

STOCK SPLITS AND THE EFFICIENCY OF THE NIGERIAN STOCK MARKET

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1. Introduction

Since the major work of Fama, Fisher, Jensen and Roll (1969) (which using stock splits offered residual analysis as a better approach to test market efficiency), different tests have been performed to test the efficiency of stock markets of various countries especially United States of America and United Kingdom (Fama, 1970; Scholes, 1972; Millar, 1977; Firth, 1975; Brenner, 1979; Marsh, 1979; among others). However, research into the efficiency of the Nigerian stock market has been limited.

In the finance literature, an efficient stock market is referred to as a market where security prices fully and instantaneously reflects all available information (Fama, 1970; Khoury, 1983; among others). Fama (1970) categorised tests on efficient stock markets into three, each of which, is based on a different notion of exactly what type of information is understood to be relevant. The first type is weak form efficiency in which the relevant information set is based on historical prices. Then, the second type is semi-strong form efficiency, in which the concern is whether prices efficiently adjust to other information that is publicly available (e.g. announcement of earnings, stock splits, new issue etc.). Finally, the last type is strong form efficiency in which the concern is whether prices efficiently adjust to any other information, whether publicly available or not.

Empirical research into the efficiency of stock markets of some countries especially United States of America and United Kingdom appears to show that their stock markets are efficient in the weak and semi-strong form (Fama, 1965; Fama and Blume, 1966; Fama, Fisher, Jensen and Roll, 1969; Scholes, 1972; Firth, 1975; among others). However, any conclusion about strong form efficiency needs to be qualified in view of the great likelihood that specialists and corporate insiders have monopolistic access to information which, on occasions enable them to earn superior returns (Jaffe, 1974; Finnerty, 1976; Reilly and Drzycimsky, 1975; among others).

The focus of this study is on the Nigerian stock market and few tests have been done to test efficiency of the market. Samuels and Yacout (1981) and Ayadi (1983) showed that the Nigerian stock market is weak form efficient. However, practitioners and other writers (not backed by any empirical work) have either held the view or implied that the Nigerian stock market is inefficient (Alile and Anao, 1986; Akingbohunbe, 1990; Odife, 1990; Osaze, 1991; and Mobolurin, 1993). Clarke (1992) in a discussion paper (not backed by empirical work) identified some critical factors that have radically impaired the development of African capital markets; some of which include lack of liquidity, poor information disclosure, questionable pricing formula etc. The implications of these factors identified by Clarke show that African capital markets can hardly be regarded as efficient. Olowe (1998)

provided further evidence for the work of Samuels and Yacout (1981) and Ayadi (1983) by showing that the Nigerian stock market is weak form efficient. However, a weak form efficiency as its name implies is a weaker form of efficiency. It will be of interest to investigate the semi-strong form efficiency of the Nigerian stock market. To date, no empirical work has been conducted to test the semi-strong form efficiency of the Nigerian stock market.

This paper investigates the semi-strong efficiency of the Nigerian stock market using stock splits as an information generating event. The rest of this paper is divided as follows: Section two discusses the literature review; Section three discusses the methodology while the results are presented in Section four. Summary and concluding remarks are discussed in Section five.

2. Literature Review

The focus of this paper is on the semi-strong form of the efficient market model. Semi-strong form tests are concerned with whether security prices fully reflect all publicly available information. There are an enormous amount and variety of public information. Each individual test is concerned with the adjustment of security prices to one kind of information generating events (e.g. stock splits, earnings announcement, accounting changes, new security issues etc.) There is little reason to believe that markets are efficient with respect to some information and not with other similar information. Thus, each test provides accumulating evidence concerning the reasonableness of the semi-strong form of the efficient market model. However, the emphasis of this paper will be on stock split information.

Stock Splits

Stock splits here simply involve changing the number of shares per shareholder without changing the percentage ownership of any shareholder or the assets or earnings of the company. Thus, it includes splitting par value of stocks and stock dividends. Stock splits are well-publicised events which lie within the realm of publicly available information. Suppose the market was inefficient with respect to the occurrence of a stock split. Then it would be anticipated that the price of a stock should, on average, rise in months following a split, as investors gradually come to appreciate the improved earnings outlook of the issuer. If the market is efficient, however, all the information communicated by a stock split should be recognised at the time of the split, and subsequent stock prices should not show

any unusual tendency to rise.

The initial major test of semi-strong efficient market model was the study of Fama, Fisher, Jensen and Roll (FFJR) (1969). They examined the effect of stock splits on security prices using residual analysis methodology. All subsequent studies utilised much of the methodology of FFJR. FFJR examined security returns around split dates to see first if there is any unusual behaviour and, if so, to what extent it can be accounted for by relationships between splits and other more fundamental variables. Using the market model developed by Sharpe (1963) to study the behaviour of average residual and cumulative average residual, FFJR concluded that the stock market is efficient with respect to split information.

Millar (1977) studied whether stock splits and stock dividend share a differing effect on stock prices. Efficient markets require that they should have the same effects, since they are practically the same thing. His findings were that, stock splits and stock dividends caused "no particular difference in stock price behaviour", and his conclusion was that "the investing market appears to be efficient."¹

However, some studies have shown that stock price reactions to stock split is complicated by the fact that announcements of stock dividend or stock splits are usually made in connection with other corporate information releases. Attention was then focused on the informational impact of 'pure' stock dividend and/or stock split announcements. Foster and Vickerey (1978) and Woolridge (1983) finds significant stock adjustments on the declaration dates of stock dividend announcements for a sample of firms that has no additional announcement recorded. Grinblatt, Masulis and Titman (GMT) 1984 analysed a large sample of stock splits announcements. The pure events analysed separately and a significant price response was detected. Stock splits generate a positive abnormal return of close to three percent upon announcement and an additional one percent abnormal return on the ex-day.

Thus, the analysis of pure events is one way to circumvent the problem of other contaminating simultaneous announcements. However, Liljeblom (1989) in a critique of the use of pure observations noted that, since most of the announcements of stock

¹ Reilly and Drzycimski (1981) also in a study on stock splits concluded that "their results consistently supported the semi-strong efficient market hypothesis, because they indicate that stock prices either adjusted prior to or very shortly after the public announcement of stock splits. Their results indicate that abnormal profits were not available to the general public or to professionals who has to pay normal transaction costs. The results do not support the strong form efficient market hypothesis, because it appears that abnormal profits are available to investors with inside information about the forthcoming split announcement..." p. 73-74

dividends and stock splits occur simultaneously to other corporate information disclosures, this selection criteria can lead to a substantial reduction of the data available. Liljeblom (1989) observed that in the sample used by GMT (1984) more than 80 percent of the announcements studied had occurred in connection with some other corporate information releases. GMT used only pure event samples in their cross-sectional regressions, where the event day price reactions were explained by variables associated with different costs of false signaling. Due to this exclusion of contaminated announcements, the sample of stock splits announcements investigated were substantially reduced.

Another critique against the use of pure observation is the potential bias discussed in Brickley (1986). If the market expects some simultaneous announcement, and abnormal return found in a pure sample can be related to the missing item instead of the one announced. Thus, effects of other, missing items can still be reflected in announcement day returns for 'pure' stock dividends or stock splits. The fact that we do not know what expectations are already discounted in stock prices has another dimension. If announcements of stock splits are welcomed as positive signals by the market, expectations concerning these announcements can partly be included in stock prices for a sample of companies with potentially favourable cash-flow forecasts. For such a company, the price reaction to a realized announcement would reflect only the unexpected part of the signal whereas a failure to signal would lead to a price decline. Hence, the total impact on the stock price of a stock split signal could be obtained only by comparing pairs of companies different only in their signaling behaviour. However, Brickley (1986) found no significant abnormal returns around randomly selected proxy disclosure dates (including both clean and contaminated events).

Although, Millar and Fielitz (1973) and Charest (1978) reported evidence of inefficiency, based on weight of evidence so far, semi-strong form of the efficient market hypothesis cannot be rejected on the basis of stock split information.

Empirical research on the semi-strong form of the efficient market model using split information discussed so far relates to the stock markets of developed countries. To date, no empirical work has been conducted to test the semi-strong form efficiency of the Nigerian stock.

3. Methodology

3.1 Data Description and Sample

One major difficulty in carrying out this kind of research in Nigeria is lack of data base.

All the data used in this study were obtained directly by the author which made it cumbersome and tedious. The data obtained which consists mainly of quoted stock prices, cash dividend paid, stock split and stock dividend.

