

## The Effects of Firm Size on Risk and Return in the Nigerian Stock Market: A Sectoral Analysis

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### Abstract

Capital Market theory is concerned with the equilibrium relationship between risk and expected return on risky assets. Within this framework, this paper seeks to empirically examine the effect of sectoral size (sectoral capitalization) on risk and expected return for the period of 2000-2004 as monthly. This study employed multi-factor model (Arbitrage Pricing Theory) in analyzing the effects of sectoral size on the risks and returns, using Ordinary Least Square (OLS) estimation procedure. This study revealed that the size of firm or sector has no significant effect on either firm or sectoral return or risk in the Nigerian Stock Market. The results are broadly consistent with similar studies for most developed and emerging economies (see: Funga and Leug 2000; Fernald and Rogers 2002; Barry 2002; Fan, Lu & Wang 2009; and Abdullahi 2011).

*Keywords: Firm size, Risk and Return, Arbitrage Pricing Theory (APT), Nigerian Stock Market*

### 1. Introduction

The Nigerian Stock Market is one of the emerging Markets in the developing world. Stock investment is essentially a long-term investment. Embarking on any human endeavour is tantamount to plunging into some kind of risk, which is of various degrees. Every investment carries one risk or the other. To do nothing could even pose a greater risk for the individual. This existential reality is more pronounced in the quest for wealth/rewards through stock investment. Most investments, in the stock market, unlike bank savings and current accounts, are not really insured by the government to protect against market losses. Even consistently positive returns on investment from a particular market over a long period of time do not guarantee a consistent scenario at all times. Therefore, investors (both individuals and institutional) have to bear one form of risk or another: Theoretically, risk has direct relationship with the level of return under the assumption of investor aversion. This implies that the greater the risk, the higher the return (Campbell 1995, Adelagan 2001, Adenikinju 2001, Oludoyi 2003, Menggen 2007). Generally, for the stock market everywhere, the reign of bull or bear – that is, the alternative expectations of stock price rise or drop is a common feature or phenomenon (Okeke, 2008). This, therefore, implies that the stock market is risky, because there is a spread of possible outcomes.

The risk and return of securities in the stock market may differ because of different factors affecting securities such as differences in structure and managerial capacity of different firms, different sectors in which they operate, the state of the economy, government policies as well as internal corporate policies themselves.

In literature, most of the stock investment decisions taken by investors are done based on either the rule of the thumb or the earning power or the size of the firm. But studies have shown that the magnitude of risk and return do not depend on the earning power of the firm or the size of the sectors, but based on its sensitivity to happenings in the economy (Fungan & Leug 2000, Fernald and Rogers 2002, Barry 2002, Benz (2002), Oludoyi 2003, Goriaev 2004, Jonathan & Lovie, 2007, Mans (2007), Girad & Sinha 2008, Fan, Lu & Wang, 2009 and Abdullahi, 2011).

This study considers sectoral analysis important because each sector has its peculiar sensitivity to market portfolio return and its sensitivity depends on the nature and type of the sectoral business activities specifically and happenings in the economy in general. It is against this background that this study investigates the effects of sectoral size on risk and return levels of the quoted firms in the Nigerian Stock Market.

## 2. Literature Review

The relationship between economic fundamentals and stock risk-return has been studied by a large number of researchers (see Chen, Roll & Ross 1986; Fama (1990), Chen (1991); Nasseh & Strauss (2000) Dickinson (2000), Shanken & Weinstein (2006); Sunitas & Kenourgios (2007); Günsel & Cukar (2007) Leon (2008); Ahmed (2008), Nikolaos, Grigoris, Nikolaos & Nikos (2009) and Abdullahi (2011). For instance, Chen, Roll & Ross (1986) hypothesized and test a set of macro-economic data series to explain US stock return. They investigated the sensitivity of macro-economic to stock risk and returns. They tested seven macro-economic variables; term structure industrial production, risk premium market capitalization, inflation, consumption and oil prices in the period of January 192-Nov. 1984. They assume that the underlying variables are not serially correlated and innovations are unexpected. In their research, they found that several of these economic variables to be significant in explaining risk and expected return during the tested period. They observed that industrial production changes in risk premium twist in the yield curve and measure unexpected inflation and changes in expected inflation during period when these variables are highly volatile, are significant in explaining risk and expected return. They found also that consumption, oil prices and market capitalization are not priced by financial market; therefore they are not significant in explaining risk and expected return.

