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# An Alternative Mean-Variance Portfolio Theoretical Framework: Nigeria Banks' Market Shares Analysis.

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## ABSTRACT

This article provides both the theoretical and experimental analysis of estimating a portfolio's asset indexes. The technique for estimating mixing weight of each asset for proper optimization of portfolio was described and Ordinary Least Squares (OLS) technique was employed in the estimation of their returns and volatilities. Twelve (12) new generation (commercial and merchant) banks' yearly market shares portfolio from 2001 to 2017 was analyzed. However, the mixing weights describing the contributing efficient frontiers carved out U.B.A and Zenith banks have been the frontiers in the commercial banks' shares portfolio with 0.272 and 0.202 weighting respectively. Additionally, 99% confidence level of Value-at-Risk (VaR), which estimated the Expected Shortfall (ES), was higher in WEMA, UNION, ACCESS, DIAMOND and FCMB with 20.6004%, 14.7637%, 14.6458%, 15.3011%, and 16.9373% respectively.
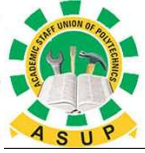
**Keywords**: Asset, Expected Shortfall (ES), Mixing weight, Ordinary Least   Squares (OLS), Portfolio.

## 1. INTRODUCTION

The ground-laying objective of portfolio conception is nothing but to allot optimally, the investment among financial assets, a wide range of products held by investors for immediate or long-time decision(s) (Bauder, 2017). Portfolio demonstration, extraction, construction formally propounded by Markowitz (1952) to unveil the association among risks, Expected returns (ER) and Expected Shortfalls. This was with a view to efficiently constructing and carving out these subsets that make up a portfolio (Bastin, 2017). In order words, the Markowitz theory perceived portfolio conception has a two-parameter framework of mean-variance (expected values and covariance matrix of asset from market observations). Portfolio conceptualization associated to some subjected assets that serves as foundation to many financial theories, for example risk-free asset theories, such as Capital Market Line (CML) and Capital Asset Price Model (CAPM) by Tobin (1985) and Sharpe (1964) respectively (Barua, 2017; Jagannathan and Ma; 2003). DeMiguel and Nogales (2009) reported and explained the instability of the mean-variance portfolio model associated with only mean asset returns and covariance matrix. They elaborated further that the estimates of covariance matrix are not responsive to extract-out estimation error attached to each asset.

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## 2. STATEMENT OF PROBLEM

To circumvent this problem, many modifications, optimization, adjustments, and addition of concomitant has been made to the portfolio framework. Among the many adjustments is the optimization of the mean-variance theoretical analysis by Kondor *et al*. (2007) & Stefanovits *et al*. (2014). This involved incorporating different optimization criteria and different concepts of risk. Senneret *et al*. (2016) and Bodnar *et al*. (2017) contributed their quota to the literature when they maintained that carving out estimation error, it requires ignoring the expected returns, since it has been established that errors in estimates of the expected returns have a bigger impact on portfolio than of covariance matrix. By doing so, the optimal portfolio becomes the global minimum variance portfolio, which is a portfolio with the smallest possible variance of all portfolios. In a similar vein, Michaud (1993), Bai *et al*. (2009), DeMiguel and Nogales (2009) proposed alternative approaches via resampling technique and stochastic algorithm programming for robust estimations. They stressed on efficiency of robustifying estimators in order to suppress the estimation error under the assertion of Gaussian asset-returns. Contrary to the robustness of the estimators, they do normally expose to highly sensitive to deviations from the distributional assumption. Emerging from the foregoing considerations, the current work adopts a new approach - Ordinary Least Square (OLS) for the minimization of the estimation error.

## 3. OBJECTIVE

The adopted approach will describe the estimation procedure as well as when a mixing or factor weight of each of the associated asset was attached to the portfolio. The estimation will then be subjected to the Nigeria commercial and merchant banks' market shares.

## 4. METHODOLOGY

### 4.1 Theoretical Analysis
Minimizing and measuring the overall risk of portfolio's assets is usually estimated via its volatility or otherwise Markowitz mean-variance model. Hurn *et al.* (2015) and Markowitz (1952). Deriving the minimum variance portfolio, considering a two assets portfolio, then the return on the portfolio is given by

$$R_{pt} = \alpha_1 R_{1t} + \alpha_2 R_{2t} \tag{1}$$

In generality, for a $"k"$ number of asset in a portfolio

$$R_{pt} = \alpha_1 R_{1t} + \alpha_2 R_{2t} + \alpha_3 R_{3t} + \ldots + \alpha_k R_{kt} = \sum_{i=1}^{k} \alpha_i R_{it} \tag{2}$$

Where;

$R_{1t}, R_{2t}, \ldots, R_{kt}$ = Are the returns of the assets portfolio.

$R_{pt}$ = Is the return on the portfolio.