3.1.1 Stock Prices and Security Returns

End of the month quoted stock prices of all companies listed on the Nigerian Stock Exchange throughout the period January 1981 to December 1992 were obtained from the daily official list of the Nigerian Stock Exchange. Companies not listed by January 2, 1981 and companies delisted by the end of December 1992 were excluded from the stock prices collection. 88 companies satisfied this requirement. The monthly stock prices of each of these 88 companies were used to obtain monthly stock returns for them over the period January 1981 to December 1992. The return for month t on a given stock is calculated as:²

$$R_{jt} = \frac{D_{jt} + (P_{jt} - P_{j,t-1})}{P_{j,t-1}} \times \frac{100}{1} \quad (1)$$

where R_{jt} = Return on common stock of company j in month t .

$P_{j,t-1}$ = End of the month quoted price of the common stock of company j at the end of the month $t-1$.

P_{jt} = End of the month quoted price of the common stock of company j at the end of the month t .

D_{jt} = Cash dividend paid during month t .

For each stock, in any month, the daily official list of the NSE was checked daily to determine whether there was any XD marking during that month. Cash dividend is treated as paid during a month in which the quoted price of a stock is first marked XD (that is, ex-dividend) by the Nigerian stock exchange.

P_{jt} used in calculating the stock returns is in terms of beginning month price. It is adjusted when necessary to abstract from the effects of capital changes, such as stock splits and stock dividend (or bonus issue), that change the number of shares held by a shareholder but do not affect his claims on the firm's assets and earnings.

Data on terms of split and stock dividend were obtained from the annual report and

² Even though simple returns have been used in this study, our results and conclusions do not differ when continuous compounded returns were used (although not reported).

accounts (1981-1992) of the quoted companies. The annual report and accounts were provided by the Nigerian Stock Exchange. Data on cash dividend paid were obtained from the daily official list of the Nigerian Stock Exchange.

3.1.2 Stock Market Returns

In this study, initial attempt to use the Nigerian Stock Exchange index (a value-weighted index) as a proxy for stock market return was dropped for insufficiency of data. The data on Nigerian Stock Exchange index started during 1984 while stock market return's data are needed for the period January 1981 - December 1992. Thus, an equally weighted portfolio return (R_m) is used as a proxy for stock market return. R_m for month t is obtained by taking the average of the 88 computed security returns in month t as explained in section 3.1.1. R_m is calculated for each month over the period January 1981 - December 1992.

3.1.3 Stock Splits, Estimation Period and Event Period

Stock split is one source of publicly available information. This study examines security returns around the split date (month) to determine whether split information can be used to increase security returns.

Stock split is defined in this study as any arrangement that increased the number of shares outstanding of a company by 15 per cent or more. Thus, this definition includes all stock dividends or bonus issue and stock split (splitting of par value of the shares) that increased outstanding shares by at least 15 per cent (see also FFJR, 1969; Brenner, 1979 among others). However, most of the splits on the Nigerian stock market consist of stock dividend or bonus issue.

Just as in Fama, Fisher, Jensen and Roll (1969) and Brenner (1979) split date (not announcement date) will be investigated.³ In this study, the month of split (month zero) is the month containing the day in which the split is effective. The effective day of a split for a security is defined as the date in which the Nigerian Stock Exchange marks the quoted

3 From the writer's exchanges with Nigerian Stock Exchange officials, the average difference between an announcement date (of notification to the Stock Exchange by quoted companies of a proposed stock split) and the date of closure of register of members is about 60 days. This shows that, on average, the difference between an announcement date and ex-scrip date is about 46 days. This can be compared to Brenner (1979) who reported an average difference between 55 days. See also FFJR (1969).

price of the security ex-scrip. Ex-scrip dates have been chosen because these dates are the only reliable dates available. Ex-scrip dates are much closer to the announcement date than the actual split date.

The estimation time period to be used in this study is from 123 months prior to a split until 21 months prior to a split for a total of 103 months.⁴ In some cases missing returns in the estimation period might result in fewer than 103 months.

The event/test period is from 20 months prior to a split until 20 months after a split. There is no missing return data in the event/test period.

For any split to be selected for analysis, the following criteria must be met.

- (i) The split must increase outstanding shares by at least 15 per cent.
- (ii) The company that made the split must be listed throughout the period January 1981 - December 1992.
- (iii) At least 40 months securities returns data must be available for estimation period.
- (iv) 41 months securities returns data must be available for event/test period.

86 stock splits involving 59 quoted companies met these criteria and the splits occurred between January 1986 and April 1991.

In this study, all our stock splits data were used for analysis without isolating any other simultaneous event. The imposition of pure event criterion as used by Grinblatt, Masulis and Titman (GMT) (1984) among others (see Section two) would lead to substantial reduction of data. Liljeblom (1989) also noted this potential bias as regards substantial reduction of data. Brickley (1986) also criticised the use of pure observation. If the market expects some simultaneous announcement, an abnormal return found in a pure sample can be related to the missing item instead of the one announced (Brickley, 1986; see Section two).

Just as discussed by Brickley (1986), it might be difficult to associate the occurrence of an event with just one item. The investors might have expected a simultaneous event when they are pricing a security. For instance, investors anticipating a split might also be expecting the company to announce their earnings. Thus, it might appear that controlling for any simultaneous event might bias investors' expectations.

4 The estimation period was not formed on data after the split/announcement since in that case our parameter estimates and estimated standard deviations would be sensitive to both some potential volatility change after stock splits (Ohlson and Penman, 1985; and Liljeblom, 1989) and to some potential ex-coupon effects (Woolridge, 1983; Grinblatt, Masulis and Titman, 1984; and Liljeblom 1989).

3.2 Residual Analysis Methodology

This study investigates the adjustment of security prices to stock split information. In investigating the adjustment of security prices to stock split information, residual methodology is employed. Residual analysis as a test of efficient market hypothesis generally proceed in two stages: First, the relevant parameter, are estimated using a certain model; second, the estimated parameters are used for prediction and use the prediction errors, also called residuals to test market efficiency. The procedures employed in this study are described in the rest of this section.

3.2.1 Choice of Model

The models used in this study for estimating residuals are as follows:⁵

- (i) Market model, i.e.

$$R_{jt} = \alpha_j + \beta R_{mt} + e_{jt} \quad (2)$$

- (ii) Market deducted returns model i.e.

$$R_{jt} = R_{mt} + e_{jt} \quad (3)$$

- (iii) Mean adjusted returns model i.e.

$$R_{jt} = \bar{R}_j + e_{jt} \quad (4)$$

where R_{jt} = the observed return for security j in month t .

R_{mt} = the stock market return in month t using equally weighted portfolio return of Nigerian Stock Exchange Common Stocks (average monthly stock returns) as a proxy.

\bar{R}_j = the average return on security j over the estimation period.

α_j and β_j = OLS estimates from the regression of stock return on market return over

5 Choosing between these models is by no means straight forward and at a least a study has been devoted to a question of choosing models (Brenner, 1979). The market model (2) tends to perform relatively poorly in terms of statistical efficiency since the alpha estimates impound any unusual behaviour during the estimation period, giving rise to noisy stage two estimates of abnormal return (Brenner, 1979; Marsh, 1979). If stock splits are distributed by companies that are experiencing an unusually positive price development, an announcement month (split month) price reaction for return from model (3) can more easily appear to be significant due to the selection bias of estimation period (Liljeblom, 1989). On the other hand, if a selection bias of estimation period were present also the parameter value of α_j and β_j from models (2) and (4) would be larger hence making it difficult to reject the hypothesis of no significant price reaction to the announcement (i.e., split month) (Liljeblom, 1989). Model (3) can be regarded as a limiting case of model (2) where all alphas are zero and all betas are one (Marsh, 1979). Thus, the three models complement each other. Because of this, we decided to use all the three, since this enables us to test the sensitivity of our results to each of these models. Studies that have used more than one model include Brenner (1979), Marsh (1979), Brown and Warner (1985), Corrado (1989), Liljeblom (1989), Campbell and Wasley (1993) among others.

the estimation period.

e_{it} = the residual or error term or abnormal return in either of the three models.
 $E(e_{it}) = 0, \text{COV}(e_{it}, e_{i,t-1}) = 0 \quad \forall i, t$

The market model (2) is the market model used by Fama, Fisher, Jensen and Roll (FFJR) (1969) and is the most common model used in the test of market efficiency and/ event studies [see also Brenner (1979), Marsh (1979), Liljeblom (1989), Campbell and Wasley (1993) among others]. The model is also not subject to Roll's (1977) critique unlike the Sharpe-Lintner Capital Asset Pricing Model.

