Sectoral Application of Asset Pricing Models on the Nigerian Stock Exchange: A Comparative Approach

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Abstract: The study applied both Capital Asset Pricing Model and Arbitrage Pricing Model on the valuation of stocks returns in the Nigerian stock exchange to make portfolio decision using both time series and cross sectional data form. Step by steps are followed with the aid of regression analysis to obtain the necessary value needed for informed decision making from the listed firms on the stock market from January 2007 to January 2017. Contrary to the theoretical expectation, results show over valuation using both models despite statistically significant at 1% in aggregate level and differential on the sectoral overview. Hence, it was concluded that most stocks are over-valued with the more accurate method of APT method because it has higher accuracy rate than CAPM and such asset should not be retained for long period of time to avoid waste of fund and investors and traders of investment in Nigerian Stock Exchange are advised to take utmost interest in sectoral performance when policy prescriptions concerning portfolio decision are looked into.

Keywords: Stock returns; Capital Asset Pricing Model; Arbitrage Pricing Theory; Portfolio Management; and Investment

JEL Classifications: G12

1. Introduction

The use of asset pricing models especially the one developed by Sharpe-Lintner (1965) Capital Asset Pricing Model (CAPM) is to estimate the firm cost of capital which had been invalidated with Farma and French, 1992; Fama and French 2004 which most of the study have not been able to produce solution to the panacea. However, finance expects need a better method to estimate the expected returns that inform viable portfolio decision. Markowitz (1952) suggests diversified portfolio is exposed only to systematic risk since unsystematic, or idiosyncratic risks are theoretically eliminated through constructing sufficiently diversified portfolios.

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Oke (2013), Adedokun and Olakojo (2012), Olakojo and Ajide (2010) and many other scholars studied the application of CAPM only on the NSE without no consensus on the empirical validity of CAPM which call for introduction of Arbitrage Pricing theory in this study that give rooms for many factors apart from the single factor. This is necessitated to give accurate asset pricing by adding risking factors that affect investment within the economy and capital market. To the best of my study, only Claus and Thomas (2001) and Ohlson and Juettner-Nauroth (2005) focused on current value and predicted value using asset pricing models to make significance difference in the identification of "cheap" and "expensive" assets.

Though the theoretical justification had assisted such that reward beta in most cases have the same value when avoided the use of wrong model. Every investors that want to earn much enough at a given risk level undertaken. In other words, a higher level of risk incurred must be awarded with a higher rate of return. In most testing carried out by scholars, both the use of CAPM and Arbitrage Pricing Theory (APT) models of the expected returns are important for portfolio decision with CAPM results tend to be in poor conditions when compare to the APT, (Bornholt (2015); Muzir, Bulut and Sengul (2010), Yunita (2018)). APT provide strong evidence as many factors are incorporated into reward beta estimates, Akpo, Hassan and Esuike (2015). Consideration needs to be given to the two models so as to establish estimated expected returns and determine the best in the Nigerian context.

Both CAPM and APT measures risk and returns which are financial information needed by investors from time to time and such component of systematic risk allow the prediction of securities of portfolios. A need for cross-sectional view of different sectors in a particular capital market is necessary and an unprecedented surge in returns on investment which has resulted in a continuous downturn in market capitalization and thus many investors are not only interested for investment appraisal but eager to know what becomes of their investment.

Following this introductory section, we structure the rest of the paper as follows. Section 2 explains the literature review stating the relationship between CAPM and APT. Section 3 methodology for our analysis and describes the data. Section 4 discusses the empirical results including preliminary analyses. In Section 5, we discuss policy implications and conclude the study.

2. Literature Review

Muzir, Bulut and Sengul (2010) tested the abilities of asset pricing models in capturing the effect of economic crises. The two models tested are the single factor models represented by the Capital Asset Pricing Model (CAPM) and the multifactor asset pricing model represented by the Arbitrage Pricing Model (APM). The data evaluated under these two models were the monthly data on returns generated from

the Istanbul Stock Market for the period 1996-2004. The finding of the research showed that the Arbitrage Pricing Model better explains stock returns changes than the Capital Asset Pricing model. Also, it was established that the APT is better at capturing the effects of economics crisis on stock price changes.

Theriou, Aggelidis, and Maditinos (2006) investigated the relationship between risk and returns using the CAPM and APT models. The data for analysis were the monthly data generated from the Athens Stock Exchange (ASE) for the period 1987-2001. The result made an overall suggestion that the relationship between risk and returns is weak in the ASE during the period under consideration. However, it was established that the CAPM has a poorer performance that the APT model. This was however argued to be due to market "Irrationality" of investors which undermines the assumptions upon which the CAPM is established. Also, the APT model allowed for the consideration of other systematic factors rather than just the market portfolio, which is considered an important element in explaining the behavior of stock returns. Furthermore, the study highlighted the importance of the "factor analysis" technique as it is considered to be an effective tool to replace the arbitrary and controversial search for factors by "trial and error".