$\alpha_1, \alpha_2, \ldots, \alpha_k$ are the mixing weights per each asset that gives insight of the relative contributions of each asset to a portfolio such that $\alpha_1 + \alpha_2 + \cdots + \alpha_k = 1$

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## 4.2. Mean, Variance and covariance of each Asset

$$\mu_1 = E(R_{1t}), \mu_2 = E(R_{2t}), \cdots, \mu_k = E(R_{kt})$$

$$Variance \ \sigma_1^2 = E(R_{1t} - \mu_1)^2$$

$$\sigma_2^2 = E(R_{1t} - \mu_1)^2$$

$$\vdots \ = \ \ \ \vdots$$
$$\vdots \ = \ \ \ \vdots$$

$$\sigma_k^2 = E(R_{kt} - \mu_k)^2$$

$$\sigma_{21} = \sigma_{12} = E(R_{1t} - \mu_1)(R_{2t} - \mu_2) \ \text{ Also,}$$

$$\sigma_{23} = \sigma_{32} = E(R_{2t} - \mu_2)(R_{3t} - \mu_3)$$

$$\sigma_{31} = \sigma_{31} = E(R_{3t} - \mu_3)(R_{1t} - \mu_1) \qquad \sigma_{24} = \sigma_{42} = E(R_{2t} - \mu_2)(R_{4t} - \mu_4)$$
$$\vdots \qquad\qquad\qquad \vdots \qquad\qquad\qquad \vdots \qquad\qquad\qquad \vdots$$

$$\sigma_{k1} = \sigma_{1k} = E(R_{kt} - \mu_k)(R_{1t} - \mu_k) \qquad \sigma_{2k} = \sigma_{k2} = E(R_{2t} - \mu_2)(R_{kt} - \mu_k)$$

For all $\ \sigma_{ki} = \sigma_{ik} \ni i = 1, \ldots, k \ but \ i \neq k$
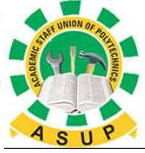
The Expected return on the portfolio.

$$\mu_p = E(R_{pt} = \alpha_1 R_{1t} + \alpha_2 R_{2t} + \alpha_3 R_{3t} + \ldots + \alpha_k R_{kt}) \qquad (3)$$

$$= \alpha_1 E(R_{1t}) + \alpha_2 E(R_{2t}) + \alpha_3 E(R_{3t}) + \cdots + \alpha_k E(R_{kt})$$

Recall that $\mu = E(x)$, so

$$\mu_p = \alpha_1 \mu_1 + \alpha_2 \mu_2 + \alpha_3 \mu_3 + \cdots + \alpha_k \mu_k$$

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### 4.3 Estimating of the Mixing weights of each Asset

Considering a two assets portfolio, such that $\sigma_p^2 = \alpha_1^2 \sigma_1^2 + \alpha_2^2 \sigma_2^2 + 2\alpha_1 \alpha_2 \sigma_{12}$

Satisfying the restriction $\alpha_1 + \alpha_2 = 1, \Rightarrow \alpha_2 = 1 - \alpha_1$. So,

$$\sigma_p^2 = \alpha_1^2 \sigma_1^2 + (1-\alpha_1)^2 \sigma_2^2 + 2\alpha_1(1-\alpha_1)\sigma_{12} \qquad (4)$$

Finding the optimal portfolio that minimizes risk; that is optimization of the portfolio.

$$\frac{\delta\sigma_p^2}{\delta\alpha_1} = 0$$

$$\Rightarrow \frac{\delta\sigma_p^2}{\delta\alpha_1} = 2\alpha_1\sigma_1^2 - 2(1-\alpha_1)\sigma_2^2 + 2(1-2\alpha_1)\sigma_{12} \qquad (5)$$

Equating $\alpha_1$ to zero and factoring its out in eqn. (6)

$$2\alpha_1\sigma_1^2 - 2(1-\alpha_1)\sigma_2^2 + 2(1-2\alpha_1)\sigma_{12} = 0$$
$$2\alpha_1\sigma_1^2 + (-2+2\alpha_1)\sigma_2^2 + 2\sigma_{12} - 4\alpha_1\sigma_{12} = 0$$
$$2\alpha_1\sigma_1^2 - 2\sigma_2^2 + 2\sigma_2^2\alpha_1 + 2\sigma_{12} - 4\alpha_1\sigma_{12} = 0$$
$$2\alpha_1\sigma_1^2 + 2\sigma_2^2\alpha_1 - 4\alpha_1\sigma_{12} = 2\sigma_2^2 - 2\sigma_{12}$$

$$\alpha_1\sigma_1^2 + \sigma_2^2\alpha_1 - 2\alpha_1\sigma_{12} = \sigma_2^2 - \sigma_{12}$$
$$\Rightarrow \alpha_1(\sigma_1^2 + \sigma_2^2 - 2\sigma_{12}) = \sigma_2^2 - \sigma_{12}$$
$$\alpha_1 = \frac{\sigma_2^2 - \sigma_{12}}{\sigma_1^2 + \sigma_2^2 - 2\sigma_{12}} \qquad (6)$$

Since, $\alpha_2 = 1 - \alpha_1$, then

$$\alpha_2 = 1 - \frac{\sigma_2^2 - \sigma_{12}}{\sigma_1^2 + \sigma_2^2 - 2\sigma_{12}} = \frac{\sigma_1^2 - \sigma_{12}}{\sigma_1^2 + \sigma_2^2 - 2\sigma_{12}} \qquad (7)$$

In generality,

$$\alpha_3 = \frac{\sigma_1^2 + \sigma_2^2 - \sigma_{32} - \sigma_{31}}{2\sigma_1^2 + 2\sigma_2^2 - 2\sigma_{32} - 2\sigma_{31}} ; \quad \alpha_4 = \frac{\sigma_1^2 + \sigma_2^2 + \sigma_3^2 - \sigma_{41} - \sigma_{42} - \sigma_{43}}{2\sigma_1^2 + 2\sigma_2^2 + 2\sigma_3^2 - 2\sigma_{41} - 2\sigma_{42} - 2\sigma_{43}} \quad \cdots\cdots \text{In that order.}$$

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### 4.4 Ordinary Least Squares Estimation of the Return Assets in Portfolios

The concept of Ordinary Least Squares (OLS) technique for parameter estimation of both linear and non-linear models will be employed in estimating asset returns.