The market deducted returns model has been used by Brenner (1979), Marsh (1979), Brown and Warner (1985), Corrado (1989), Liljeblom (1989) among others.

The mean adjusted returns model as discussed in Brown and Warner (1980, 1985) was found to be as powerful as any of the more complex procedures as long as event dates are not clustered in calendar time.⁶ Most event studies now make use of the mean adjusted returns model (Brown and Warner, 1985; Kalay and Loewenstein, 1985; Oppenheimer and Dielman, 1988; Liljeblom 1989; Corrado, 1989; Campbell and Wasley, 1993 among others).

3.2.2 Residuals Estimation

Residuals or excess return are calculated for the event or study period of \pm months around the split month from each model of (2), (3) and (4). Residuals are also calculated for the estimation period using each of these models.

Based on residuals or excess returns from (2) to (4) for the 86 stock splits, the average residual return in each event period month is computed as:

$$AR_t = \bar{e}_t = \frac{\sum_{j=1}^{N_t} e_{jt}}{N_t} \quad (5)$$

where AR_t = is the average residual for month t .

N_t is the number of splits in month t .

Average residual, AR_t is computed for t in the interval $-20 \leq t \leq 20$.

Cumulative average residual for each month, CAR_t is computed as

$$CAR_t = \sum_{k=-1}^t AR_k \quad (6)$$

⁶ Clustering of event dates is not a serious problem with stock splits. See Brenner (1979).

At every t , we sum all ARs from month $K=20$ to month t .

As this study is concerned with market efficiency, more emphasis will be placed on post-split AR and CAR (Brown, 1974; Marsh, 1979; Brenner, 1979; among others). If any of the post-split AR is statistically significant or CAR is statistically and economically significant; or any of the difference between CAR in month t and CAR in month K (Δ_m) is statistically and economically significant, the stock market will be regarded as being inefficient in the semi-strong form. The tests on the statistical significance of AR and CAR are discussed in Section 3.2.4 below.

The economic significance of cumulative excess returns, CARs; or cumulation of ARs for some consecutive months e.g. month $t=0$ to month $t=1$ etc.; or differences between CAR in month t and CAR in month k will be tested by checking whether their values exceed transaction costs on the Nigerian stock market. Prior to 1993, transaction costs of trading in equities on the Nigerian Stock Exchange sum to 3.1258 per cent, but from 1993, transaction costs sum to 4.00075 per cent (excluding value-added tax). In this study, the current transaction costs of 4.00075 per cent will be used to check whether excess returns can be earned even on the basis of these costs.

3.2.3 t-Test Statistics for AR and CAR

(a) t-test for AR

Two different t-test statistics are used in this study to test the significance of the average residuals of each model. The t tests are based on the assumption that residuals are distributed normally.⁷

The first t-test, t_1 is computed as follows.⁸

$$t_1 = \frac{AR_t}{SDE_t} \quad (7)$$

where SDE_t is the standard error of average residuals in month t and is given by the cross sectional standard deviation (STD) computed for every relative month divided by \sqrt{n} .

7 The problem of interpreting significance test is one-sided, if the hypothesis is rejected under normality, it may hold under a stable distribution. If, however, the hypothesis cannot be rejected under normality, then we cannot reject it assuming a stable distribution. See Brenner (1979).

8 This t_1 -test statistic is based on the assumption that the excess returns for each event are cross sectionally independent and normally distributed (Brown and Warner, 1985; Liljeblom, 1989). Brown and Warner (1985) results indicate that if there are only slight departures from independence, explicit use of this information can increase the efficiency of the variance estimator. This t_1 -statistic in turn has the advantage of reflecting changes in the event time in the standard deviations (Liljeblom, 1989). This approach was also used by Brenner (1979).

n is the number of splits.

SDE_t is thus given as,

$$SDE_t = \sqrt{\frac{\sum_{i=1}^n 1(\hat{e}_{it} - \bar{\hat{e}}_t)^2}{n(n-1)}} \quad (8)$$

where \hat{e}_{it} is the residual from any model;

$\bar{\hat{e}}_t$ is the average residual from any model.

n is the number of splits

The t1-test for $n-1$ degrees of freedom will be used to show whether the average residual, $AR_t \equiv \bar{\hat{e}}_t$ is significantly different from zero.

The second t-test, t2 is based on a procedure similar to a procedure suggested by Brown and Warner (1985). For each month t , t2 is calculated as follows:

$$t2 = \frac{AR_t}{SER} \quad (9)$$

where AR_t is the average residual return for month t .

SER is the standard error of the average residual return to which is given by \hat{SAR}/\sqrt{n} .

\hat{SAR} is the standard deviation of the average residual returns over the pre-event period.⁹

n is the number of splits

$$\hat{SAR} = \sqrt{\frac{1}{102} \sum_{t=-123}^{-21} [AR_t - \overline{AR}]^2} \quad (10)$$

$$\overline{AR} = \sum_{t=-123}^{-21} \frac{1}{103} AR_t \quad (11)$$

(b) t-test for CAR

To test the statistical significance of CAR_t of each model, the standard error of the cumulative average residual, CER_t is computed. This is computed by first adding the monthly cross-sectional variances over t and then divide by n . The square root gives us

⁹ The normal probability plots of average excess returns in the estimation period showed a departure from normality in all the models. This approach, thus, has to be used with caution.

CER_t . Thus, CER_t is computed as

$$CER_t = \sqrt{\frac{\sum_{k=-20}^t -20 \sum_{j=1}^n (\hat{e}_{jt} - \bar{\hat{e}})^2}{n(n-1)}} \quad (12)$$

where n is the number of splits in month t

$$k = -20, \dots, t \\ -20 \leq t \leq 20$$

At every t , we sum all the cross-sectional variances from month $k = -20$ to month t and divide by the number of splits in month t before finding the square root.

$$t3 = \frac{CAR_t}{CER_t} \quad (13)$$

The $t3$ -test for $n-1$ degrees of freedom will be used to test the statistical significance of CAR .

(c) t-test for differences between CARs

A further analysis on testing for the difference (Δ) between CAR in month t and month k , will use the following approach in calculating t-test:

- (i) The standard error of CAR_t minus CAR_k for a model is calculated. This is found by first adding the monthly cross-sectional variances from month $k+1$ to month t and then divide by n (number of splits in month t). The square root then gives us the standard error of CAR_t minus CAR_k .
- (ii) The t-test then is computed as CAR_t minus CAR_k divided by the computed standard error.

This approach was also used by Brenner (1979).

3.2.4 Non-Trading/Inactive Trading

A potential source of bias in the result is non-trading/infrequent trading. This problem was first identified by Fisher (1966) and hence known as Fisher effect. The problem is particularly acute for some quoted prices on Nigerian Stock Exchange. The major source of bias is the tendency for prices recorded at the end of a period to represent the outcome of a transaction which occurred earlier in or prior to the period of question. Similarly, returns on market index are some weighted average of the returns for the period of interest and the returns for prior period. As discussed by Dimson (1979) and Marsh (1979), infrequently traded securities will have both covariance and variance terms which are downward biased. However, the direction in the bias of β_j estimate will depend on the relative trading

frequencies of shares in the sample versus the constituents of market index. Marsh (1979) pointed out that, when estimating the betas of a random sample companies using a market value-weighted index (such as Nigerian Stock Exchange Index) which tends to be biased towards large companies, it seemed almost certain that the mean estimated beta will be less than one.

Two principal approaches have been suggested to handle non-trading in the literature. Dimson (1979) suggested the aggregated coefficients method [see also Scholes and Williams (1977)]. In this method, beta is estimated by summing the coincident, lagged and leading betas from a multiple regression of security returns on coincident, lagged and leading market returns. An alternative approach used by Marsh (1979) is the trade to trade method [see also Franks, Broyles and Hecht (1977)]. In this approach, betas are estimated on the basis of variable rather than fixed length periods, where each period is defined as the time between two adjacent recorded trades. The return on the index is then calculated over precisely the same period and market model parameters are estimated using these paired observations.

In this study, we first conducted a test using the aggregated coefficients method. However, a number of questions was raised especially about the appropriate number of leads and lags to include and over the extent of noise in the aggregated coefficients for individual securities. This potential source of bias was also noted by Marsh (1979). To avoid bias due to arbitrary selection of leads and lags, this approach was dropped.

