THE PERFORMANCE OF NIGERIAN STOCK EXCHANGE SECTORAL INDICES: JANUARY 2009 – DECEMBER 2010*

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1.0   INTRODUCTION

Stock market indices are used as a general measure of the performance of stock markets in terms of price appreciation or depreciation. These indices are important economic indicators, as they gauge the health and, very often, can predict the future direction of economic activity.   In addition to the Nigerian Stock Exchange's (NSE) All-Share Index, the Central Bank of Nigeria (CBN) regularly analyzes movements in the most prominent stock indices in seventeen other nations in Africa, North America, South America, Europe and Asia. Besides movements in the overall indices, investors and policymakers are also attuned to the performance of the different sectors of the economy which are represented by sectoral indices. For example, the Standard and Poor's 500, an index of 500 large capitalization equities in the United States, is made up of ten sectors–Energy, Materials, Industrial, Consumer Discretionary, Consumer Staples, Health Care, Financials, Information Technology, Telecommunications Services, and Utilities. While the overall SandP 500 index had a nominal return of 15.06 per cent in 2010, the best-performing sector was Consumer Discretionary, with a return of 27.66 per cent

whereas the worst-performing sector was Health Care, with a return of 2.90 per cent (Standard and Poor's, 2011). Similarly, the most prominent stock index in the U.K., the FTSE 100, comprises ten sectors–Oil and Gas, Basic Materials, Industrials, Consumer Goods, Health Care, Consumer Services, Telecommunications, Utilities, Financials and Technology (Financial Times London Stock Exchange, 2011).

In an effort to enhance trading and performance measurement among the different sectors of the Nigerian equity market, the NSE launched five sectoral indices, namely, the NSE 30 Index[†]; the NSE Banking Index; the NSE Insurance Index; the NSE Food/Beverage Index and the NSE Oil/Gas Index, in January 2009. The indices were based on a number of criteria, including market capitalization[‡] and liquidity.

The paper reviews the performance of the sectoral indices during the first twenty-four months of their existence, i.e., between their inception in January 2009 and December 2010. We seek to examine not only the raw performance of the indices but also their risk-adjusted performance. The results of the analysis will facilitate the

allocation of capital by institutional as well as individual investors in the Nigerian equity market.

The rest of the paper is organized as follows. Section 2 discusses the transformation of the indices and their correlation. In section 3, we examine the nominal performance of the sectoral indices while section 4 discusses their risk-adjusted performance.   Section 5 concludes the paper.

2.0   TRANSFORMATION AND CORRELATION OF THE INDICES

Interestingly, the indices started at values other than 100, which made them difficult to compare. At inception on January 30, 2009, the NSE 30 index had a value of 563.4; the NSE Banking index had a value of 297.78; the NSE Insurance index had a value of 515.38; the NSE Oil and Gas index had a value of 624.91 and the NSE Food and Beverage index had a value of 355.94. In order to facilitate the analysis, the indices were transformed by rebasing them to have a common starting value of 100 in January 2009. Equation 1 shows the methodology adopted to rebase the indices:

$$RI_t = \frac{I_t}{I_0} \times 100 \qquad (1)$$

where:

RI_t = rebased index value at the end of period t

I_t = original index value at the end of period t

I_0 = original index value at period 0 (i.e., the starting value)

Performance tracking is considerably enhanced with the rebased indices as they all start with a common value and their performance over time can be easily monitored, as shown in Figure 1. It is pertinent to mention the relationship among the indices before discussing their relative performance. Table 1 shows the correlation coefficients of the indices, computed with weekly data. With respect to co-movement with All Share Index (ASI), the highest correlation coefficient of 0.8860 was between the ASI and the NSE Banking index, while the lowest was between the ASI and the NSE Insurance index, at -0.2097. Among the sectoral indices, the highest correlation coefficient of 0.9208 was between the NSE 30 index and the NSE Food and Beverage index; the lowest, at -0.8298, was between the NSE Food and Beverage and NSE Insurance indices. Thus, a high correlation was observed between indices representing sectors or aggregations which constitute a high proportion of overall market capitalization (such as Banking and the NSE 30) and the ASI. The NSE Insurance index had negative or low correlation with the other indices.

