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The January and Monday effect or the lack thereof

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Abstract

This paper assesses the existence of calendar anomalies on 167 stocks listed on the Nigerian stock exchange ("NSE") between the period 2004 and 2014. These stocks, at different times, also constituted part of the all share index within the review period. The approach taken in this paper differs slightly from most papers where the review has been on indices rather than individual stocks. The simple Ordinary Least Squares ("OLS") estimation technique and the Generalised Autoregressive Conditional Heteroscedasticity ("GARCH") model were utilized to test for day of the week effects and any other monthly calendar anomaly that has been reported at different times on the Nigerian Stock Exchange.

The evidence from this study indicates that for the Nigerian Stock Exchange All Share Index ("NSE ASI"), and majority of the listed equity instruments, there was no statistically significant day of the week or month of the year effect. There is no evidence of a January effect or any other monthly effects. The constituents of the NSE ASI were employed because as at December 2014, a single stock on the NSE ASI, accounted for over 20% of the index composition. This has been the case since the year 2010.

Keywords: Calendar anomalies, Nigeria, January effect, Day of the week effect, OLS, GARCH.

1. Introduction

According to Muhammad et al (2010), substantial evidence supporting the Efficient Market Hypothesis ("EMH") has been documented over the years. EMH states that security or stock prices fully reflect all available information and will immediately adjust to the arrival of new information (Adam, 2004). However, since equity markets were closed on both Saturday and Sunday, it was argued that investors cannot do anything with the market even though they got some information during the weekend. Therefore there is a lag between the receipt of information and subsequent action, herein is the source of the anomalies. The lag is what is assumed to gives rise to the Monday effect where returns on Monday are lower and statistically significant relative to other days in the week. The work of Rozeff and Kinney (1976) ushered in the review of calendar anomalies in different markets. Banz (1981) found that small firms earn a higher rate of return than larger firms and Donald and Keim (1983) found that the bulk of the returns accruing to small firms are earned in January and half of these in the first five days of the January. Both studies constitute what could be classified as the January effect. In Nigeria, Osazevbaru, H.O. and Oboreh, J. (2014) found that a Monday effect existed on the Nigerian stock exchange between January 1995 and December 2009, it is however unclear from this study whether an all share price index was created or the research was conducted on all listed stocks within the review period.

According to Oduwole (2015), The NSE was instituted in 1960 and has been the primary organised exchange for Nigerian equities since then. The market is yet to develop more sophisticated instruments and very few studies exist on the performance of trading strategies and financial instruments within the Nigerian financial space. Various studies which include; Berument (undated) showed that, "Chang, Pinegar and Ravichandran (1993), Dubois (1986), Kato and Schallheim (1985), Jaffe and Westerfield (1985a, 1985b) and Solnik and Bouquet (1990) show the existence of days of the week anomalies in different markets. Also, Corhay, Fatemi and Rad (1995), Flannary and Protopapadakis (1988), Gay and Kim (1987), and Gesser and Poncet (1997) pointed that the return of the future and foreign exchange rate varies by the day". This study aims to ascertain whether the January effect or Monday effect occurred in 167 listed instruments on the Nigerian stock exchange between January 2004 and December 2014. I also check for other days of the week effects and months of the year anomalies using the simple OLS approach and the GARCH approach in the period January 2004 to December 2014. The methodology is described in section 2 and data and results in section 3. The limitations are also discussed.

2. The Methodology

This paper utilized daily closing share prices for 167 listed firms on the Nigerian Stock Exchange ("NSE") between January 2004 to December, 2014 for days of the week and the closing price for the last day of each month for the month of the year effect. The data was obtained from the Data team of the NSE. Returns data were

generated from the price data using the expression:

$$R_t = \ln(\frac{P_t}{P_{t-1}}) \quad (1)$$

Where R_t is the return at time t, P_t is the current price at time t, P_{t-1} is the earlier period price and ln is the natural logarithm. Osazevbaru, H.O. and Oboreh, J. (2014), explain that the standard methodology employed in investigating anomalies in returns entails estimating an Ordinary Least Squares ("OLS") regression with dummies to capture the day-of-the-week and month-of-the year effects (Gao and Kling, 2005; Dimitrios and Hall, 2007; Alagidede, 2008). To test for any day of the week effect, the study estimated the model below.

$$R_t = \alpha + \beta_1 D_{1t} + \beta_2 D_{2t} + \beta_3 D_{3t} + \beta_4 D_{4t} + \varepsilon_t \quad (2)$$

$$R_t = \alpha + \beta_1 D_{1t} + \beta_2 D_{2t} + \beta_3 D_{3t} + \beta_4 D_{4t} + ... + \beta_{11} D_{11t} + \varepsilon_t \quad (3)$$

Where D is the dummy variable (1 or 0) for the day of the week, α_i is the constant term and the dummy variable for Monday. However, many of the classical assumptions in OLS are violated when testing financial times series. Equation 3 is for the monthly effects regression and the Dummy variables are 1's or 0's for months of the year. According to Connolly (1989) the assumptions violated in financial timeseries include: autocorrelated returns, non-normally distributed residuals, leptokurtosis and heteroskedasticity. If these factors are applied to regression analysis then Connolly found that the day of the week effect disappeared in the US market in 1975. Therefore the lagged returns must be included to remove autocorrelation from the error terms therefore a slightly different equation is tested. Equation 4 below shows this.

$$R_t = \alpha + \beta_1 D_{1t} + \beta_2 D_{2t} + \beta_3 D_{3t} + \beta_4 D_{4t} + \sum_{i=1}^{N} \varphi_i R_{t-i} + \varepsilon_t \quad (4)$$

Where $\sum_{i=1}^{N} \varphi_i R_{t-i}$, is the sum of the lagged values of the return equation where n is the lag order.