The trade to trade method used by Marsh (1979) requires a database containing trading dates as well as prices. Marsh himself noted that he was able to use this approach because London Share Price Database offers an advantage of containing trading dates as well as prices. Marsh also noted that the absence of trading date data has made this approach unpopular.¹⁰ There is an absence of database containing trading dates and prices in Nigeria. Thus, this approach is also not used in this study.

The approach adopted in this study is to reduce the effect of non-trading on our result as much as possible. First, we try to avoid the use of daily or weekly data. To use daily or weekly prices will produce too many observations of "no change" in prices. Ayadi (1983) who noted this problem used weekly prices in his study. However, the problem might still be present with weekly prices. Thus, in this study, monthly data will be used. Second, since

¹⁰ The trade to trade method can also create the problem of heteroscedasticity in the market model parameter estimate using OLS if the variance of residuals is approximately proportional to the length of the period. Marsh (1979) also noted this problem.

downward bias in the estimate of beta is more definite for market-value weighted index such as Nigerian Stock Exchange Index (Marsh, 1979), we constructed an alternative proxy for market portfolio return. An equally weighted portfolio return is constructed by averaging the monthly computed security returns of quoted companies on the Nigerian Stock Exchange (see section 3.1.2). The beta estimate using this equally weighted portfolio return (R_m) might reduce the bias in the estimate of beta. Third, to increase reliability in the results, we presented results of residual analysis using market deducted returns model and mean adjusted returns model.

Finally, tests are also conducted to check whether the results obtainable from the residual analysis, from our sample of 86 stock splits, for the market model, market deducted return model and mean adjusted returns model, using the procedures in Section 3.2.1 to Section 3.2.3 might have been affected as a result of inclusion of inactively traded securities in our sample. The Securities and Exchange Commission (SEC) usually publishes in its annual report and accounts a list of 20 actively traded securities. Using SEC annual reports and accounts from 1988 to 1992, we selected our sample of actively traded securities by selecting a company which is in our stock split sample companies and is classified as actively traded securities by value by SEC at least twice in any of the five years, 1988, 1989, 1990, 1991 and 1992. This procedure resulted in 44 stock splits involving 24 actively traded securities. The behaviour of average residuals and cumulative average residuals is then investigated for these 44 stock splits for the market model, the market deducted return model and the mean adjusted return model using the procedure in Section 3.2.1 to Section 3.2.3.

4 The Results

4.1 Market Model Parameter Estimation

Table 1 summarizes the frequency distribution of the regression results for the 86 stock splits sample using market model (2) over the estimation period as discussed in chapter three using the stock returns data for the period January 1981-December 1992. The maximum estimation period uses stock returns for the period January 1981-July 1989.

The stock market returns, on average, explained 20 percent of the variance in security returns. This mean value of R^2 is comparable to the results reported by Kaplan and Roll (1970), Brown (1978), Marsh (1979) among others.

Beta (β) coefficients, on average, are statistically significant at the 5% level. The stock market returns (an equally weighted market portfolio return) produce a mean β estimate

of 1.16. The downward bias in beta as expected in a value-weighted index (Marsh, 1979) appears to have been avoided.

The mean α estimate in Table 1 is comparable to the results reported by Fama, Fisher, Jensen and Roll (FFJR) (1969), Brown (1970), Marsh (1979) among others. The F-Statistic, on average, shows that R^2 is significantly different from zero at the 5% level.

The results in Table 1 conform fairly well so the linear regression model. The mean and median values of Durbin-Watson test statistic show that there is no evidence of first-order autocorrelation of residuals at the 5% significance level in the estimate. The scatter diagrams for the estimation period for all the split securities of (a) monthly security return versus market return and (b) estimated residual return in month t versus estimated residual return in month $t-1$ along with (c) normal probability plots of market model residuals, on average, support the regressions assumptions of linearity, homoscedasticity and serial independence.

Table 1. Distribution of Market Model Parameter Estimates for the Stock Splits Sample

Time Period	Statistic	Mean	Standard Deviation	Quartiles			Extreme Values		Skewness
				1	2**	3	Min	Max	
Monthly, Maximum Estimation Period: January 1981-July 1989 (Sample size=86)	α	0.27	1.31	0.52	0.38	1.12	-3.04	4.11	-0.25
	$t(\alpha)$	0.61	1.50	0.51	0.59	1.78	-2.65*	4.72*	0.04
	β	1.16	0.84	0.56	0.97	1.50	-0.17	4.46*	0.68
	$t(\beta)$	3.98*	2.41	2.32*	3.85*	5.85*	-0.68	10.43*	0.16
	R^2	0.20	0.15	0.07	0.17	0.32	0.00	0.59	0.60
	F	21.29*	22.04	5.36*	14.25*	33.84*	0.13	108.86*	0.96
	DW	1.71*	0.35	1.45	1.69*	1.88*	1.05	2.71*	0.17
	T	71	19.51	51	74	89	41	103	-0.46

* indicates significant at the 5% level.

** indicates that second quartile is the same as the median.

T denotes number of observations.

The stock returns data for the period, January 1981 - December 1992 has been used in obtaining the estimation period for each split (see Chapter three) model.

However, the normal probability plots of market model residuals for the estimation period, on average, showed a slight departures from normality. This sort of departure was also noted by Marsh (1979). FFJR (1969) results also show that the distribution of residuals do not conform to the normal linear regression. Thus, as noted by Marsh (1979), it seems prudent to treat ordinary least squares significance test with caution.

However, in sum, our market model (2) stands up fairly well to the assumption of linear

regression model.

The rest of our analysis will concentrate on analyzing the behaviour of estimated residuals of split securities in the event period. The market deducted returns model and the mean adjusted returns model will also be examined to increase reliability in our results.

4.2 Residual Analysis

4.2.1 All the Splits Sample Results

Table 2 (Panels A,B, and C) show the average residuals (ARs), cross-sectional standard deviation of residuals (STD), t-statistics (t1 and t2) for ARs, cumulative average residuals (CARs) and t-statistic (t3) for CARs for all the stock splits sample in 40 months surrounding the split month. Panel A of Table 2 presents the results using the market model. Panel b of Table 2 shows the results using the market deducted returns model while Panel C of Table 2 shows the results using the mean adjusted returns model. Figure 1 presents the graphs of the cumulative average residuals for all the splits sample.

The behaviour of average residuals in 20 months preceding the split month in Panel A of Table 2 are not systematically positive or negative. Unlike other studies [e.g. FFJR (1969)], the pre-split ARs show a poor price adjustment. In FFJR (1969), the largest values of AR occurred 2,3 and 4 months prior to a split. This corresponds to the usual lead time between the announcement of a split and the actual split. Once a split is announced, investors can reasonably anticipate that the split will actually occur and hence will build up the price of the stock, resulting in abnormally high yields. The pre-split behaviour of ARs (especially five months before the ex-scrip month) appears to suggest that Nigerian investors did not anticipate or poorly anticipate that split will occur before the Nigerian Stock Exchange marks the prices of the quoted securities ex-scrip. The pre-split behaviour could hardly be attributed to the impending split as the largest pre-split AR occurred in month $t=-8$. The excess return in month $t=-8$ could have been due to other information effect.

The cumulative abnormal returns (CARs) in Panel A of Tale 2 show the positive abnormal returns prior to the split date. However, these pre-split CARs are statistically insignificant. The CARs in Panel A of Table 2 are statistically significant at the 5% level from month $t=+9$ to month $t=+14$. The positive pre-split returns are similar to the results reported by Marsh (1979). However, since the concern of this study is market efficiency, more attention will be confined to post-split period (see Section three). The post-split CARs show the existence of abnormal returns as indicated from the trend in statistical significance of CARs. This might tentatively indicate that the market is inefficient.