Yunita (2018) analyzed and compared the accuracy level of the CAPM and APT model in determining the expected return. The Mean Absolute Deviation (MAD) was used to determine the eligible stocks to be selected for analysis under the two models. For the CAPM model, eighteen (18) eligible stocks were selected while sixteen (16) stocks were selected for APT model, and these companies are listed on the Jakarta Islamic Index. The data for analysis were generated from through the website www.yahoofinance.com and www.bi.go.id for the period 2014-2018. The factors utilized under the APT model are Inflation, Exchange rate, Composite Stock Exchange Price Index and BI Rate. The result of the comparison between the two models suggested that there is no significant difference between the accuracy of the CAPM and APT model in estimating the stock return of the companies selected. However, the APT model is suggested to be a more accurate model as it is said to have high accuracy rate than CAPM.

Pettway and Jordan (1987) estimated the return generating function parameters for regulated public utilities using the APT model and CAPM. Weekly returns data were generated from companies which are listed either on the NYSE or AMEX. The study period was from 1969- 1979 which is then divided into two periods, the base period being 1969-1973 and the test period being 1975-1979. Five public utility portfolios were established for estimation which are 58 Electric Services companies, 26 Electric and other services companies, 6 Natural Gas Transmission Companies, 6 Natural Gas Transmission and Distribution Companies and 8 Natural Gas Distribution Companies. The result suggested that the APT model has better

performance in representing the return generating process of the five utility portfolios.

Musharbash (2016) compared the CAPM and the APT model. The data for analysis were extracted from the Frankfurt Stock Exchange, the stocks used being taken from the Deutscher Aktienindex (DAX) for 29 out of 30 listed stocks. The study period was from March, 2001 to December, 2015 which was then broken down to three period which are the pre-crisis period (march,2001 – December 2006), the crisis period (January, 2007 – December, 2010) and the post-crisis period (January,2011 – December, 2015). The result showed that for the entire period, the APT model performed better than the CAPM. However, it was observed that when considering the sub-periods independently, the CAPM performed better than the APT model. Hence, it was concluded that the APT model is best fit for Long-term periods while the CAPM is best fit for short-term periods. The latter conclusion is explained to be due to the higher and quicker propensity of stocks rate of return to respond to changes in the returns of market portfolio and prevailing market conditions, while the former is justified by the entrance of other factors into the scenario in the long-run.

Cagnetti (2002) had an empirical study of the Italian Stock Market using the CAPM and APT theory model. The data for analysis were the monthly returns of 30 shares listed on the Italian Stock market and the considered period was from January 1990 to June 2001. The result showed that the relationship between risk and returns in the Italian stock market was weak and that the CAPM performed poorly in explaining the relationship. However the study favored the APT model as it is said to allow for other factors that are different from the market portfolio, and that since shares and portfolio are significantly affected by numerous systematic forces, it is then rational to use a model that accommodate such factors.

Nguyen, Stalin, Diagne, and Aukea (2017) reviewed the basic ideas of the CAPM and APT model. It was established that the APT model has an advantage over the CAPM due to it accommodation for other factors different from market portfolio. However, the APM has an application difficulty as the factors to be used are not easy to identify. It is also established that while the CAPM places emphasis on efficient diversification and neglects unsystematic risk, the APT model neglects essential risks which is a part of systematic risk due its utilization of naïve diversification based on the law of large number. It is also stated that despite the unrealistic assumptions of the models in the real world, the models actually provides us an accommodating valuation to some extent.

Akpo, Hassan and Esuike (2015) examined the CAPM and APT model, their assumptions and possible reconciliation of the two models. The CAPM model is stated to be attractive based on its powerful and intuitive predictions of the relationship between expected return and risk. However, risk do not remain stable overtime hence a limitation to the model. The APT model is known for its

accommodation for not only expected returns but also uncertain returns in arriving at the total return of an asset. Though the two models are known to be conflicting in assumptions, there are apparent agreements. The two models agree that investors can borrow and lend at risk free rate and that are no transaction costs, taxes or restrictions on short selling. However, the research appears to be in favor of the APT model as it recommended that investors and other investment companies should embrace a multifactor model as stock returns are affected numerous factors such as expectation about future levels of real GNP, expectations about future interest rate and expectation about future level of inflation.

