	0.0005	-	-	-0.398	0.003
	2	-0.4805	1.2292	-0.0100	-49.22	-0.1070	-0.790	0.227

****, **, * imply significant at 1%, 5% and 10% significance level respectively, in parenthesis are standard errors*

γ_j *MRP= Beta from Market Risk Premium;* γ_j *VOL= Beta from Volatility of stock returns,* γ_j *CPL= Beta from Consumer Price Index;* γ_j *MTKvol = Beta from Log of Market volume*

Both asset pricing models were tested significantly in the Nigerian Stock Exchange using two stages of regression of CAPM and APT on 11 different sectors created in each period separately. The first stage generated the beta of each sector, which was used as the independent factor in the second stage, which was a cross-sectional regression. The slope of cross-sectional regression is the market risk premium for the portfolio. The result of the second stage of both models is given in the table 2

The two models are correct with the inclusion of volatility if the intercept term must be zero, which is not from table 2 as the Agricultural and Industrial Goods sectors resulted in less than zero while Construction, ICT and Services sectors are negative under APT while financial service, natural goods and Oil & Gas are negative under APT with all statistically insignificant even at 10% level.

However, the coefficient of beta for market risk premium is marginally negative for both models (Conglomerate) and negative value in the Construction, Consumer Goods, ICT and Services sectors for CAPM, while natural services and oil and gas for APT models and positive in the remaining sectors for both models implying that all coefficients of beta are either more significant to or less than to average excess market returns which is expected to zero. The result is the same with beta from the coefficient of volatility that ICT and Oil & Gas are both negative under both models, and Health service for CAPM and Financial Service and Service sectors are APT are negative value while the remaining sectors of both models are positive value but not equal to average excess volatility series.

From the macroeconomic and stock market factors affect the expected returns of all sectors with much significant from the consumer price indices (CPL). For example, CPL has negative coefficient for Conglomerate, Consumer Goods, Financial Services, Natural Services and Services and positive for remaining sectors. Meanwhile, much negative impact from Natural goods and Financial Services with the consumer goods with lower negative response. Virtually, market volume (MTKvol) has negative response to all sectors except Construction, Health service, Natural service and Oil & Gas with little response that is not more than 0.3.

Apriori, variance of the error term in first pass must not be other than zero in second pass cross-sectional regression. Here, the estimated value of the coefficient is either less than zero or greater than zero.

Table 3: Testing results of Asset pricing models on sectoral portfolio without intercept

SECTOR	CAPM			APT				
	MRP	VOL	Adj R-Sqrd	MRP	VOL	CPL	MTKvol	Adj R-Sqrd
Agriculture	0.5399	-0.0584	0.0116	0.4361**	-0.0805***	250.58***	-1.5352***	0.9884
Conglomerate	0.1253	0.0151	-0.233	0.2249	0.0261	-400.87	0.0772	-0.2760
Construction	0.0011	0.0066	0.9101	-0.0082	0.0091	150.97	0.0366*	0.2907
Consumer goods	0.0133	0.0023	0.0315	0.1289	0.0018	-41.51	-0.5319	0.1621
Financial Service	0.1572***	-1.52E-05	0.0089	0.2608***	-0.0014	-123.69**	-0.1201	0.1022
Health Service	0.2478**	-0.0352	0.2056	0.0364	0.0052	60.84	0.3442	0.3889
ICT	0.8282	-0.1409	0.0727	0.1805	-0.0505	324.35	-1.0626	0.7457
Industrial goods	0.2860***	0.0010***	0.6945	0.1965**	0.0009**	52.82	-0.3755	0.6318
Natural service	0.2069	0.0012	-0.0749	0.2481	0.0296	-259.28	0.5935	-0.2761
Oil and Gas	0.2867*	-0.002	0.1820	-0.1243	-0.0004	469.91	0.4173	0.3546
Services	0.1507	-9.00E-05	-0.1810	0.1898	-0.0053	-68.49	0.0246	-0.4989

****, **, * imply significant at 1%, 5% and 10% significance level respectively, in parenthesis are standard errors*

γ_j MRP= Beta from Market Risk Premium; γ_j VOL= Beta from Volatility of stock returns, γ_j CPL= Beta from Consumer Price Index; γ_j MTKvol = Beta from Log of Market volume

Except for F-statistics that are not available for model without intercept, the Adjusted R-Square value was used to make valid comparism to bring economic judgment. From Table 3, only 3 sectors (Conglomerate, Natural services and Service with negative adjusted R-squared value are present for both models while the rest are positive though with some the small percentage ranging from 0. 0089 to 0.9101 for CAPM and 0.2780 to 0.9884 for APT. However, the table has higher adjusted R. squared in most sectors in the study, meaning that without intercept the specific performance of each sector could be identified when compare with table 2 with differential representation to justify each sector as against the unconstrained model which is not the econometrically correct model and gives poor performance.

5. Conclusion and Recommendation

According to the literature, if the intercept term is not zero or it is significant, then the model does not hold in that case. Only in the Construction and Industrial goods sectors were the F-statistics significant, and the rest of the sectors were not significant, implying that the modification of asset pricing models with volatility series is not important in the computation of stock expected returns from a sectoral perspective. Prima facie, both asset pricing models could not support the modification in the market despite the justification in Table 2 of Section 3

From the information and historical evidence found, it can be concluded that it seems that the models are never really testable. It seems that the Capital Asset Pricing Model is able to explain the relationship between the expected returns of an asset and the assets beta, but the use of Asset Pricing theory gives better results when observing historical figures. All models seem to be sufficient to prove the relationship between the return of an asset and the asset beta, but none of them shows superiority between the two, and with the introduction of the volatility series, they perform better off. The Capital Asset Pricing Model and the Arbitrage Pricing Theory give some explanations that would be sufficient to understand the differences but do not explain them in depth. Hence, the study highlights the importance of parameter uncertainty in understanding the determinants of equity beta and the performance of levered firms with a behavioural explanation.

Spanning stock returns volatility series with asset pricing models that involve estimation and implementation in security valuation which intuitive has no validation and does not confirm with the hypothesis. The expected value-beta relationship found nonlinear and does not validate the asset pricing theory with this inclusion.

From the outcome of the study, investors and traders of investment in Nigerian Stock market are advised to take utmost interest in sectoral performance when policy prescriptions concerning portfolio decision are looked into as Investors should be well educated on the gross and net spillover of each sector and implication of decision to be taken for proper portfolio decision. Spanning volatility series with asset pricing models to show significant improvements in the model but was not validated for direct relationship with expected returns but could have indirect relationship, indicating the fact that understand the specific qualities associated with each sector that improves in better portfolio selection as priority is given to some sectors over others.

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