The criterion for LS;

$$Q = \sum_{i=1}^{n} [\varepsilon_t]^2 \tag{8}$$

But in a stochastic setting (risk attached), eqn. (1) can be re-written as

$$R_{pt} = \alpha_1 R_{1t} + \alpha_2 R_{2t} + \alpha_3 R_{3t} + \ldots + \alpha_k R_{kt} + \varepsilon_t = \sum_{i=1}^{k} \alpha_i R_{it} + \varepsilon_t \tag{9}$$

$$R_{pt} = f(\alpha_i R_{it}) + \varepsilon_t \Rightarrow \varepsilon_t = R_{pt} - f(\alpha_i R_{it}), \text{ where } \varepsilon_t \sim N(\mu, \sigma^2), \text{so}$$

$$Q = \sum_{i=1}^{k} \left[ R_{tp} - f(R_{it} - \alpha_i) \right]^2$$

Using Maximum Likelihood (ML),

$$L(R_{it}, \sigma^2 / R_{tp}) = \frac{1}{\left(2\pi\sigma^2\right)^{\frac{k}{2}}} e^{-\frac{1}{2}Q} \tag{10}$$

$$= \frac{1}{\left(2\pi\sigma^2\right)^{\frac{n}{2}}} e^{-\frac{1}{2}\sum_{i=1}^{k} \left[ R_{tp} - f(R_{it} - \alpha_i) \right]^2}$$

The partial derivative of $L(R_{it}, \sigma^2 / R_{tp})$ by $R_{1t}, R_{2t}, \ldots, R_{kt}$ and equating to zero, that is, $\dfrac{\partial Q}{\partial R_{it}} = 0$

gives

$$\frac{\partial Q}{\partial R_{it}} = -2\sum_{i=1}^{k} \left[ R_{tp} - f(R_{it} - \alpha_i) \right]^2 \left[ \frac{\partial f(R_{it}, \alpha_i)}{\partial R_{it}} \right]_{R_{it}} \tag{11}$$

$$\Rightarrow \sum_{i=1}^{k} R_{it} \left[ \frac{\partial f(R_{it}, \alpha_i)}{\partial R_{it}} \right]_{R_{it}} - \sum_{i=1}^{k} \alpha_i R_{it} \left[ \frac{\partial f(R_{it}, \alpha_i)}{\partial R_{it}} \right]_{R_{it}} \tag{12}$$

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Forming a system of equations;

$$\alpha_1 \sum_{i=1}^{k} R_{tp} \left( \sum_{i=1}^{k} R_{it}\alpha_i \right) - \alpha_1 \left( \sum_{i=1}^{k} R_{it}\alpha_i \right)^2 = 0$$

$$\alpha_2 \sum_{i=1}^{k} R_{tp} \left( \sum_{i=1}^{k} R_{it}\alpha_i \right) - \alpha_2 \left( \sum_{i=1}^{k} R_{it}\alpha_i \right)^2 = 0 \qquad (13)$$

$$\vdots \qquad\qquad \vdots \qquad\qquad \vdots$$

$$\alpha_k \sum_{i=1}^{k} R_{tp} \left( \sum_{i=1}^{k} R_{it}\alpha_i \right) - \alpha_k \left( \sum_{i=1}^{k} R_{it}\alpha_i \right)^2 = 0$$

$R_{it}$ in the system of equations in equation (13) can then be solved for either Row Reduced Echelon form or by linear method via substitution.