Table 1: Correlation Coefficients of NSE Sectoral Indices, Jan. 2009 Dec. 2010

	ASI	NSE 30	NSE BANKING	NSE FOOD & BEVERAGE	NSE INSURANCE	NSE OIL & GAS
ASI	1.0000					
NSE 30	0.7229	1.0000				
NSE BANKING	0.8860	0.5050	1.0000			
NSE FOOD & BEVERAGE	0.5990	0.9208	0.2968	1.0000		
NSE INSURANCE	-0.2097	-0.8166	0.0120	-0.8298	1.0000	
NSE OIL & GAS	0.4196	-0.0183	0.2053	0.1271	0.3370	1.0000

Source: Authors' computations.

3.0   NOMINAL PERFORMANCE

Nominal returns measure the change in the monetary value of an investment. Although investors should be concerned about the purchasing power of the returns on their investments, most financial obligations are paid in nominal terms. Moreover, most performance comparisons in the business press accessible to investors are made in nominal terms. As such, nominal returns are important for investors and are the first stage in performance analyses.

Table 2 shows that, in nominal terms, the NSE Food and Beverage index had the best performance during the January 2009 - December 2010 period, rising by 116.6 per cent in total, or a weekly average return of 0.82 per cent. At the other ends of the performance spectrum, the NSE Insurance index declined by 69.9 per cent or a weekly average return of minus 1.25 per cent between January 2009 and December 2010. The NSE Banking and NSE All-Share indices posted returns at the middle of the two extremes, rising by 33.2 per cent and 14.0 per cent or a weekly average return of 0.30 per cent and 0.14 per cent, respectively. As such, the Food and Beverage, NSE 30 and Banking indices performed better than the overall market (as measured by the All-Share index) while the Oil and Gas and Insurance indices performed worse than the overall market.

Table 2: Nominal Performance of NSE Sectoral Indices, Jan. 2009 Dec. 2010

Index	Index Level at End of Jan 2009*	Index Level at End of Dec 2010	% Change	Avg. Weekly Returns**	Rank
NSE Food/Beverage	100.00	216.64	116.6%	0.82%	1
NSE 30	100.00	190.07	90.1%	0.68%	2
NSE Banking	100.00	133.23	33.2%	0.30%	3
NSE All-Share Index	**100.00**	**114.03**	**14.0%**	**0.14%**	**4**
NSE Oil and Gas	100.00	54.22	-45.8%	-0.64%	5
NSE Insurance	100.00	30.15	-69.9%	-1.25%	6

* Reindexed to a base of 100 for all stock indices.

**Geometric (i.e., compound) average.

Figure 1 shows the nominal performance of the sectoral indices in relative terms, again a common starting value of 100 in January 2009. Stock market prices tend to rise over time, though in a volatile manner. The NSE Food and Beverage and NSE 30 indices had risen the most in nominal terms, but it had also suffered significant volatility.

4.0 RISK-ADJUSTED PERFORMANCE

Successful investors take cognizance of the risk associated with returns. High returns are generally associated with high risk. As such, an analysis of stock market performance which does not account for risk is at best incomplete and potentially misleading. In order to properly compare performance, we must adjust the nominal returns of the sectoral indices for risk.