Zhang and Li (2012) analyzed the Chinese Stock Market by comparison of the CAPM and APT models. The study focused rather on the SME board and the ChiNext board of the Chinese Stock Market. 160 companies where selected and the daily prices were extracted for the period 1st September 2009 to 31st August 2010. The systematic risk was the only factor considered under the CAPM while three factors were considered under the APT model which are the systematic risk, daily exchange volume and volatility. The findings showed that the APT model does not perform better than the CAPM. Also, there was no evidence that the APT model forecast better than the CAPM for the SME board and the ChiNext Board.

3. Methodology and Data

The required data are not accessible for all the firms listed in the Nigerian Stock Exchange, only a sample of 99 firms with full monthly data was selected from 184 firms. The monthly actual rates of return data relating the stocks of the companies in the sample for the period from January 2007 to January, 2017 (11,979 observations for all) downloaded from the official website of the Nigerian Stock Exchange which was later converted into monthly data and the predetermined macroeconomic indicators for the same time interval were collected from the official website of the Central Bank of Nigeria and Bureau of Statistics.

It forced us to make some adjustments on the data that many of the macroeconomic indicators are index values computed based on a quarterly of each year. We had to convert such index values to chain index values in order to be able to see the monthly changes in the indices.

3.1. Measurement of Variables

Stock returns as pricing of stock would be calculated by using the following equation.

$$Stock\ \mathrm{Re}turn R_t^i(Y) = \frac{1}{Days_t^i} X \sum_{d=1}^{Days_t^i} \frac{P_t^i - P_{t-1}^i}{P_{t-1}^i} \quad \text{.....(1)}$$

Where P_t^i is daily stock price at end of the day while P_{t-1}^i is the daily stock price at the last day.

The market return (Rm_t) would be calculated by using the following equation.

$$Market\ \mathrm{Re}turn(Rm_t) = \frac{1}{Days_t^i} X \sum_{d=1}^{Days_t^i} \frac{\mathrm{Im}_t^i - \mathrm{Im}_{t-1}^i}{\mathrm{Im}_{t-1}^i} \quad \text{.....(2)}$$

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

However asset returns to be used for this study so as avoid the problem of serial correlation and the unit truth problem is shown below:

$$r_i = \log(\frac{P_t}{P_{t-1}}) \quad \text{.....(3)}$$

Where r_i is the asset returns, P_t is the stock price at the end of the day and P_{t-1} is the stock price at the end last trading day.

As with previous empirical studies that tested asset pricing models using returns on market index as a proxy for returns on market portfolio, this study will also use returns on market index as a proxy for returns on market portfolio with the use of this formula:

$$R_t = \log(\frac{ASI_t}{ASI_{t-1}}) \quad \text{.....(4)}$$

Where R_t = asset market returns, ASI_t is the share market index for day of transaction and ASI_{t-1} is the share market index at the last day of transaction.

The expected returns of stock will be determined using:

$$Er_i = \sum_{t=1}^{t} \frac{r_i}{T} \quad \text{.....(5)}$$

Where Er_i is the expected returns of stocks, r_i is the daily asset returns as disclosed in (6) above and T is the period involved.

The Capital Asset Pricing Model returns to be constructed for the study shall be:

$$(r_i - r_{ft}) = \alpha_i + \beta(R_t - r_{ft}) \quad \text{.....(6)}$$

Where r_i is determined from equation (3) above, r_{ft} is the treasury bill rate (3 months), R_t is the stock market return determined in equation (4). The above equation (6) shall be examined on selected stocks listed on the NSE and β shall be generated for consideration.

The Arbitrage Pricing Model constructed for the study shall be:

$$(r_i - r_{ft}) = \alpha_i + \beta(R_t - r_{ft}) + \log(cpl) + \log(Intro) \quad \text{.....(7)}$$

Where r_i is determined from equation (3) above, r_{ft} is the treasury bill rate (3 months), R_t is the stock market return determined in equation (4), *cpl*- is the consumer price index under period of consideration and intro - Since the impact of returns is needed, it was then made cpl and intro to be constant value as only β would be needed here.