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## 5. DATA PRESENTATION

The dataset of recorded portfolios of 12 commercial (new generation) banks' market shares by Central Bank of Nigeria (CBN) was used in this work to investigate and reveal facts about the assets embedded. The shares were from January 2007 to December 2018. The banks are Access, Diamond, Fidelity, FCMB, Guaranty Trust Bank (GTB), SKYE, Stanbic IBTC, United Bank of Africa (UBA), Union, Unity, WEMA, and Zenith bank. The quantitative financial series of each of the banks was then treated has portfolio entity.
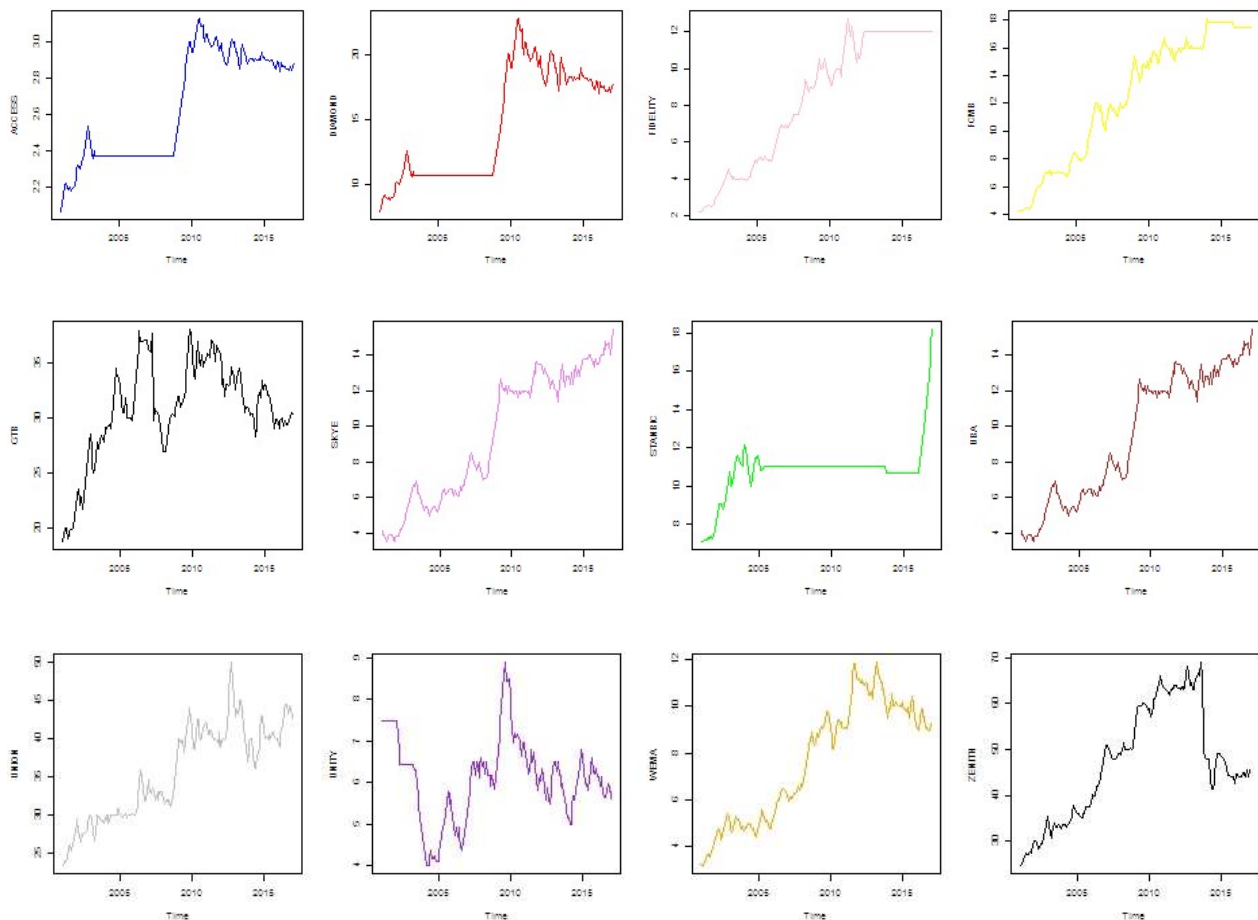
**Fig.1: Time plot of the Banks' Shares from 2007 to 2018**

Apart from Fidelity, FCMB, SKYE and UBA banks' shares that swing increasing over the years, Stanbic IBTC's bank shares that steadly maintained a contant trend from 2005 to 2015 before its shares skyrocketed sporadically. Other banks' shares retained zig-zag fluctuating trend of the share price.

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**Table .1: Descriptive Statistics and Higher moment**

| Indexes | ACCESS | DIAMOND | FIDELITY | FCMB | GTB | SKYE | STANBIC |
|---|---|---|---|---|---|---|---|
| Min. | 3.5464 | 1.9239 | 1.13 | 2.32 | 7.64 | 2.6509 | 4.2703 |
| 1st Qu. | 6.8028 | 4.7974 | 2.190 | 4.785 | 14.560 | 4.6418 | 7.3500 |
| Median | 8.6450 | 7.5000 | 2.7200 | 7.2500 | 17.0400 | 7.0502 | 9.3000 |
| Mean | 10.5175 | 8.9331 | 4.544 | 8.611 | 20.075 | 8.0391 | 10.229 |
| 3rd Qu. | 11.5220 | 10.700 | 6.475 | 10.308 | 24.993 | 9.6257 | 11.0000 |
| Max. | 25.5037 | 23.4505 | 13.00 | 21.60 | 40.00 | 19.8530 | 23.0000 |
| Jaque Bera | 0.7949 | 0.6700 | 0.5936 | 0.7281 | 0.9812 | 0.6612 | 0.5089 |
| Asset Ranking | -0.0500 | -0.03408 | -0.0242 | -0.0164 | 0.0095 | -0.0031 | 0.0031 |
| S.E Mean | 0.1416 | 0.144027 | 0.092 | 0.127 | 0.1981 | 0.1100 | 0.1051 |
| LCL Mean | 10.2416 | 8.651363 | 4.36171 | 8.361 | 19.6870 | 7.8235 | 10.0231 |
| UCL Mean | 10.7931 | 9.216397 | 4.7264 | 8.8605 | 20.4643 | 8.2550 | 10.4346 |
| Stdev. | 5.4448 | 5.578160 | 3.60000 | 4.92651 | 7.6733 | 4.2607 | 4.0622 |
| Skewness | 1.1580 | 0.938678 | 1.13905 | 0.98124 | 0.8716 | 0.9174 | 1.5795 |
| Kurtosis | 0.1140 | -0.171067 | -0.3067 | -0.3053 | -0.4472 | -0.2572 | 1.9296 |
| Beta Covariance | 0.6729 | 0.5429 | 0.6012 | 0.8563 | 1.3172 | 0.4210 | 1.6865 |
| Beta CoSkewness | 0.6293 | 0.5277 | 0.5915 | 0.8320 | 1.2303 | 0.4089 | 1.6401 |
| Beta CoKurtosis | 0.5829 | 0.5080 | 0.5710 | 0.8174 | 1.1000 | 0.4001 | 1.6255 |