4.1 Coefficient of Variation

Following Ikoku (2009) we first measure risk-adjusted performance using the coefficient of variation (CV) of returns.[§] The CV measures risk per unit of return by dividing the standard deviation of returns by the mean (i.e., average) of the returns; see, for example, Reilly and Brown (2006). In equation form:
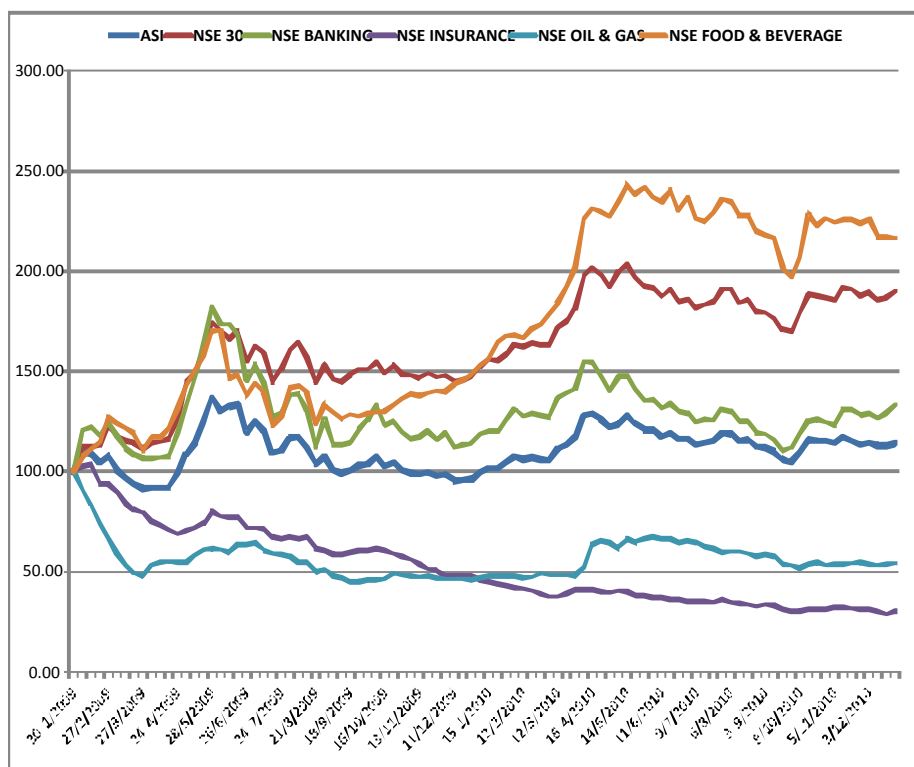
Coefficient of Variation = Standard Deviation / Mean   (2)

Because CV measures risk per unit of return, the lower the CV of an index, the better its performance. Table 3 shows the risk-adjusted performance of the sectoral indices. The CVs range from minus 7.09 for the NSE Oil and Gas index to 27.71 for the NSE ASI index. The NSE Food and Beverage index had the best performance among the 5-sector indices during the review period. This was followed by the NSE 30 index. Interestingly, the use of CV did not alter the performance ranking of the indices.

4.2 Sharpe Ratios

Investors are concerned about whether a portfolio's returns are due to smart investment decisions or as a result of excessive risk. Investment opportunities are deemed worthy if

Figure 1: Nominal Performance of Sectoral Indices, Jan. 2009 Dec. 2010*

Source: Authors' computations.
* Reindexed to a base of 100 for all stock indices

Table 3: Risk-Adjusted Performance (Coefficient of Variation) of NSE Sectoral Indices, Jan. 2009 Dec. 2010

Index	Standard Deviation of Returns	Avg. Weekly Returns*	Coefficient of Variation	Rank
NSE Food/Beverage	4.49%	0.82%	5.48	1
NSE 30	3.96%	0.68%	5.82	2
NSE Banking	5.59%	0.30%	18.63	3
NSE All-Share Index	**3.88%**	**0.14%**	**27.71**	**4**
NSE Oil and Gas	4.54%	-0.64%	-7.09	5
NSE Insurance	2.94%	-1.25%	-2.35	6

*Geometric (i.e., compound) average.

higher returns do not come with too much additional risk. The Sharpe ratio (also known as the Sharpe reward-to-variability ratio) is a measure of excess return per unit of risk; it is often used to evaluate the performance of portfolios in the asset management industry. The ratio helps to make the performance of one portfolio comparable to that of another portfolio by making an adjustment for risk. The greater a portfolio's Sharpe ratio, the

better its risk adjusted performance. As such, the Sharpe ratio is easier to interpret than the CV.

The computation of the Sharpe ratio (designated) is shown in equation 3:

$$S_i \quad \frac{R_i \quad RFR}{i} \quad (3)$$

[§]*CV is superior to standard deviation because standard deviation is affected by the size of the units being measured. This problem is resolved by dividing standard deviation by the mean of the units to derive a scale-free metric.*

**Table 4: Risk Adjusted Performance (Sharpe Ratios) of NSE
Sectoral Indices, January 2009 - December 2010**

Index	Avg. Weekly Returns*	Avg. Weekly Yield on 10-Year Bonds	Standard Deviation of Returns	Sharpe Ratios	Rank
NSE Food/Beverage	0.82%	0.160%	4.49%	0.147	1
NSE 30	0.68%	0.160%	3.96%	0.131	2
NSE Banking	0.30%	0.160%	5.59%	0.025	3
NSE All-Share Index	**0.14%**	**0.160%**	**3.88%**	**-0.005**	**4**
NSE Oil and Gas	-0.64%	0.160%	4.54%	-0.176	5
NSE Insurance	-1.25%	0.160%	2.94%	-0.480	6

*Geometric (i.e., compound) average.

where:

R_i = the average rate of return for Portfolio i during a specified time period.