Table 2 Average Residuals, Cross-Sectional Standard Deviation of Residuals, t-values for Average Residuals, Cumulative Average Residuals and T-statistic for Cumulative Average Residuals in Month Surrounding the Split Month for All the Split Sample

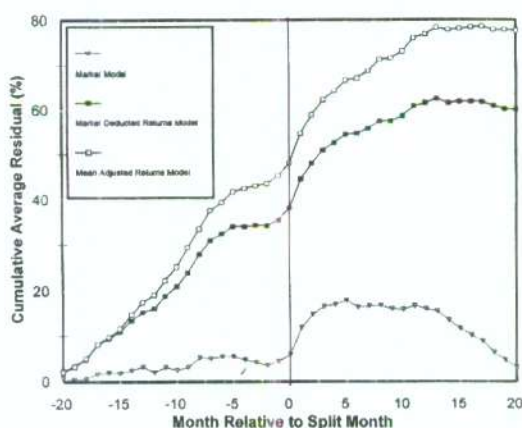
Month	Panel A: Market Model					Panel B: Market Deducted Returns Model					Panel C: Mean Adjusted Returns Model							
	AR	STD	t1	t2	CAR	AR	STD	t1	t2	CAR	AR	STD	t1	t2	CAR			
-20	0.72	8.65	0.77	3.38*	0.72	0.77	2.30	8.71	2.45*	4.80*	2.30	2.45*	2.13	8.30	2.38*	4.58*	2.13	2.38*
-19	-0.18	5.83	-0.28	-0.83	0.54	0.48	1.19	6.61	1.67	2.49*	3.49	2.96*	1.17	5.98	1.82	2.52*	3.30	3.00*
-18	0.13	0.13	0.15	0.62	0.67	0.47	1.37	8.51	1.49	2.85*	4.86	3.25*	1.80	8.41	1.99	3.86*	5.10	3.57*
-17	1.08	8.99	1.11	5.09*	1.75	1.09	3.23	9.82	3.05*	6.73*	8.10	4.42*	3.09	9.57	2.99*	6.62*	8.19	4.65*
-16	0.24	5.46	0.40	1.12	1.99	1.09	1.35	5.84	2.14*	2.81*	9.45	4.88*	1.63	5.90	2.57*	3.50*	9.82	5.24*
-15	-0.05	9.30	-0.05	-0.23	1.94	0.93	1.62	10.60	4.41*	11.6	4.92*	1.84	10.59	1.61	3.94*	11.66	5.32*	
-14	0.53	9.43	0.52	2.52*	2.47	1.07	2.31	8.74	2.44*	4.80*	13.37	5.48*	3.09	9.11	3.15*	5.63*	17.46	6.14*
-13	0.81	8.09	0.92	3.81*	3.28	1.33	1.86	7.89	2.19*	3.88*	15.23	5.90*	2.73	8.31	3.05*	5.85*	14.79	6.82*
-12	-1.27	10.65	-1.17	-5.99*	2.01	0.74	0.89	8.16	1.01	1.85	16.12	5.91*	1.64	8.47	1.79	3.51*	19.13	7.02*
-11	1.21	10.10	1.11	5.70*	3.22	1.11	2.79	10.00	2.59	5.82*	18.91	6.45*	3.19	10.07	2.94*	6.84*	22.32	7.61*
-10	-0.68	11.19	-0.56	-3.19*	2.54	0.81	2.15	9.43	2.12*	4.49*	21.07	6.78*	2.99	9.64	2.87*	6.40*	25.30	8.13*
-9	0.70	8.85	0.73	3.28*	3.23	0.98	3.00	8.36	3.33*	6.25*	24.07	7.44*	4.13	8.09	4.73*	8.85*	29.43	9.11*
-8	2.08	10.90	1.93	9.82*	5.31	1.53	4.00	10.53	3.53*	8.34*	28.07	8.19*	4.07	10.39	3.63*	8.73*	33.50	9.80*
-7	-0.18	10.41	-0.16	-0.87	5.13	1.41	2.92	8.94	3.03*	6.09	30.99	8.71*	4.06	9.14	4.11*	8.69*	37.56	10.56
-6	0.38	6.79	0.56	1.78	5.51	1.49	1.44	5.60	2.38*	2.99*	32.43	8.98*	1.81	5.75	2.92*	5.27*	39.36	10.90*
-5	0.06	7.92	0.07	0.29	5.57	1.47	1.64	8.45	1.80	3.41*	34.07	9.15*	2.43	8.82	2.55*	5.21	41.79	11.19*
-4	-0.70	5.23	-1.25	-3.32*	4.86	1.27	-0.04	5.07	-0.08	-0.09	34.02	9.04*	0.73	4.95	1.37	1.52	42.52	11.27*
-3	-0.58	6.64	-0.80	-2.72*	4.29	1.10	0.36	5.78	0.58	0.75	34.38	9.01*	0.66	5.84	1.05	1.47	43.18	11.29*
-2	-0.73	4.15	-1.62	-3.43*	3.56	0.91	0.12	5.05	-0.22	0.26	34.26	8.89*	0.43	5.42	0.74	0.93	43.62	11.27*
-1	1.00	5.63	1.65	4.73*	4.96	1.15	1.26	5.32	2.20*	2.62*	35.52	9.12*	1.72	5.67	2.81*	3.68*	45.33	11.57*
0	1.42	18.97	0.69	6.69*	5.98	1.34	2.69	8.49	1.35	5.60*	38.21	8.73*	2.85	18.57	1.42	6.11*	48.18	10.95*
1	5.84	11.19	4.84*	27.55*	11.81	2.55*	2.42	10.58	5.63*	13.37*	44.63	9.87*	6.55	11.13	5.46*	14.05*	54.74	12.00*
2	2.93	9.63	2.82*	13.82*	14.74	3.10*	3.50	12.06	2.69*	7.29*	48.13	10.23*	4.25	12.14	3.24*	9.10*	58.98	12.43*
3	1.84	8.59	1.99	8.69*	16.58	3.43*	2.85	9.79	2.70*	5.93*	50.98	10.57*	3.19	9.75	3.04*	6.84*	62.17	12.79*
4	0.38	6.37	0.54	1.78	16.96	3.47*	1.72	6.57	2.43*	3.59*	52.70	10.81*	2.15	6.15	3.23*	4.60*	64.32	13.11*
5	0.99	10.00	0.92	4.68*	17.95	3.59*	1.88	9.82	1.77	3.91*	54.58	10.94*	2.63	9.54	2.56*	5.65*	66.95	13.36*
6	-1.51	11.36	-1.31	-7.58*	16.35	3.17*	0.22	8.23	0.25	0.47	54.80	10.81*	0.44	8.39	0.44	0.86*	67.36	13.23*
7	0.29	9.58	0.28	1.36	16.63	3.16*	1.08	10.27	0.98	2.25*	55.88	10.77*	1.51	10.22	1.37	3.24*	68.87	13.22*
8	0.12	7.31	0.15	0.57	16.76	3.15*	1.72	7.70	2.07*	3.58*	57.60	10.97*	2.33	7.42	2.91*	4.99*	71.20	13.51*
9	-0.72	4.86	-1.37	-3.38*	16.04	3.00*	-0.03	5.38	-0.06	-0.07	57.57	10.89*	0.23	5.13	0.41	0.49	71.42	13.47*
10	0.18	6.07	-0.28	-0.86	15.86	2.95*	1.10	9.02	1.13	2.29*	58.67	10.92*	1.60	9.02	1.64	3.42*	73.02	13.55*
11	0.83	12.46	0.62	3.90*	16.68	3.01*	2.16	14.11	1.42	4.50*	60.83	10.89*	3.04	14.36	1.96	6.51*	76.05	13.56*
12	-0.67	8.66	-0.72	-3.19*	16.01	2.85*	0.73	7.93	0.85	1.51	61.56	10.89*	0.84	7.52	1.04	1.81	76.90	13.57*
13	-0.54	10.96	-0.46	-2.46*	15.47	2.69*	0.90	10.82	0.78	1.88	62.46	10.83*	1.48	10.61	1.29	3.17*	78.38	13.56*
14	-1.98	6.31	-2.90*	-9.33*	13.49	2.33*	-0.94	5.22	-1.67	-1.96	61.52	10.61*	-0.50	5.14	-0.90	-1.07	77.68	13.41*
15	-1.86	10.52	-1.64	-8.79*	11.63	1.97	0.33	10.24	0.30	0.68	61.85	10.48*	0.25	10.86	0.22	0.54	78.13	13.19*
16	-1.42	6.19	-2.12*	-6.68*	10.22	1.72	-0.02	4.72	-0.04	-0.05	61.82	10.44*	0.28	4.89	0.54	0.60	78.41	13.19*
17	-1.29	5.34	-2.23*	-6.08*	8.93	1.50	-0.11	4.56	-0.23	-0.24	61.71	10.38*	0.18	4.62	0.36	0.39	78.59	13.17*
18	-2.52	9.00	-2.59*	-11.89*	6.41	1.06	-0.81	5.96	-1.08	-1.69	60.90	10.17*	-0.67	7.37	-0.85	-1.45	77.92	12.94*
19	-1.63	6.25	-2.42*	-7.71*	4.78	0.79	-0.68	4.13	-1.54	-1.42	60.21	10.02*	-0.04	4.71	-0.09	-0.09	77.88	12.89*
20	-1.73	5.95	-2.70*	-8.19*	3.04	0.50	-0.12	4.82	-0.23	-0.25	60.10	9.97*	-0.18	5.08	-0.32	-0.32	77.70	12.81*

AR, STD and CAR are in percentages; sample size is 86 stock splits; *Indicates significance at the 5% level.