| | U.B.A | UNION | UNITY | WEMA | ZENITH |
|---|---|---|---|---|---|
| Min. | 1.64 | 1.9605 | 0.5000 | 0.5000 | 10.1138 |
| 1st Qu. | 5.65 | 4.5851 | 0.770 | 0.80750 | 13.7003 |
| Median | 11.0050 | 7.9000 | 1.1850 | 1.42500 | 1.4250 |
| Mean | 18.8620 | 16.5057 | 2.679 | 5.068 | 24.1027 |
| 3rd Qu. | 30.2000 | 32.1329 | 4.693 | 36.6750 | 36.6750 |
| Max. | 63.9404 | 50.330 | 9.950 | 15.00 | 68.9700 |
| Jaque Bera | 0.5562 | 0.9987 | 0.7542 | 0.7192 | 0.8100 |
| Asset Ranking | 0.0500 | -0.0095 | 0.03408 | 0.0164 | 0.02422 |
| S.E Mean | 0.4485 | 0.3956 | 0.0678 | 0.14663 | 0.3857 |
| LCL Mean | 17.9830 | 15.729 | 2.5455 | 4.7802 | 23.3461 |
| UCL Mean | 19.7404 | 17.2812 | 2.8116 | 5.3555 | 24.8594 |
| Stdev. | 17.3498 | 15.322 | 2.626 | 5.6793 | 14.9398 |
| Skewness | 1.0612 | 0.7968 | 1.0843 | 0.8892 | 1.1395 |
| Kurtosis | -0.374114 | -1.069 | -0.2664 | -0.9525 | -0.9525 |
| Beta Covariance | 1.1298 | 0.7236 | 0.51029 | 0.9823 | 1.8337 |
| Beta CoSkewness | 1.1010 | 0.7142 | 0.5021 | 0.9728 | 1.8142 |
| Beta CoKurtosis | 1.0009 | 0.7104 | 0.4981 | 0.9658 | 1.8021 |

**Source: CBN: 2019.**

Keys: 1st Qu.= 1st Quarter;  3rd Qu.= 3rd Quarter

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From table. 1 above, UBA, Unity and Zenith bank set the pace in terms of the their asset ranking via the shares with positive ranks of 0.02422, 0.03408, 0.0500 respectively. Though UBA bank happenned to be the first of all with enjoyable and beneficial shares by stakeholders and shareholders followed by Union and Zenith bank. GTB and Stanbic IBTC fall in the same category with UBA, Unity and Zenith in the profitable investments by shareholders but with minimal (rankings: 0.0095, 0.0031) accrued returns compared to the afurementioned three banks over the last eleven (11) years. Unlike the Zenith, UBA, Stanbic IBTC, Unity and GTB, Access, Fidelity, Diamond, Fidelity, FCMB, SKYE, Union and WEMA banks, their long term returns are undecided. Furthermore, the quality control of the returns of these assets (shares) indicated a reasonable and a higher Upper Control Limits (UCLs) in Zenith, GTB, UBA and Unity bank with their UCLs being 24.8594, 20.4643, 19.7404, and 17.2812 respectively than others. However, none of the banks experienced a situation where the Lower Control Limit (LCL) exceeded or equaled the UCL; this indicated that all the banks' shares yielded positive returns in their magnitude of contributions.
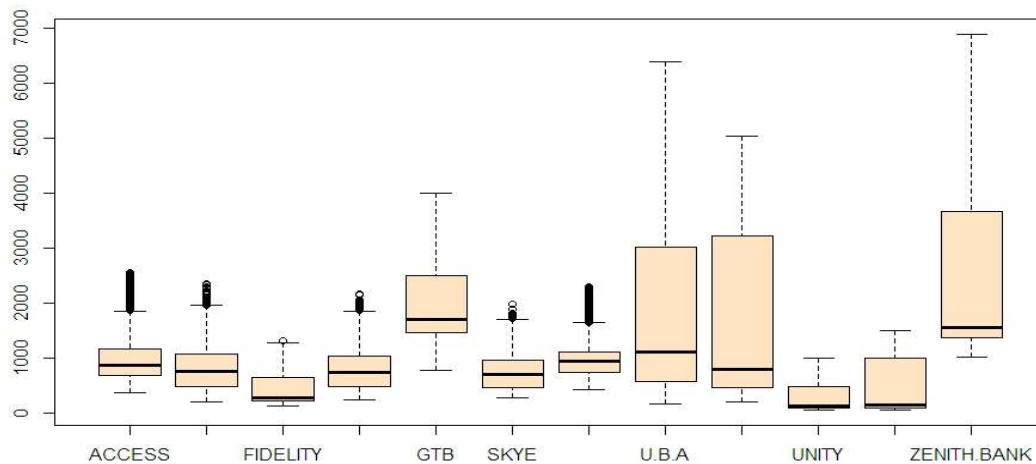