3.2. Model Specification

To compare the performance of asset pricing models on the stocks listed in the Nigerian Stock Exchange, the procedure shall involve the time serials model (see equation 10 & 11) which is first level estimation to determine the (β) sign for all the asset under consideration and cross sectional model that is second level estimation to determine λ_1. These two estimations shall be done using ordinary least square measurements and the applicable formula are:

$$(r_i - r_{ft}) = \alpha_i + \beta(R_t - r_{ft}) + \varepsilon_i \quad \text{.....(10)}$$

$$(r_i - r_{ft}) = \alpha_i + \beta(R_t - r_{ft}) + \log(cpl_t) + \log(Intro_t) + \varepsilon_t \quad \text{.....(11)}$$

NB. Equation (10) for CAPM and Equation (11) for APT

To be able to make comparism among different sectors in the market, compilation of mean return (average of each firm for the period under consideration), (β) from equation (10) & (11) for each firm and then run a cross sections regression model on these sectors shall be examined using model below:

$$Er_i - r_{rf} = \gamma_0 + \gamma\hat{\beta}_{CAPM} + \upsilon_i \ldots\ldots\ldots\ldots\ldots\ldots(12)$$

$$Er_i - r_{rf} = \gamma_0 + \gamma\hat{\beta}_{APT} + \upsilon_i \ldots\ldots\ldots\ldots\ldots\ldots(13)$$

Where Er_i is the expected returns as disclosed in the equation (8) above, r_{ft} is the Treasury bill rate and while β is the derived value from equation (10) and (11). The equation would give us the opportunity to obtain λ for both CAPM and APT.

However, to be able to make interpretation the study will compare the average actual return derived against the average expected return to each sector which is determined using this Average excess stock returns:

$$\alpha_i = \bar{r}_i - (r_{rf} + \lambda_i \hat{\gamma}_{CAPM\,i}) \ldots\ldots\ldots\ldots\ldots\ldots(14)$$

$$\alpha_i = \bar{r}_i - (r_{rf} + \lambda_i \hat{\gamma}_{APT}) \ldots\ldots\ldots\ldots\ldots\ldots(15)$$

Where α_i is the average actual mean returns for each sector, $\bar{r}_i$ is the mean return for each sector, r_{ft} is the Treasury bill rate, $\hat{\gamma}_{CAPM\,i}$ derived from equation (12) and (13) in the above step. The equation would give us the opportunity to obtain α_i for both CAPM and APT.

Decision is taken when $\propto$ is greater than zero, this implies that actual average returns is greater than the predicted average return and hence, the stock is undervalued and on the other hand, when the $\propto$ is lesser than zero, this implies that actual average returns is less than the predicted average returns, this implies that the stock is overvalued. However, in order to take portfolio decision, when $\propto$ is greater than zero, investor buy more of stocks and retain as part of portfolio for long period of time and when it is negative, investor sell stocks and retain the stock for short period of time.

4. Analysis and Results

4.1. Descriptive Statistics of the Variables

This sub-section discusses the statistical properties of the variables which were reported on average per each sector. Thus, the univariate statistics of the variables, which include the mean, median, standard deviation, skewness, Jarque-Bera, Kurtosis, among others are reported. The results of the descriptive statistics for selected variables are presented in table 4.1. It is evident from Table 4.1 that both

the mean (first moment) and skewness (third moment) for each of the variables are less than unity (approximately equal to zero for all the variables).

Furthermore, the results shows the kurtosis (fourth moment) which measures the tail shape of a histogram. Variables with values of kurtosis less than three are called platykurtic (fat or short-tailed), with discount rate differential falling under this category. On the other hand, variables whose kurtosis value is greater than three are called leptokurtic (slim or long-tailed). None of the variables is mesokurtic i.e. having kurtosis value around three. Juxtaposed against these are the probability values and the Jarque-Bera test of normality distributed, as the probability values for all the variables very low, and close to zero.

Table 4.1. Summary Statistics for Selected Sectors on Average of Monthly data

Sector	Mean	Median	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	Prob.
Conglomerate	0.00123	0.0002	0.011353	0.04518	0.51735	215.433	0.0000
Consumer Goods	0.00029	0.000142	0.010149	1.19255	13.8174	1375.427	0.00005
Financial Services	0.000629	0.00013	0.02022	0.5208	21.198	5170.016	0.000014
Health & Agriculture	0.00154	0.00106	0.011863	0.4400	56849	56.4974	0.000003
Industrial Goods	0.00093	0.00051	0.0167	0.333	15.419	1785.613	0.00003
Natural Resources and Oil and Natural Gas	0.00029	0.0003	0.01016	0.26696	11.4491	850.128	0.00020
Services	0.00118	0.000452	0.01201	0.11385	9.1028	302.298	0.0000

Source: Author's Calculations, (2017)

For instance, the average mean returns of each sector are below zero with the conglomerate has the highest figure while both Consumer goods and natural resources and oil and natural gas had lowest figure however the skewness has differential view. The skewness is a measure of the symmetry of the histogram. The rule of thumb for any standardized normal variable is that, both its mean value and skewness should be zero. Meanwhile, only Consumer goods that had a skewness that is greater than zero. Based on this criterion, it can be inferred that all the variables in the model have standard normal distribution as all the sectors are positively skewed.