The results in Panels B and C of Table 4.2 are similar to those of Panel A of Table 4.2. The behaviour of pre-split average residuals in Panels B and C is similar to those of Panel A especially in terms of the largest values of pre-split ARs. In Panel B, the largest value of AR occurred in month $t=-8$ while largest value of AR occurred in month $t=-9$ in Panel C of Table 2. In Panel B and C of Table 2, the ARs in months $t=-2$, -3 and -4 are smaller than these largest ARs. Following FFJR (1969), it also appears that the pre-split behaviour of ARs could hardly be attributed to the impending split. The results in Panel B of Table 2 unlike Panels A and C show that all the pre-split ARs are positive. Furthermore, ARs are positive and statistically significant, on average, in month $t=-1$ in Panels B and C of Table 2 using both t_1 and t_2 statistics. This appears to indicate a little anticipation or it could be due to other information effect.

A similarity in the t statistics of post-split ARs in Panels A, B, and C of Table 2 is that, using both t_1 and t_2 test statistics, ARs are statistically significant at the 5% level in months $t=+1$ and $+2$. The cumulative returns from month $t=0$ to month $t=+2$ in Panel B and C are 12.61 per cent and 13.65 per cent respectively while those of Panel A as stated earlier were 10.19 per cent. These cumulative returns are greater than transaction costs in the stock market indicating existence of abnormal returns.

Figure 1: Cumulative Average Residuals in Months Surrounding the Split Month For All the Splits Sample



The magnitude of the abnormal returns can be seen in Table 3 which shows the differences of CARs for five selective months (months $t=0, +1, +5, +12$ and $+20$) for all the splits sample for the market model, the market deducted returns model and the mean adjusted returns model.

The results in Table 3 show that the smallest value in the first difference (Δ_1) is 5.83 percent from the market model. This value is statistically significant at the 5% level. The value is also economically significant as it exceeds transaction costs which currently sum to 4.00075% in the Nigerian stock market.

The values of Δ_1 for the market deducted returns model and the mean adjusted returns model (which are both greater than 5.83 per cent) appear to show that, a trader that buys a stock on the split month (ex-scrip month) can earn an excess return a month later. The values for the second (Δ_2), third (Δ_3) and fifth (Δ_5) differences appear to show that excess returns can be earned by trading on split information on the Nigerian stock market for the market model, market deducted returns model and the mean adjusted returns model. The values for the sixth difference (Δ_6) are statistically and economically significant in both the market deducted returns model and the mean adjusted returns model. However, Δ_4 and Δ_6 are statistically and economically insignificant in the market model. The excess returns are both statistically and economically significant. The tenth difference Δ_{10} for the market model (which is a decline) appears to show that a trader that takes a short position in securities can earn excess returns between month 12 and month 20 since Δ_{10} is statistically and economically significant. However, Δ_{10} is insignificant in both the market deducted returns model and the mean adjusted return model.

$\Delta_1, \Delta_2, \Delta_3, \Delta_4, \Delta_5$, and Δ_6 in the market deducted returns model and the mean adjusted returns model are larger than those of the market model. Even though it might not be possible to earn significant excess returns in Δ_4 and Δ_6 in the market model; and Δ_7 in both the market deducted returns model and the mean adjusted returns model, the predominant excess returns in $\Delta_1, \Delta_2, \Delta_3$, and Δ_5 in all the models appear to show that the Nigerian stock market is inefficient. Figure 1 also confirms this inefficiency of the stock market. An increasing trend in CAR can be observed, in the first five months after the split for the market model and the first thirteen months after the split for the market deducted returns model and the mean adjusted returns. Even if this might have been due to other information effect (which might likely be publicly available) contaminated with stock split, it is an indication the security prices in the Nigerian stock market appear not to adjust to publicly available information.

In sum, using all the splits sample (86 stock splits), the results appear to show that the

Nigerian stock market is inefficient with respect to split information. The results are unaffected by the choice of model.

Table 3: Differences of CARs for Five Selective Months for all the Splits Sample

CAR Differences (Δ_{jk}) Between Month j and Month k	Market Model	Market Deducted Returns Model	Mean Adjusted Returns Model
$\Delta_1 = (+1) - (0)$	5.83 (4.83)*	6.42 (5.63)*	6.56 (5.47)*
$\Delta_2 = (+5) - (0)$	11.97 (5.33)*	16.37 (6.84)*	18.77 (7.82)*
$\Delta_3 = (+12) - (0)$	10.03 (2.94)*	23.35 (6.54)*	28.72 (8.05)*
$\Delta_4 = (+20) - (0)$	-2.94 (-0.71)	21.89 (5.28)*	29.52 (7.07)*
$\Delta_5 = (+5) - (+1)$	6.14 (3.24)*	9.95 (4.73)*	12.21 (5.88)*
$\Delta_6 = (+12) - (+1)$	-1.94 (-0.76)	6.98 (2.63)*	9.95 (3.77)
$\Delta_7 = (+12) - (+5)$	-12.97 (-5.42)*	-1.46 (-0.69)	0.80 (0.37)

- * indicates significant at the 5% level.
- t-statistics are in parentheses below the difference in CAR values.
- Sample is 86 stock splits.
- The values of CAR differences are in percentage.

4.2.2 Actively Traded Securities

The statistical significance of ARs and CARs for actively traded securities in our stock list sample (although not reported) are similar to the results reported in Table 2. Table 4 which summarises the differences of CARs for five selective months (months $t=0, +1, +5, +12$, and $+20$) also shows that significant abnormal returns can be earned on the Nigerian stock market. $\Delta_1, \Delta_2, \Delta_3, \Delta_4$, and Δ_5 are positive, economically and statistically significant at the 5% level in all the models. Δ_6 is positive, economically and statistically significant at the 5% level in the market deducted returns model and the mean adjusted returns model. Δ_6 , though statistically insignificant at the 5% level in the market model, is economically significant. Δ_7 is negative, statistically and economically significant in the market model.

Table 4: Differences of CARs for Five Selective Months for Actively Traded Securities in the Stock Splits Sample

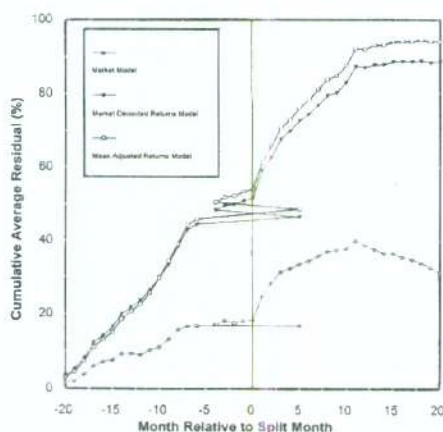
CAR Differences (Δ_m) Between Month t and Month k	Market Model	Market Deducted Returns Model	Mean Adjusted Returns Model
$\Delta_1=(+1)-(0)$	6.31 (3.08)*	7.53 (3.92)*	7.32 (3.56)*
$\Delta_2=(+5)-(0)$	15.09 (4.48)*	21.25 (6.44)*	22.11 (6.49)*
$\Delta_3=(+12)-(0)$	20.34 (4.18)*	35.64 (6.73)*	38.05 (7.02)*
$\Delta_4=(+20)-(0)$	12.76 (2.29)*	37.20 (6.27)*	40.13 (6.62)
$\Delta_5=(+5)-(+1)$	6.31 (2.36)*	13.72 (5.12)*	14.79 (5.44)*
$\Delta_6=(+12)-(+5)$	5.25 (1.49)	14.39 (3.74)*	15.94 (3.78)*
$\Delta_7=(+20)-(+12)$	-7.58 (-2.82)*	1.56 (0.58)	2.08 (0.77)

- * indicates significant at the 5% level.
- t-statistics are in parentheses below the difference in CAR values.
- Sample is 44 stock splits.
- The values of CAR differences are in percentage.