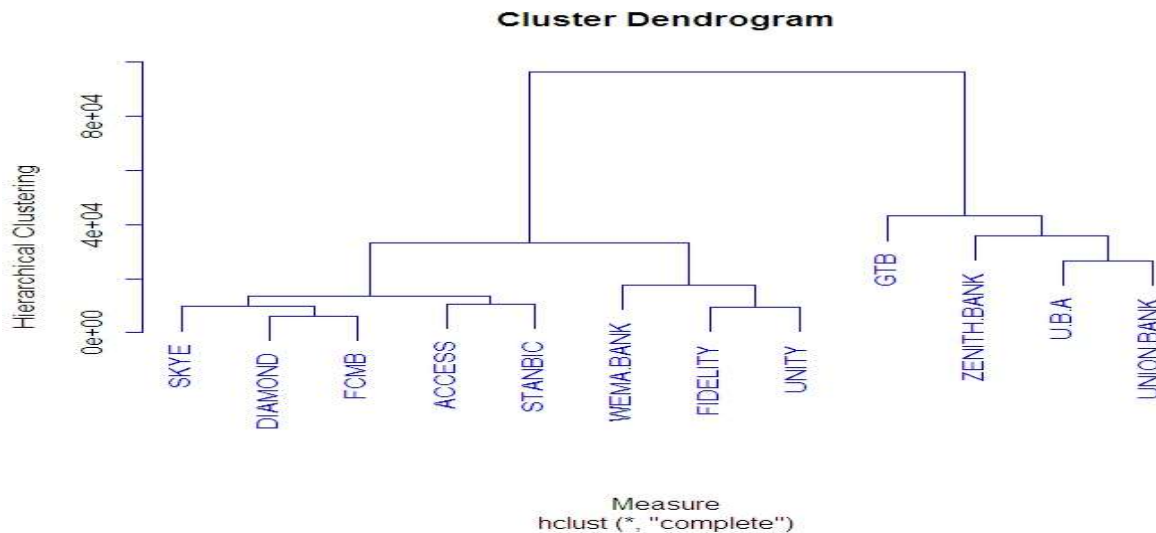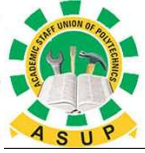**Fig .2: Asset Boxplot of the Banks.**



**Fig .3: Hierarchical Clustering Measurement.**

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The pictorial figure. 2 of asset boxplot collaborates with asset ranking and quality control via the UCLs and LCLs as discussed in table.1. Figure.3 intricates on the hierarchical of categories based on degree of performance collocation of asset shares of these banks. According to cluster dendogram, GTB leads the classified ladder of most successful and gained market valued asset shares such that UBA, Zenith and Union bank team up together as the apex gained market valued shares' banks. Next in the grade B category of performance are WEMA, Fidelity and Unity bank followed by grade C category class that comprises of Access, FCMB, SKYE, DIAMOND and Stanbic IBTC.

**Table .2: Estimates of Downside Risks, Volatilities and Value –at–Risk (VAR) for each of the Asset.**

| | ACCESS | DIAMOND | FIDELITY | FCMB | GTB | SKYE | STANBIC |
|---|---|---|---|---|---|---|---|
| Semi Deviation | 6.7 | 6.9 | 7.31 | 7.8 | 5.31 | 7.7 | 6.7 |
| Gain Deviation | 9.44 | 8.2 | 8.90 | 9.3 | 16.16 | 9.4 | 9.8 |
| Loss Deviation | 6.9 | 7.2 | 7.6 | 8.6 | 5.61 | 8.9 | 6.9 |
| Idiosyncratic Returns | -0.8923 | 0.2903 | 0.7929 | -1.025 | 0.9920 | 0.5201 | 0.4535 |
| Weights ($\alpha_i$) | 0.045 | 0.0104 | 0.0173 | 0.0026 | 0.140 | 0.047 | 0.078 |
| Equal weight | 0.0833 | 0.0833 | 0.0833 | 0.0833 | 0.0833 | 0.0833 | 0.0833 |
| Maximum Drawdown | -23.45 | -12.89 | -19.65 | -25.38 | -31.09 | -42.90 | -36.16 |
| Downside Deviation (0%) | 3.5 | 4.7 | 2.4 | 6.8 | 3.7 | 5.9 | 6.5 |
| Downside Deviation (MAR=10%) | 3.6 | 4.4 | 2.5 | 6.3 | 3.6 | 5.2 | 6.3 |
| Downside Deviation (rl=4%) | 2.5 | 4.2 | 2.1 | 6.3 | 3.1 | 5.4 | 6.8 |
| Active Premium | 0.0352 | 0.0781 | 0.0319 | 0.0561 | 0.0871 | -0.0492 | -0.0477 |
| Tracking Error | 0.1037 | 0.0365 | 0.0478 | 0.0463 | 0.3674 | 0.4572 | 0.0374 |
| Treynor Ratio | 0.7864 | 0.0468 | -0.9e(-06) | 0.0285 | 0.77201 | 0.6952 | 0.4673 |
| VaR (99%) | 14.6458 | 15.3011 | 10.6553 | 16.93734 | 8.3786 | 17.0029 | 10.9031 |
| Beyond VaR | 14.6458 | 15.3011 | 10.6553 | 16.93734 | 8.3786 | 17.0029 | 10.9031 |
| Modified VaR (99%) | 19.6593 | 20.6858 | 13.4794 | 20.4652 | 51.39834 | 25.8162 | 15.8971 |