To decide the optimal numbers of lags, to use in the regression, the Akaike Information Criterion ("AIC") was utilised. Akaike (1974) provides a model to decide on the optimal number of lags and he formulates

$$AIC = n\log(\frac{RSS}{n}) + 2k \quad (5)$$

Where RSS is the sum of the square residuals from the model and 2k is the penalty term from attaching additional lags, without a penalty term the AIC would always select the model with the highest number of lags.

The premise is that considering information spills into the market over Saturday and Sunday, market participants are likely to sell off on Monday if there is significant negative news. Hence one should observe statistically significant returns on Monday or on any other day with the anomaly. The AIC results differed by stock, hence 3 lags were chosen across all stocks for consistency.

Lagrange Multiplier tests are conducted using the residuals from the model under the null hypothesis and that heterocsedasticity was present. The major problem with the model above is the constant variance assumption. This is unreasonable, considering that time varying variance exists in stock market returns. Therefore a model that can control time varying variances needs to be used. To avoid heteroscedaticity, the study applies the

Generalised Autoregressive Conditional Heterocsedasticity (GARCH) model. In which case, the following equations below are estimated.

Bollerslev (1986) extended Engle's original work by allowing the conditional variance to follow an ARMA process. This model is known as a generalized ARCH model, or GARCH model. A GARCH(r, m) model can be written as

$$a_t = \sigma_t \varepsilon_t \text{, and } \sigma_t^2 = \alpha_0 + \alpha_1 a_{t-1}^2 + ... + \alpha_m a_{t-m}^2 + \beta_1 \sigma_{t-1}^2 + ... + \beta_r \sigma_{t-r}^2 \quad (6)$$

Where $\alpha_0 > 0, \alpha_i \geq 0, \beta_j \geq 0,$ and $\sum_{i=1}^{\max(m,r)} (\alpha_i + \beta_i) < 1$

The latter constraint on $\alpha_i + \beta_i$ ensures that the unconditional variance of a_t is finite, even though its conditional variance evolves over time. It is easy to see that model (6) reduces to an ARCH (m) model if r=0. For the purpose of this review, a GARCH(1,1) model is utilised.

3.Results

Table 1: Day of the week effect – Nigerian All Share Index

	Coefficient	t-statistic
Monday	0.000237138	0.9876532
Tues	0.000753245	1.6034891
Wed	-0.000284803	-0.5978485
Thu	-0.000125401	-0.269939
Fri	-0.000309944	-0.6617343
Lag1	0.337850398	21.55472
Lag2	0.072851686	4.4108429
Lag3	-0.049433681	-3.1515348

In table 1, all day of the week coefficients are statistically insignificant at 5% level of significance for the Nigerian All Share Index. Negative returns for Wednesday to Friday are observed, therefore, there is no evidence of a day of the week effect. There was a marked decline in stock prices and returns in the years 2009 and 2010 in Nigeria, hence this could have affected data series significantly and potentially changed the regime of returns. This could be investigated in a future study.

Table 2: Day of the week effect – 167 Stocks with negative returns

Day	Number of Stocks	% of Sample	Number Sig	% of Sample
Monday	102	61%	17	10%
Tues	83	50%	15	9%
Wed	85	51%	17	10%
Thu	71	43%	13	8%
Fri	54	32%	15	9%

Table 2, shows the number of stocks per day that show negative returns on average during the review period. On Monday 61% of stocks on the NSE showed negative returns however only 17 of these were statistically significant. This accounts for only 10% of the sample size. This therefore makes it easy to conclude that for the majority of stocks on the Nigerian stock exchange there was no day of the week effect within the review period.

The results are contrary to Osazevbaru, H.O. and Oboreh, J. (2014), who find evidence for the Monday effect however, the Monday returns were not statistically significant.

Table 3: Month of the year effect – 167 Stocks with statistically significant returns

Month	Number Sig	% of Sample
Jan	34	21%
Feb	25	16%
Mar	22	14%
Apr	21	13%
May	20	13%
Jun	24	15%
Jul	21	13%
Aug	34	21%
Sep	25	16%
Oct	18	11%
Nov	23	14%
Dec	22	14%

Similarly, table 3 shows the number of stocks that exhibited returns that were statistically significant at 5% level for each month. None of the months showed above 21% of the sample size having statistically significant returns.

4. Conclusion

This paper set out to research various calendar anomalies on the Nigerian stock exchange by reviewing 167 listed instruments overtime, there was no statistically significant evidence of any anomaly amongst the majority of the listed instruments. Therefore in terms of calendar anomalies within the review period, the Efficient Market Hypothesis held true on the NSE. In the future, a different approach could be employed where the data could be reviewed on a rolling basis of 3 – 5 years to ascertain if at a certain point in time these anomalies did exists. The rapid decline of the Nigeria stock exchange in the years 2009 and 2010 could have changed the views of various investors in recent years hence anomalies before then could have now disappeared.

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