In summary, the descriptive statistics revealed that the data sets are normally distributed. This is so because most of the probability values are less than unity, while their means nearly equals the corresponding medians.

4.2. Stationarity Tests

Time series properties of all variables used in estimation were examined in order to obtain reliable results. Thus, this exercise was carried out through Dickey Fuller

Generalized Least Square (DFGLS) test. This development arises from the prevalence of substantial co-movements among most economic time series data, which has been argued in the literature as undermining the policy implications that could be inferred from such modelling constructs (Engel & Granger, 1987). Most empirical work extensively applies the Augmented Dickey-Fuller (ADF) to find the order of integration on variable. However, due to their poor power properties, both tests are not reliable for small sample data set. While the newly proposed test such as the Dickey-Fuller Generalized Least Square (DF-GLS) de-trend test developed by Elliot et al (1996).

The returns series was examined per firm under each sector in order to show what order of integration the variable belongs to, Market Returns, Treasury Bill Rate and Consumer Price Index were equally accounted for. This was done through Augmented Dickey Fuller Unit Root Test type and the Ng-Perron Unit Root Test type.

For the ADF test type, Returns was established to be of the integrated order of zero for all firms under the service sector. This means that returns is stationary at level under this sector, thereby rejecting the null hypothesis that the returns series has unit root. The hypothesis that the Returns series has unit root was also rejected for all firms under the Conglomerate Sector, showing that the returns series is also stationary at level under this sector.

Under the consumer goods sector, the null hypothesis that the returns series has unit root was also rejected, while it is being established that the returns series are stationary at level. For each of the Health Sector firms, the null hypothesis that the return series has unit root was rejected likewise, precisely signifying that the return series is also stationary at level. Similar result was obtained for the most of the firms under the Industrial Goods and Construction Sector except for one firm (DNM) for which it was established that while the returns series was stationary, it was only at first difference.

For each firm under the Natural Resources and oil and Gas sector, the null hypothesis that the returns series has unit root was rejected and it was established that the variable is of the integrated order of zero, that is, stationary at level. While the result showed that the returns series is stationary at level under most of the firms in the Financial Service sector, an exception was found to one firm (MBE) which indicated that the variable is only stationary at first difference. Market Returns was also established to be stationary at zero while Consumer Price index was shown to be stationary at first difference. Overall, these variables as examined under the ADF test type are shown to be reliable for estimation.

Table 4.2: Augemented Dickey-Fuller Test with GLS Detrending (ADFGLS) unit root test results