As a comparison with Table 3, the values of Δ_m in Table 4 are clearly larger in all the models. In the market model, Δ_4 and Δ_5 are negative in Table 3, while they are positive in Table 4. These results also seem to indicate that the inclusion of inactively traded securities in the stock splits sample affects the magnitude of the abnormal returns.

Figure 2 also clearly shows that there is an upward increasing trend in the CARs in all the models. The increasing trend in the CARs of the market model now becomes clearer when compared to Figure 1. The market deducted returns model and the mean adjusted returns model appear to have the same pattern in Figure 1.

Figure 2: Cumulative Average Residuals in Months Surrounding the Split Month for Actively traded Securities in the Stock Splits Sample



5. Summary and Concluding Remarks

This study investigated whether the Nigerian stock market is efficient in the semi-strong form that is whether security prices on the Nigerian stock market adjust to publicly available information.

Using stock split as an information generating event, it appears statistically and economically abnormal returns can be earned on the Nigerian stock market. The results are unaffected by the choice of model. The results are also the same for a sample of actively traded securities. Thus, the Nigerian stock market appears to be inefficient in the semi-strong form.

The results have implications for security analysis. Active portfolio management could be suggested as an investment approach that attempts to detect and exploit perceived departures from efficiency [see Foster (1987)].

From the writer's exchanges with stock market operators in Nigeria, one of the problems affecting pricing efficiency in the Nigerian stock market is inadequate information flow in the stock market. The pricing of securities on the secondary market depends to a large extent on the quality, adequacy and timing of information available to

stockbrokers and other market participants. If the flow of information is not adequate or timely, the resulting effect would be that some securities would either be grossly overpriced or underpriced. The listing requirements of the Nigerian Stock Exchange (NSE) provide that after listing, companies quoted on the market should send quarterly reports to the Exchange for onward dissemination to stockbrokers. For companies quoted on the Second-tier securities market, the requirement is that they send their half-year reports and year-end accounts to the Exchange. Also, the general undertaking signed by all quoted companies makes it mandatory for them to notify the Exchange without delay, an announcement of dividends, changes in corporate and capital structure, changes in directorships, changes in the general characters or nature of the business of the company and any other material information. However, as pointed out by Mobolurin (1993), a large proportion of quoted companies do not adhere strictly to these rules and regulations. They often forget to send the required reports or when they do, they are stale and of no value.

The NSE has sanctioned in the past some quoted companies that violated these rules and regulations by either temporarily suspending price movement or suspending trading in the shares of such companies (Mobolurin, 1993). The NSE has also tried to improve on the issue of stale and timey information through the 'Facts behind the Figure Programme' which is in two parts:

- (a) Industrial visits by Stockbrokers and pressmen to the companies.
- (b) The companies visit the Exchange to brief stockbrokers, pressmen and the investing public on the latest happenings in their companies.

These visits might only reduce the problem but may not necessarily be a complete solution. In fact, the visits might not even be timely. For instance, supposing the event might have happened in March (which is known to the company's directors only) and the visits were made in September. Another dimension is that, considering the logistics of organising an industrial visit, some visits might not even take place.

Another problem affecting pricing efficiency in the Nigerian stock market is inadequate understanding of financial information by Nigerian investors and inadequate skills among Nigerian stockbrokers. There are many Nigerian investors that are still financial illiterate. Inability of the investors to understand reported information means that security prices cannot be properly determined as information might not be properly interpreted.

Other problems affecting pricing efficiency in the Nigerian stock market include inefficient communication system, low level of automation in the country and interference by the regulatory authorities in the determination of secondary market prices.

It is suggested that efforts should be made by stock market operators and regulatory

authorities to improve pricing efficiency in the Nigerian stock market to improve allocational efficiency of the market. There is a need to improve the timeliness and adequacy of information flow in the stock market. The NSE should educate the quoted companies about the need to furnish timely information to the stock market. Apart from financial information, quoted companies should also furnish other information such as change in management, new technology, effect of new government legislation, sources of raw materials etc.

There is also a need for the stock market operators and the Securities and Exchange Commission to educate Nigerian investors on understanding and interpreting financial information. This can be done either through publications which should be made easily affordable or by organising seminars or sponsoring regular programmes in the radio or television.

There is also a need for stockbrokers in Nigeria to continuously broaden their skills especially in modern portfolio management and security analysis. This might improve their skills in pricing of securities and also enable them to offer comprehensive and qualitative advice to their clients.

There is also the need for stockbrokers to sharpen their investigative skills as regard's information searching. They should try as much as possible to have up to date information about all quoted securities. The Nigerian government should institute appropriate machinery to improve the communication system in the country. The efficiency of Nigerian Telecommunication Plc (NITEL) should be improved possibly by expediting action on its privatisation and licensing more private telecommunication companies.

Recently, securities clearing, trading and settlement system have been computerised on the Nigerian stock market. However, because of the huge capital outlay involved, many of the stockbrokers are yet to be fully automated. The NSE should continue to encourage stockbrokers to be fully automated.

However, as a suggestion for further research, other information generating events should be used in testing the efficiency of the stock market in the semi-strong form.

References

- Akingbohunbe, S.S., "The Role and Impact of the Securities and Exchange Commission in the Economy", *Securities Market Journal* (Nigeria), 6, 1990 43-51.
- Alile, H.I. and A.R. Anao, *The Nigerian Stock market in Operation*, Lagos: The Nigerian Stock Exchange, 1986.
- Ayadi, O.F., "The Nigerian Capital Market and the Random Walk Hypothesis", Unpublished M. Sc dissertation, University of Lagos, 1983.
- Brennan, M. and T. Copeland, "Stock Splits, Stock Prices and transaction costs", *Journal of Financial Economics* 22, 1988, 83 - 101.
- Brenner, M., "The Sensitivity of the Efficient market Hypothesis to Alternative Specifications of the Market Model", *Journal of Finance*, September 1979, 915-929.
- Brickley, J. A., "Interpreting Common Stock Returns Around Proxy Statement Disclosures and Annual Shareholders Meetings", *Journal of Financial and Quantitative Analysis*, 21, September 1986, 343-349.
- Brown, S., "Earnings Changes, Stock Prices and Market Efficiency", *Journal of Finance*, March 1978, 17-28.
- Brown S., and J. Warner, "Measuring Security Price Performance", *Journal of Financial Economics*, 8 1980, 205-258.
- _____, "Using Daily Stock Returns: The Case of Event Studies", *Journal of Financial Economics*, 14, March 1985, 3-31.
- Brown, S., and M. Weinstein, "Derived Factors in Event Studies", *Journal of Financial Economics*, 14, September 1985, 491-95.
- Campbell, J.C., and C.E. Wasley, "Measuring Security Price Performance using NASDAQ Returns", *Journal of Financial Economics*, 33, February 1993, 73-92.
- Charest, G., "Split Information, Stock Returns and Market Efficiency - I", *Journal of Financial Economics*, 6, 1978a, 265-296.
- Clarke, L.C., "Promoting and Developing Capital Markets in Africa - Essence, Problems and Prospects", Nigerian Securities and Exchange Commission/Africa Development Bank Conference on Promotion of Capital Markets in Africa, Abuja, November 1992.
- Corrado, C.J., "A Non-parametric test for Abnormal Security Price Performance in Event studies", *Journal of Financial Economics*, 23, 1989, 385-95.
- Dimson, E., "Risk Measurement When Shares Are Subject To Infrequent Trading", *Journal of Financial Economics*, 1979, 197-226.
-