RFR = the average rate of return on risk-free assets during the same time period[‡‡].

i = the standard deviation of the rate of return for portfolio i during the time period.

As seen in Table 4, the Sharpe ratios for the indices mirror their CVs in terms of performance ranking. The NSE Food and Beverage index, with a ratio of 0.147 still performed better than the indices including the aggregate portfolio, i.e., NSE All-Share index, during the review period. This was followed by the NSE 30 index with a ratio of 0.131. The NSE Insurance index with a ratio of minus 0.480 had the worst performance, followed by the NSE Oil and Gas index.

One advantage of the Sharpe ratio over the CV is that it compares the returns on a risky asset to those of an alternative "risk-free" asset. It is interesting to note that, between January 2009 and December 2010, only the NSE Food and Beverage, NSE 30 and NSE Banking indices had higher returns than 10-year Federal Government of Nigeria (FGN) bonds. The average weekly returns on the benchmark 10-year FGN bonds, at a modest 0.160 per cent, were 1.14 times higher than the 0.14 per cent posted by the overall stock market during the period under review.

5.0   CONCLUSION

This analysis compares the performance of the sectoral indices introduced by the NSE in January 2009. The indices were ranked according to their nominal and risk-adjusted performance. It was found that the NSE Food and Beverage index, followed by the NSE 30 index had the best nominal and risk adjusted returns, while the NSE Insurance index, followed by the NSE Oil and Gas index had the worst returns. The NSE Banking and NSE ASI indices were in the middle of these extremes.

Given that consumer prices rose by 26.6 per cent over the 24-month period, only the NSE Food and Beverage, NSE 30 and NSE ASI indices had positive inflation-adjusted returns. The Banking index had a positive nominal return of 33.2 per cent during the period under review. However, when this return is adjusted for inflation, the Banking index's performance becomes a moderate 6.6 per cent.

Considering that the data covered significant periods of bear market episodes due to the global financial and economic crises, the performance of the Food/Beverage sector did not come as a surprise. Although most stock market sectors decline during a recession, certain industries such as consumer staples and health-care stocks usually decline less than the average. This is why they are considered "defensive" stocks.

The outcomes of this analysis address the ability of these stock indices to function as wealth preservation and enhancement vehicles. Following the results, our recommendation is that investors should continue to diversify among

**This ratio was developed in 1966 by William F. Sharpe, who won the 1990 Nobel Prize in Economics.
[††]Risk-free in this context refers to assets, such as treasury bonds, which are deemed to have essentially no default risk. Treasury bonds have other types of risk such as interest rate risk, liquidity risk and inflation risk. See Ikoku (2010) for a discussion of the risks associated with investing in treasury bonds.
[‡‡]The average rate of return used in the analysis is the average weekly yield on 10-Year FGN bonds.

equities, especially by investing in sectors with better risk-adjusted performance. The NSE Insurance index may have turned in the worst performance among the indices but its negative or low correlation with the other indices suggests that investors could use insurance stocks to reduce the risk of their portfolio without doing undue damage to returns. In addition, investors should consider FGN bonds as long as their returns are higher than the rate of inflation.

The prospects for these indices remain bright, as the Nigerian Stock Exchange (NSE) is working with Bloomberg to co-brand them, which will enhance their profile and thereby give institutions the confidence to create products based on these indices, knowing that they will be accessible to a global investor base. The NSE should encourage the creation of exchange traded funds (ETFs) representing the sectoral indices in order to facilitate portfolio management by investors.

Because the four sectoral indices accounted for only 51 per cent of market capitalization in December 2010, the NSE should create more sectoral indices in order to offer a better coverage of the Nigerian equity market. An obvious candidate is the building materials sector, which accounted for 30 per cent of market capitalization in December 2010, but was not included in any of the sectoral indices.

In the final analysis, since the dataset largely covered the peak periods of the global financial and economic crises which had an adverse impact on stock performance globally (the NSE ASI dropped by 33.8 per cent in 2009, having dropped by 45.8 per cent in 2008), this study can be extended to cover periods after the global financial and economic crises. This paper could form a basis for performance analyses in the post-crises period.

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