SECTORS	Assets	Variables	Constant (Model 1)		Constant and Linear Trend (Model 2)		Order of Integration
			Levels	First Diff.	Levels	First Diff.	
SERVICE	ABC	returns	-9.400817*	-9.373144*	-9.415106*	-9.37477*	I(0)
	ACA	returns	-11.1925*	-11.46198*	-11.28809*	-11.44706*	I(0)
	CIL	returns	-7.5449*	-10.7076*	-7.523225*	-10.68854*	I(0)
	LEA	returns	-8.212032*	-9.299385*	-8.181996*	-9.276101*	I(0)
	NAH	returns	-10.1544*	-8.408212*	-10.09951*	-8.375235*	I(0)
	RTBR	returns	-12.10349*	-9.13395*	-12.05257*	-9.117967*	I(0)
	TRA	returns	-8.016636*	-12.00398*	-3.563148*	-11.97051*	I(0)
	UPL	returns	-8.688105*	-9.839142*	-8.688094*	-9.872501*	I(0)
	NCR	returns	-10.31848*	-13.47545*	-10.36452*	-13.4145*	I(0)
	TRI	returns	-11.10144*	-7.385835*	-11.16683*	-7.354899*	I(0)
CONGLOMENR	AGL	returns	-8.934647*	-8.895791*	-8.961877*	-8.877026*	I(0)
	CHE	returns	-8.356565*	-12.87555*	-8.364114*	-12.81941*	I(0)
	JOHN	returns	-10.32133*	-10.70518*	-10.51188*	-10.68924*	I(0)
	SCO	returns	-5.485878*	-7.473995*	-5.48278*	-7.434959*	I(0)
	TRS	returns	-9.745714*	-10.11317*	-9.768451*	-10.0625*	I(0)
	UAC	returns	-9.202218*	-12.76884*	-9.338034*	-12.72669*	I(0)
CONSUMER GOODS	CAD	returns	-9.438804*	-10.85062*	-9.402858*	-10.80416*	I(0)
	CHA	returns	-11.58643*	-11.72069*	-11.55339*	-11.66901*	I(0)
	DAN	returns	-8.65183*	-9.366853*	-8.662912*	-9.342086*	I(0)
	DUN	returns	-3.805165*	-7.916784*	-4.939726*	-7.871048*	I(0)
	FLOUR	returns	-9.28523*	-10.00254*	-9.280891*	-9.95905*	I(0)
	GUINESS	returns	-10.88062*	-9.791348*	-9.629468*	-9.747617*	I(0)
	INTB	returns	-6.662554*	-7.876667*	-6.67192*	-7.839324*	I(0)
	JOS	returns	-9.54527*	-11.82756*	-8.502976*	-11.7768*	I(0)
	NAS	returns	-7.646049*	-9.581534*	-7.697645*	-9.621812*	I(0)
	NB	returns	-11.10829*	-9.271073*	-11.07213*	-9.227991*	I(0)
	NES	returns	-10.74236*	-14.35291*	-10.69637*	-14.29624*	I(0)
	NNFM	returns	-4.058598*	-10.52208*	-7.273528*	-10.47717*	I(0)
	PREM	returns	-9.405467*	-8.854494*	-9.398497*	-8.807995*	I(0)
	PZ	returns	-10.17938*	-13.16187*	-10.5207*	-13.1011*	I(0)
	UNI	returns	-9.850279*	-12.81978*	-9.908068*	-12.77047*	I(0)
	VITA	returns	-9.770967*	-9.420238*	-9.870461*	-9.389482*	I(0)
	UTC	returns	-8.370235*	-9.698779*	-8.329683*	-9.664854*	I(0)
	SEV	returns	-10.46391*	-12.81986*	-10.45034*	-12.76746*	I(0)
HEALTH	EVA	returns	-9.823369*	-10.34296*	-9.827975*	-10.30221*	I(0)
	GLAX	returns	-10.04732*	-8.324969*	-10.11038*	-8.286935*	I(0)
	MAY	returns	-10.09538*	-8.161772*	-10.09993*	-8.116907*	I(0)
	MOR	returns	-9.498098*	-10.73736*	-9.664689*	-10.70336*	I(0)
	NEI	returns	-9.984204*	-7.808476*	-9.942355*	-7.765662*	I(0)
	NIG	returns	-9.346885	-18.68785	-9.395713	-18.58866	I(0)
	PHAR	returns	-9.358978	-10.23741	-9.333514	-10.2052	I(0)
	PSCO	returns	-11.28902	-8.153905	-11.26718	-8.112637	I(0)
INDUSTRIAL GOODS AND CONSTRUCTION	ASH	returns	-8.262131	-10.21978	-8.363277	-10.17157	I(0)
	BER	returns	-9.041747	-7.900814	-9.005779	-7.865594	I(0)
	BET	returns	-9.86662	-10.62285	-9.837304	-10.56998	I(0)
	CAP	returns	-11.30466	-10.54343	-11.27554	-10.49531	I(0)
	CCN	returns	-9.346885*	-18.68785*	-9.395713*	-18.58866*	I(0)
	CUT	returns	-9.358978*	-10.23741*	-9.333514*	-10.2052*	I(0)
	DNM	returns	-11.28902*	-8.153905*	-11.26718*	-8.112637*	I(1)
	FIRST	returns	-8.262131*	-10.21978*	-8.363277*	-10.17157*	I(0)
	WAPC	returns	-9.041747*	-7.900814*	-9.005779*	-7.865594*	I(0)
	JBER	returns	-9.86662*	-10.62285*	-9.837304*	-10.56998*	I(0)
	UAP	returns	-11.30466*	-10.54343*	-11.27554*	-10.49531*	I(0)
	PMPAI	returns	-8.380268*	-9.575189*	-8.361393*	-9.529986*	I(0)
NATURAL RESOURCES AND OIL AND GAS	ALE	returns	-9.292322*	-8.369293*	-9.730005*	-	I(0)
	BOC	returns	-15.84491*	-8.744684*	-10.46162*	-	I(0)
	CON	returns	-11.37072*	-10.18272*	-11.32504*	-	I(0)
	JAP	returns	-8.092627*	-9.762840*	-8.057828*	-	I(0)
	MOB	returns	-9.799096*	-10.09642*	-9.776526*	-	I(0)
	OAN	returns	-9.905508*	-11.20598*	-9.930770*	-	I(0)
	OKOM	returns	-10.14247*	-12.68957*	-10.13233*	-	I(0)
	TOT	returns	-11.22634*	-9.046071*	-11.25483*	-	I(0)
FINANCIAL SERVICES	ACC	returns	-8.723019*	-8.267302*	-8.689956*	-	I(0)
	AII	returns	-10.58167*	-9.555062*	-10.54270*	-	I(0)
	COT	returns	-7.363755*	-10.03135*	-7.501913*	-	I(0)
	COR	returns	-10.12229*	-8.944118*	-10.08191*	-	I(0)
	CUS	returns	-11.24531*	-10.92872*	-11.21117*	-	I(0)
	DEA	returns	-8.199305*	-12.50155*	-8.377563*	-	I(0)
	DIA	returns	-9.766471*	-9.079202*	-9.722049*	-	I(0)
	ETI	returns	-9.396673*	-7.829660*	-9.594959*	-	I(0)
	FBN	returns	-9.044125*	-10.29620*	-9.129912*	-	I(0)
	FCM	returns	-8.359336*	-8.460247*	-10.65245*	-	I(0)
	GNI	returns	-12.62325*	-10.67844*	-12.99516*	-	I(0)
	GUAR	returns	-9.759542*	-12.19966*	-9.752221*	-	I(0)
	GUIAINS	returns	-11.13522*	-10.16814*	-6.885159*	-	I(0)
	LAS	returns	-5.484468*	-10.79280*	-5.838959*	-	I(0)
	LAW	returns	-10.94636*	-8.329517*	-11.00734*	-	I(0)
	LIN	returns	-5.319157*	-3.731974*	-6.873112*	-	I(0)
	MBE	returns	-2.00258	-6.672198*	-2.730347	-	I(1)
	NEM	returns	-7.172133*	-9.164634*	-7.311123*	-	I(0)
	NGR	returns	-10.46815*	-7.985135*	-7.469736*	-	I(0)
	SOV	returns	-13.21305*	-10.57648*	-7.984774*	-	I(0)
	STA	returns	-4.473156*	-7.992236*	-4.407810*	-	I(0)
	STN	returns	-10.49069*	-9.239708*	-10.44329*	-	I(0)
	STD	returns	-8.870293*	-7.782909*	-7.272609*	-	I(0)
	STE	returns	-9.860904*	-14.13176*	-9.852018*	-	I(0)
	UBA	returns	-9.612273*	-10.91817*	-9.582805*	-	I(0)
	UBN	returns	-10.93986*	-11.67353*	-10.89430*	-	I(0)
	UNH	returns	-6.485191*	-10.81308*	-6.496983*	-	I(0)
	UNIL	returns	-9.850279*	-12.81978*	-9.908068*	-	I(0)
	FID	returns	-9.069466*	-9.132318*	-9.113547*	-	I(0)
	INTEN	returns	-10.84603*	-10.02869*	-10.81832*	-	I(0)
	PREST	returns	-8.543594*	-13.44884*	-8.506656*	-	I(0)
	ROY	returns	-7.574619*	-8.284593*	-7.642449*	-	I(0)
	SKY	returns	-8.175549*	-10.44707*	-8.350076*	-	I(0)
	UNIT	returns	-11.32604*	-9.565821*	-11.36111*	-	I(0)
	WAPI	returns	-11.05030*	-8.929008*	-11.00465*	-	I(0)
	WEMA	returns	-8.030257*	-10.97673*	-7.986918*	-	I(0)
	ZEN	returns	-11.31167*	-9.621381*	-11.26355*	-	I(0)
Market Returns			-10.01448*	-14.29641*	-9.965046*	-	I(0)
Treasury bill rates			-7.145233	-10.09642*	-5.838959*	-	I(0)
Consumer Price index			2.429191	-4.433164*	0.728043	-	I(1)