Similarly, Brown and Wein (1983) estimate and test the APT in the context of the bilinear paradigm introduced by Kruskal (1978). They examine the special case of the APT in which the numbers of factors are pre-specified using the same data of Roll and Ross (1980) but through forming 60 securities groups instead of 30 grouping securities according to their industrial classifications instead of alphabetical order. They find a 3-factor APT model rejecting the 5 or 7 - factors version. They show that specific firm or industry size effects that may be diversified are not price in the APT scenario. This means that there are few rather than many economy wide factors that appear to be prized or significant in explaining risk and expected return.

Lehman & Modest (1987) show that of all the decision choices, the number of factors has least effect on model estimate. If the factors specified economic fundamental(s), one uses simple regression of factor providing security risk-return on the factor score, to estimate the factor loadings. This is applicable to this study.

## 3. Methodology, Data Sources and Selection

The sample consists of the firms stocks listed in Nigerian Stock Exchange (NSE) for the period of 2000-2004 monthly data with no missing observation after survival test process .60 stocks left which classified in 20 sectors. For the size of sector, proxy by( sectoral capitalization), we obtained the data from the Nigerian Stock Exchange (NSE).

The most viable estimation procedure used in this study is Ordinary Least Square (OLS). OLS is used because it has the advantage of identifying the existence of autocorrelation and where such exist, some techniques could be used to remove such autocorrelation. According to Oludoyi (1998), where the assumptions of non-autocorrelation and constant variance of the error term (u) break down, the errors of the regression of each firm are serially correlated. And similarly the variances of the errors are no longer constant, therefore giving rise to heteroscedasticity. This study used E-view software 7.0 2009 for the analysis.

Monthly data is used in this study, therefore, Friday closing share prices were collected, where Friday was a public holiday, we used Thursday closing prices. If Friday and Thursday were public holidays, then we used Wednesday closing prices.

Table 1: Industry/Sector Classification

S/No	Sector	Number of firms
1	Agric	2
2	Automobile & Tyre	2
3	Banking	6
4	Building material	2
5	Breweries	2
6	Chemical paints	4
7	Commercial services	2
8	Conglomerates	3
9	Constructions	2



10	Engineering	2
11	Food/Beverages & Tobacco	4
12	Health	4
13	Industrial Domestic Products	4
14	Insurances	7
15	Managed fund	2
16	Packaging	2
17	Petroleum (Marketing)	3
18	Printing & Publication	3
19	Real Estate	2
20	Textiles	2
Total		60

Source: Field Work, 2011

Gunsel and Cukar (2007) are of the opinion that lagged effect of capitalization variable on stocks' risk and return should be expected. Therefore, in a stock exchange market, investors usually take decisions base on expectations, if the expectation is realized, there will be no unexpected change in stock prices. This is valid for the stock exchange markets which are efficient. However, most of the stock exchange markets are not efficient and they respond to change, with time lag. The reasons of the lag are that investors may wait until they realize the real effect of the change, to understand whether the changes are permanent or temporary, or some factors show their effects with a time lag because of its characteristics.