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|  | U.B.A | UNION | UNITY | WEMA | ZENITH |
|---|---|---|---|---|---|
| Semi Deviation | 5.83 | 6.3 | 8.7 | 9.6 | 6.21 |
| Gain Deviation | 21.53 | 15.5 | 7.4 | 7.3 | 19.9 |
| Loss Deviation | 5.99 | 4.9 | 4.5 | 6.8 | 5.85 |
| Idiosyncratic Returns | 1.1029 | 0.8673 | 1.0029 | 0.2901 | 1.4522 |
| Weight ($\omega_i$) | 0.272 | 0.0791 | 0.071 | 0.0256 | 0.202 |
| Equal weight | 0.0833 | 0.0833 | 0.0833 | 0.0833 | 0.0833 |
| Maximum Drawdown | -19.8 | -20.51 | -31.30 | -28.82 | -34.06 |
| Downside Deviation (0%) | 5.5 | 8.4 | 5.9 | 7.3 | 9.4 |
| Downside Deviation (MAR=10%) | 5.4 | 8.1 | 5.7 | 7.5 | 9.5 |
| Downside Deviation (rl=4%) | 4.8 | 8.7 | 6.2 | 7.1 | 9.7 |
| Active Premium | 0.0378 | 0.0471 | 0.0162 | 0.0182 | 0.0518 |
| Tracking Error | 0.3822 | 0.1649 | 0.0439 | 0.0203 | 0.0593 |
| Treynor | 0.6952 | 0.6952 | 0.6952 | 0.6952 | 0.6952 |
| VaR (99%) | 8.0149 | 14.7637 | 8.9753 | 20.6004 | 7.9973 |
| Beyond VaR | 8.0149 | 14.7637 | 8.9753 | 20.6004 | 7.9973 |
| Modified VaR (99%) | 12.9094 | 17.7584 | 14.4958 | 25.4081 | 12.4028 |

**Source: CBN: 2019.**

No doubt, prospective shareholders, stakeholders and investors normally ask for some level of confidence in terms of risk. Value-at-risk (VaR) helps in measuring the economic loss (es) attached to the evaluation of assets in a portfolio. The 99% confidence level of the VaR, which is the estimated Expected Shortfall (ES), was higher in WEMA, UNION, ACCESS, Diamond and FCMB with 20.6004%, 14.7637%, 14.6458%, 15.3011%, and 16.9373%. In addition, the Beyond VaR that measures the relationship of mean expected tail loss that adds VaR and ES is approximately the same magnitude of defalcation with VaR at 0.01% significant error. The Semi-Deviation that measures the possibility of downside volatility (stumbling), that is the downward trend, this trend flied in the ointment with minor influences UBA, Zenith, Union, GTB and Stanbic IBTC bank with (5.83%, 6.21%, 6.3%, 5.31% and 6.7%) respectively.