Source: Author's Calculations, (2017)

Note: The Null Hypothesis is the presence of unit root. Model 1 includes a constant, Model 2 includes a constant and a linear time trend . *,**,***, significant at 1%, 5%, and 10% respectively. Lag length selected based on Schwarz information criterion (SIC). The Elliott-Rothenberg-Stock DF-GLS test statistics are reported.

4.3.1. Comparative Behaviour of Sectoral Asset Pricing

Table 4.3. Comparative Behaviors of Asset pricing

Sectors	No. of Firms	CAPM		APT	
		α	γ	α	γ
All	99	-181.1447***	180.7122***	-182.5840***	182.1254***
Conglomerate	6	-24.20833*	23.63700*	-23.02226	22.44648
Consumer Goods	18	-4.804471	4.216763	-3.743532	3.154416
Financial Services	37	5.767346	-6.364970	5.933089	5.933089
Health and Agriculture	8	-1.041233	0.448956	-0.978095	0.385704
Industrial Goods	12	9.573319**	-10.17341**	9.125378	-9.723703
Natural Resources and Oil and Natural Gas	8	1.920733	-2.514408	1.410840	-2.003745
Services and ICT	10	-5.845894	5.258308	-5.503271	4.914642

Source: Computed by the Author (2017)

*, ** And *** indicate significant at 10%, 5% and 1% respectively. The p value- values are in the parentheses.