### 3.1. The Returns Model Specification

The returns of firms' shares can be obtained using both share pricing and dividend variation models as

$$R_{jt} = \frac{P_{jt} + D_{jt} - P_{jt-1}}{P_{jt-1}} \dots\dots\dots (1)$$

Where  $R_{jt}$  = actual return on firm at period t

$P_{jt}$  = Price of firm j at period t

$P_{jt-1}$  = price of firm j at period t-1

$D_{jt}$  = dividend paid on each share of firm at period t

If we take the natural log of the series we obtain returns in (1) above by subtracting in period t-1 from those in period t plus dividend to arrive at:

$$L_n R_{jt} = L_n (P_{jt} + D_{jt} - P_{jt-1}) - L_n (P_{t-1}) \dots\dots\dots (2)$$

### 3.2. Factor and Risk Model Specification

The Arbitrage Pricing Theory (APT) postulates that several factors affecting return and risk and can be measured. It is a multi-factor model. Thus the return-risk assets is defined

$$R_j = b_{j0} + b_{j1}F_{j1} + \epsilon_j \dots\dots\dots (3)$$

Where  $R_j$  is the realized return on sectoral portfolio and  $b_j$  is the reaction coefficient measuring the change in portfolio returns for a change in risk factor and  $F_j$  is the size factor.

In this study the factor employed is size proxy by sectoral capitalization.

$F_j$  = Sectoral capitalization

$\epsilon$  = A residual error for sector portfolio

The APT introduced by Chen, Roll & Ross (1986) involves identifying variables which influence stock risks and returns. This macro-economic activities influence the risk-return on stocks and utilizing macro variables in the risk-return generating process providing a basis to of theories of pricing a financial asset is by discounting future cash flows. The exogenous variable that affects the future cash flows or the risk discount rate of a firm

must be considered to identify the macro-economic factors that influence the stock market. The risk of security; relative to the market portfolio is computed as

$$\beta_j = b_{j1} \frac{\text{Cov}(F_j R_m)}{\sigma_m^2} + \frac{\text{Cov}(e_j R_m)}{\sigma_m^2} \dots \dots \dots (4)$$

Where  $B_j$  = risk of security

$b_{j1}$  = the reaction coefficient measuring the change in portfolio risk

$F_i$  = size of the sector

$\text{Cov}(R_j R_m)$  = covariance of the firm  $j$  with market portfolio.

$\sigma_m^2$  = variance of the market return.

#### 4. Results and Interpretations

Table 2: Sectoral Risks, Returns and Capitalization

S/N	Sector	Return %	Risk	Capitalization	Sectoral contribution to Nigeria Stock Exchange %
1	Agric	11	0.89	10.37 billion	0.42
2	Automobile & Tyre	4.8	0.81	3.7 billion	0.02
3	Banking	6.6	0.76	1963.8 billion	61.2
4	Building material	1.8	1.06	72.4 billion	3.62
5	Breweries	9.2	0.90	34.7 billion	6.20
6	Chemical paints	10.7	0.47	4.01 billion	0.18
7	Commercial services	1.9	0.06	100 million	0.06
8	Conglomerates	10.2	0.45	103.71 billion	3.08
9	Constructions	0.5	0.50	5.90 billion	1.19
10	Engineering	7.0	1.2	430.7 million	0.14
11	Food/Beverages & Tobacco	9.6	0.82	243.1 billion	8.8
12	Health	4.7	0.42	14.0 billion	0.53
13	Industrial Domestic Products	5.9	0.27	5.99 billion	0.36
14	Insurances	7.2	0.51	28.94 billion	4.67
15	Managed fund	7.5	0.27	3.45 billion	0.09
16	Packaging	8.5	0.62	4.76 billion	0.56
17	Petroleum (Marketing)	10.2	0.60	240 billion	7.47
18	Printing & Publication	7.0	0.60	939.6 million	0.18
19	Real Estate	11.3	0.83	8.72 billion	0.32
20	Textiles	4.8	1.03	2.9 billion	0.03

Source: Column 1 and 4 are obtained from FACT BOOK 2005, NSE while column 2, 3 and 5 are computed by authors.