The same banks expect Stanbic IBTC carpeted profitable deviations and gaining insights of 21.53%, 19.9%, 15.5% and 16.16% respectively. Furthermore, the ratio of assets' excess return that describes the portions of returns of each asset (Treynor ratio) that could be directly attributed to the returns of tractable investments in the benchmark recorded ratios that exceeded 0.5 with (0.7864, 0.77201, 0.6952, 0.7042, 0.5831 and 0.6999) for Access, GTB, SKYE, U.B.A, Union, and Zenith respectively. Moreover, the investment's annualized return minus the benchmarks annualized return (active premium) indexes recorded negative estimates with SKYE and Stanbic IBTC, suggesting a non-annual returns to stakeholders, shareholders and investors. Lastly, the unequal factor weights ($\alpha_i$) describing the contributing efficient frontiers carved out UBA and Zenith banks have been the frontiers in the commercial banks' shares portfolio with 0.272 and 0.202 weighting respectively.
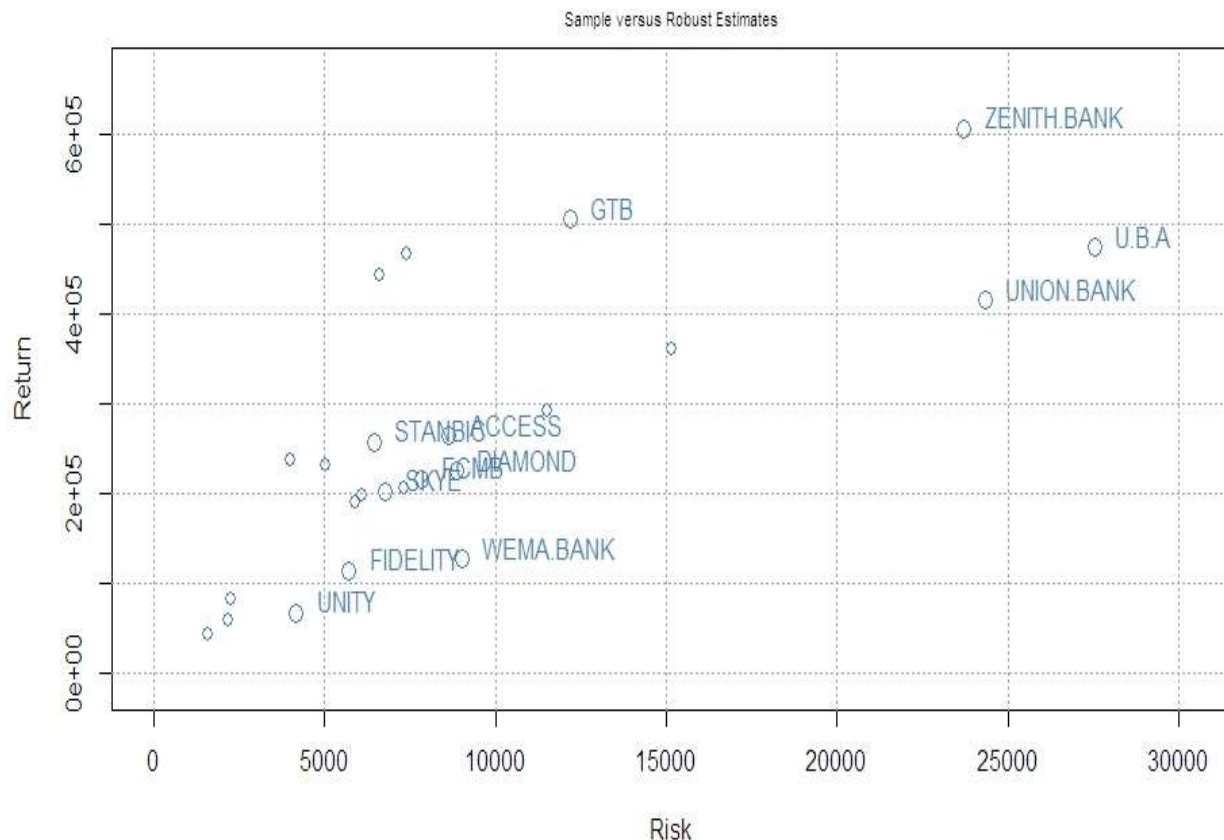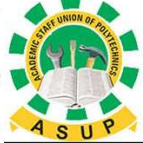
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**Fig .4: Risk Plot of each Asset Returns.**

It is indubitable to infer that the returns of Zenith dictated the pace for UBA, GTB and Union banks' returns to follow as the apex investors' bank over the eleven years period. The higher the returns expected the higher the viable risk to be taken.

## 6. CONCLUDING REMARKS

From the preceding, it is safe to maintain that out of the twelve shares asset of the Nigeria commercial and merchant banks' portfolios - apart from the fact that the contributing factors of Zenith, UBA, GTB, and Union to the shares' portfolio are substantial - their long time returns might be an 'eye catching' phenomenon for shareholders, investors, stakeholders and financial analysts. Further research could also be extended to risk budgeting, transactions and positions with profit and loss. Lastly, the method of moments (be it higher moments) cannot solely rely on in the extraction of market indexes of a portfolio.

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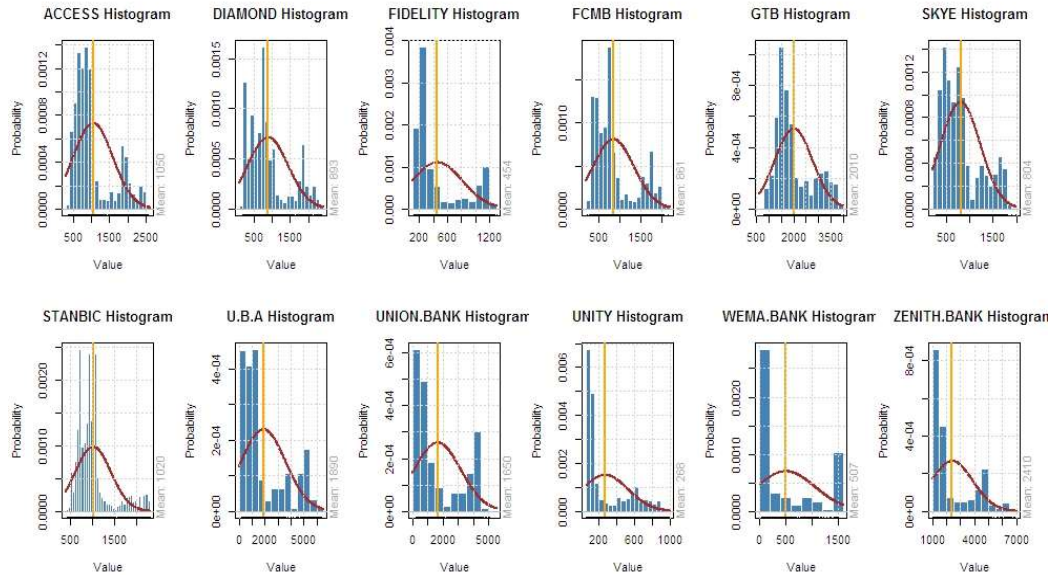www.isteams.net

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## APPENDIX



**The Probability Integral Transformation (PIT) of each of the corresponding Banks' shares**



**Pearson Correlation Image among *the corresponding Banks' shares***