-
- Fama, E. F., "Efficient Capital Markets: A Review of Theory and Empirical Work", *Journal of Finance*, May 1970, 383-417.
- _____. *Foundations of Finance*. New York: Basic Books, 1976.
- _____. "The Behaviour of Stock Market Prices", *Journal of Business*, January 1965, 34-105.
- Fama, E. F., and M. Blume, "Filter Rules and Stock market Trading Profits", *Journal of Business*, 39, January 19626, 226-241.
- Fama, E. F., L. Fisher, M. Jensen and R. Roll, "The Adjustment of Stock Prices to New Information", *International Economic Review*, February 1969, 1-21.
- Finnerty, J. E., "Insiders and Market Efficiency", *Journal of Finance*, September 1976, 1141-48.
- Firth, M., "The Information Content of large Investment Holdings", *Journal of Finance*, December 1975, 1265-1281.
- Fisher, L., "Some New Stock-Market Indexes", *Journal of Business*, Supplement, 1966, 1991-225.
- Foster, T. W., and D. Vickerey, "The information Content of Stock Dividend Announcements", *Accounting Review*, April 1978, 360-70.
- Franks, J. R., J. E. Broyles and M. J. Hecht, "An Industry Study of the Profitability of Mergers in the United Kingdom", *Journal of Finance*, December 1977.
- Grinblatt, M. S., R. W. Masulis and S. Titman, "The Valuation Effects of Stock Splits and Stock Dividends", *Journal of Financial Economics*, 13, 1984, 461-90.
- Jaffe, J., "Special Information and Insider Trading", *Journal of Business*, July 1974, 410-428.
- Jensen M., "The Performance of Mutual Funds in the Period 1945 - 64", *Journal of Finance*, May 1968, 389-416.
- Kalay, A., and V. Loewenstein, "Predictable Events and Excess Returns", *Journal of Financial Economics*, 14, 1985, 423-449.
- Kaplan, R. S., and R. Roll, "Investor Evaluation of Accounting Information: Some Empirical Evidence", *Journal of Finance*, April 1972, 225-257.
- Liljeblom, E., "The Informational Impact of Announcements of Stock Dividends and stock Splits", *Journal of Business Finance and Accounting*, 16, Winter 1989, 661-697.
- Lintner, J., "The Valuation of Risky Assets and the Selection of Risky investment in Stock Portfolios and Capital Budgets", *Review of Economics and Statistics*, February 1965, 13-37.
-

Marsh, P., "Equity Rights Issues and the Efficiency of the UK Stock Market", *Journal of Finance*, September 1979, 839-862.

McNichols, M., and A. Dravid, "Stock Dividends, Stock Splits, and Signalling", *Journal of Finance*, July 1990, 857-879.

Millar, J.A., "Split or Dividend: Do the Words Really Matter?" *Accounting Review*, January 1977, 52-55.

Millar, J.A. and B.D. Fielitz, "Stock Splits and Stock - Dividend Dimensions", *Financial Management*, Winter 1973, 35-45.

Mobolurin, O., "Secondary Market Trading: A Critical Appraisal", UNILAG CONSULT's Seminar on Capital Markets, Lagos, March 1993.

Odife, D.O., "Improving the Operational Efficiency of the Nigerian Capital Market", Securities and Exchange Commission's Seminar on Ten Years of Securities Regulation in Nigeria, Lagos, August 1990.

Ohlson, J.A. and S. H. Penman, "Volatility Increases Subsequent to Stock Splits: An Empirical Aberration", *Journal of Financial Economics*, 14, 1985, 251-266.

Olowe, R.A. "Weak Form Efficiency of the Nigerian Stock market: Further Evidence", *African Development Review*, Forthcoming, 1998.

Osaze, B.E., "*The Capital Market - Its Nature and Operational Character*", Benin: Bob Osaze, 1991.

Oppenheimer, H.R., and T.E. Dielman, "Dividend and Earnings Announcements and Stockholders' Returns: Further Empirical Evidence", *Managerial Finance*, 14, Hull N. Humberside: Barmarick Publications, 1988, 34-42.

Reilly, F.K., and E. F. Drzycimski, "short-run Profits from Stock-Splits", *Financial Management*, Summer 1981, 64-74.

Roll, R., "A Critique of the Asset Pricing Theory's Tests", *Journal of Financial Economics*, March 1977, 129-176.

Samuels, J.M., and N. Yacout, "Stock Exchanges in Developing Countries", *Savings and Development*, No. 4, 1981, 217-320.

Scholes, M., "The Market for Securities Versus Price Pressure and the Effects of Information on Share Prices", *Journal of Business*, April 1972, 179-211.

Scholes, M., and J. Williams, "Estimating Betas from Nonsynchronous Data", *Journal of Financial Economics*, December 1977, 309-329.

Securities and Exchange Commission, *Facts and Figures on the Nigerian Capital Market*, 2nd ed. Lagos, 1994.

_____. *Report and Accounts For the Year Ended 31st December 1988*. Lagos, 1989.

_____. *Report and Accounts For the Year Ended 31st December 1989*, Lagos, 1990.

_____. *Report and Accounts For the Year Ended 31st December 1990* Lagos, 1991.

_____. *Report and Accounts For the Year Ended 31st December 1992*, Lagos, 1993.

Sharpe, W., "A Simplified Model for Portfolio Analysis" *Management Science*, January 1963, 277-293.

Shearson Lehman Brothers, Midlantic Banks Inc., Analysis of a possible Stock Split, July 1983.

Woolridge, R.J., "Ex-Date Stock Price Adjustment to Stock Dividends: A Note", *Journal of Finance*, March 1983, 247-255.

Woolridge, R.J., and D. Chambers, "Reverse Splits and Shareholder Wealth", *Financial Management*, 12, 1983, 5-15.

Abstract

This study investigates whether the Nigerian Stock Market is efficient in the semi-strong form, that is, whether security prices on the Nigerian stock market adjust to publicly available information. Stock splits were used as information generating events. Monthly stock returns data over the period January 1981 - December 1992 were employed in the analysis.

Using residual analysis methodology, the market model, the market deducted returns model and the mean adjusted returns model were employed to test the semi-strong form efficiency of the Nigerian Stock market. The results show that the Nigerian stock market is inefficient in the semi-strong form. The results are unaffected by choice of model or choice of proxy for stock market return. The results are also the same for a sample of actively traded securities.

From the writer's exchanges with stock market operators in Nigeria, the problems affecting pricing efficiency in the Nigerian stock market include inadequate information flow in the stock market, inefficient communication system, inadequate understanding of financial information by Nigerian investors, inadequate skills among some Nigerian stockbrokers, low level of automation in the country and interference by the regulatory authorities in the determination of secondary market price.

It is suggested that efforts should be made by stock market operators and regulatory authorities to improve pricing efficiency in the Nigerian stock market to improve allocational efficiency of the market. Recommendations include improvement in the adequacy and quality of information flow in the stock market, improvement in the automation of the stock market, improvement in the knowledge of stockbrokers in modern security analysis and portfolio management and improvement in the efficiency of Nigerian Telecommunication Plc.

FRACTIONNEMENTS D'ACTIONS ET EFFICIENCE DE LA BOURSE DES VALEURS AU NIGERIA

Résumé

Cet étude se propose de vérifier l'efficacité de la Bourse des Valeurs du Nigeria dans la forme semi-forte, c'est à dire si les cours des titres se conforment aux informations à la disposition du public, en utilisant comme opérations source d'information les fractionnements d'actions. Pour l'analyse on a utilisé les données sur les rendement mensuels des actions pour la période janvier 1981 -décembre 1992.

Pour tester l'efficacité dans la forme semi-forte de la Bourse des Valeurs au Nigeria ont a employé le modèle du marché, le modèle des rendements à déduction de marché et le modèle des rendements ajustés à la moyenne sur la base de la méthodologie de l'analyse résiduelle. Les résultats démontrent que la Bourse nigériane n'est pas efficace dans la forme semi-forte. Les résultats ne changent ni par rapport au modèle choisi ni par rapport au type de donnée choisie en substitution du rendement de marché des titres. On a obtenu des résultats pareils aussi pour un échantillon de titres fort négociés.

Une recherche de l'auteur parmi les opérateurs en bourse du Nigeria indique que en ce qui concerne le manque d'efficacité des cours de la Bourse de Valeurs nigériane les problèmes relève de l'insuffisance des flux d'informations, d'un système de communication inefficace, de l'incapacité des investisseurs du Nigeria de comprendre les informations financières, de la spécialisation insuffisante de certains courtiers de bourse, du faible niveau d'automatisation du pays et de l'interférence des autorités de contrôle dans la détermination des cours du marché secondaire.

L'auteur est de l'avis que les opérateurs de la bourse et les autorités de contrôle devraient faire un effort pour améliorer l'efficacité des cours dans le but d'améliorer l'efficacité de distribution du marché. Parmi les recommandation, on souligne l'importance de la qualité et de la quantité des flux d'information, de la promotion de l'automatisation de la bourse des valeurs, de la formation des opérateurs en matière d'analyse des titres et de gestion de portefeuille et de l'amélioration de l'efficacité de la Nigerian Telecommunication Plc.

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