From table 2 above, it is obvious that banking sector dominated the Nigerian stock market both in volume, value of trading and the market capitalization. It contributed about 61.2% to the total market capitalization, while other sectors combined contributed about 38.8%. The reason for the dominance might be as a result of recapitalization and consolidation reform policy of the Federal Government of Nigeria in 2004. 20 sectors were studied, 50% of the sectors have returns above the estimated average market return (7%). Surprisingly Real Estate sector whose capitalization is very low offered the highest return, followed closely by Agricultural sector, but the most Capitalized Banking Sector offered returns lower than the estimated average market return and other sectors that are not as capitalized as the Banking Sector. It is worthy of note that Real Estate Sector's contribution to total market capitalization is 0.32%, while the Banking Sector's contribution is 61.2%. The



implication of this outcome is that sector's size as proxy by capitalization does not have effects on sectoral returns. This outcome was confirmed statistically in this study. The returns of the sectors are directly related with the associated risks. This relationship conformed to theoretical framework on the relationship between risk-return in the literature (Sharps, 1964; Ross, 1993 and Serra 2002).

#### 4.1 Regression Results

**Table 3: Effects of Sector's Size on Sectoral Return**

Model	Coefficient	Standard errors	t-statistics	Prob. t
(constant)	0.068	0.0081	8.47	0.00
Sector's size	0.018	0.0033	3.5	0.59

Source: Author's Computation, 2011

The probability value for sector's size (0.59), which implies that it does not have significant influence on the sectoral returns. The outcome of this study are in conformity with other studies across the globe (see: Funga & Leug, 2000, Fan Lu & Wang 2009, Oludoyi 2003 and Abdullahi 2011).

**Table 4: Measure of the Model Strength**

R-squared	S.E. of Reg.	S.D. of Dept. Var.	Durbin Watson
0.47	0.029	0.032	2.48

Source: Author's Computation, 2011

The R-squared (coefficient of determination) for this regression is 0.47 which shows that about 47% of the variation in sectors' returns is explained by the APT model. As a further measure of the APT model fit compared the standard error of regression (0.029) to standard deviation of dependent variable (0.32). With the simple linear regression, the model error of the estimate is fairly lower, which implies a good estimation fitness of the model. The Durbin-watson statistics of 2.48 implies that there is no serial correlation.

**Table 5: Effects of Sector's Size on Sectoral Risk**

Model	Coefficient	Standard errors	t-statistics	Prob. T
Constant	0.64	0.073	8.69	0.00
Sector's size	0.023	0.030	2.76	0.46

Source: Author's Computation, 2011

The probability value for sector's size (0.46), which implies that it does not have significant influence on the sectoral risks. The outcome of this study are in conformity with other studies across the globe (see: Fernal and Rogers 2002, Barry, 2002 Goviaerv 2004 ; Jonathan & Lovie 2007 and Abdullahi, 2011).

**Table 6: Measurement of the Model Strength**

R-squared	S.E. of Reg.	S.D. of dep. Var.	Durbin Watson
0.53	0.029	0.033	2.12

Source: Author's Computation, 2011

The R-square (coefficient of determination) is (0.53) which shows that about 53% of the variation in sectoral risk is explained by the model. As a further measure of the strength of the model fit, compared the standard error of regression (0.029) to the standard deviation of dependent variable (0.033). With the simple linear regression model, the error of the estimate is fairly low, which implies good fitness of the model. The Durbin-Watson Statistics of 2.12 implies that there is no serial correlation.

#### 5. Conclusion

The regression results indicate that sectoral size tested has no significant influence on both sectoral risk and return. This indicates that other economic fundamentals affect the sectoral risk and return or the multi-factor APT model with sectoral size variable fails to explain the effect on sectoral risk and return.

Conclusively, based on the findings of this study, investment in big sector or firm (blue chip) does not necessarily guarantee safety of investment in stock market; neither does it ensure high returns all-time.

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