From table 4.3 above, of all 99 firms considered for the study there are 181.1% over valuation of stocks from the market at 1% level of significance under CAPM while 182.5% over valuation of stocks from the market also at 1% level of significance under APT. The same performance to Conglomerate sector of 24.2%, Consumer goods sector of 4.8%, Health and Agriculture sector of 0.9% and Service and ICT sectors of 5.8% over valuation respectively under CAPM while Conglomerate sector of 23.0%, Consumer goods sector of 3.7%, Health and Agriculture sector of 1% and Service and ICT sectors of 5.5% over valuation respectively under APT. In other way, Financial Service sector of 5.7%, Industrial Goods sector of 9.5% and Natural Resources and Oil and Natural Gas sectors of 1.9 under CAPM while Financial Service sector of 5.9%, Industrial Goods sector of 9.1% and Natural Resources and Oil and Natural Gas sectors of 1.4 under APT showing slight difference under both theories.

Meanwhile, the predicted value (γ) from the study there are 180.7% over valuation of stocks from the market at 1% level of significance under CAPM while 182.1% over valuation of stocks from the market also at 1% level of significance under APT. The same performance to Conglomerate sector of 23.6%, Consumer goods sector of 4.2%, Health and Agriculture sector of 0.4% and Service and ICT sectors of 5.2% over valuation respectively under CAPM while Conglomerate sector of 22%,

Consumer goods sector of 3.1%, Health and Agriculture sector of 0.3% and Service and ICT sectors of 4.9% over valuation respectively under APT. In other way, Financial Service sector of 6.3%, Industrial Goods sector of 10.1% and Natural Resources and Oil and Natural Gas sectors of 2.5 under CAPM while Financial Service sector of 5.9%, Industrial Goods sector of 9.7% and Natural Resources and Oil and Natural Gas sectors of 2.0 under APT showing slight difference under both theories.

5. Conclusion

The study empirically examined the application of capital asset pricing model and arbitrage pricing model in Nigerian Stock Exchange for valuation purpose. The overall performance of all stocks under consideration show that they are all overvalued with the magnitude of their over-valuations varies under both models as using APT showed higher over valuation compare to CAPM with the predicted average returns showed vice versa for all. The same performance applies to Conglomerate sector, Consumer goods, Health and Agriculture and Service and ICT except the fact that contrary opinions resulted under CAPM and APT. However, Financial Services, Industrial goods, Natural Resources and Oil and Natural Gas stocks were undervalued since average returns is greater than the predicted average return with differential performance under CAPM and APT. the implication of this is that both has no critical stand point that could best judge valuation of stocks despite the both have linear relationship between stock returns and the risk premiums.

Meanwhile, the portfolio decision would be good when α is greater than zero which stocks should be considered for longer period of time and otherwise when is lower to zero. From the table above, the aggregate α (-181.1447-CAPM & -182.5840 – APT) value is lower to zero and investment should be retained for only short period of time. The same performance applies to Conglomerate sector, Consumer goods, Health and Agriculture and Service and ICT. However, Financial Services, Industrial goods, Natural Resources and Oil and Natural Gas stocks should be retained for long period as the value is greater than the zero under CAPM and APT. Successful investors indeed has a potential in comprehending features of each sector not accounted for an aggregate level.

Finally, albeit the unrealistic assumptions of the real world on the application of asset pricing, the statistical analysis produced meaning that stocks from Nigerian Stock Exchange are either undervalued or overvalued that give us an accommodating differential valuation in some sense. It is worth mentioning that no theory is perfect and it is worthwhile to learn from theory object to the criticism. Hence, most stocks are over-valued and such should not be retained more than short period of time. However, the more accurate method referring to this research is APT method

because it has higher accuracy rate than CAPM, this result is supported by some prior empirical works, Yinuta (2018), Cagnetti (2008), Zhang and Li, (2012).

Following from the outcome of the study, investors and traders of investment in Nigerian Stock Exchange are advised to take utmost interest in sectoral performance when policy prescriptions concerning portfolio decision are looked into. Further, macroeconomic factors, such as Consumer Price Index, Treasury bill rates and Total Market index from each sector are important for assessment of stock returns.

For future line of study, panel data approach should be introduced to pool for substantive result and the study time frame will likely produce a more robust result and policy prescriptions.

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