

Share Price Movement and the White-noise Hypothesis: the Algebraic Approach

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Abstract - Over time market players have developed much interest in factors that bring about movement or change in share price in the stock market either upward movement or downward movement several issues have been adduced for this over the years, some of which are rational and some are said to be irrational factors for the purpose of this study this is called market noise or white noise

The problem is that all the mentioned factors can be measured or have been measured one way or the other except the white noise that seems no one have provided any serious measurement for, thus, in this study an attempt is made to test this factor

The secondary source of data was used for the purpose of the analysis and a multiple regression analysis was adopted

The model derived by the researcher shows that the white noise is equal to the error factor of the first order of the regression. The regression model derived in the second order was tested and the result shows that the white noise will improve the coefficient of the impact variables when used and that the predictive power of the model becomes more realistic with the inclusion of the white noise variables than when excluded

It was therefore recommended that white noise coefficient be included when measuring the impact of the independent variable on the market values of share for effective prediction purpose

Key words: share price, white-noise, dividend, interest rate.

1. Introduction

The movement in the price of share at the stock market most of the times has been an issue of concern to market players. The change in the price of share of quoted firms are said to be due to change in certain fundamental factors, this include the financial performance (measured by dividend paid by the firm, the earning made by the firm etc) and the macroeconomic variables(such as interest rate ruling , inflation rate etc) however, experience in the capital market have shown that there are other factors that are responsible for the change in share price but are not captured in these variables, such variable is the market noise this may arose as result of popular opinion on the stock but such opinion can be spurious at times, it can be baseless some times also it can be a calculated attempt by certain interested individuals

,financial analyst of repute or due to certain insider information that may not yet been known in the market. The fact that it is baseless less may make the change in price expected to be worthless at the same times. At other times this insider information may end up being false, however, it would have force the price of the share up. Thus, any relationship established between share price change and the basic fundamentals have less or reduced value, such relationship may be necessary but not sufficient to predicting the behavior of share price in the capital market, this, hence, create a gap in research.

This study therefore is an attempt to create a model that will be able to provide for the market noise (white-noise) factor theoretically and also empirically analyze the theory with the hope of providing a generic model that will gender a high predictive power for the movement in share price in the stock market. It will also measure the relationship between the price of share and the change in the fundamentals without measure of the white-noise and when the white-noise variable is included. It will also measure the change in slope of the predictive variables in the multiple regression pre and post inclusion of the white noise variable.

The study is set out to proffer solutions to the following problems: The movement in share price is not only affected by financial performance of the firm and macroeconomic variables there is also the effect of the market noise(white-noise) that is, changes in price due to popular opinion however there is not known parameter to measure the effect of the market-noise or the white-noise.The error term of the multiple regressions will be very high thereby reducing the value or measuring value of the coefficient of the financial performance and macroeconomic variables, however, with the attempt at measuring the market-noise (white noise) effect there is the tendency to have a reduced error term for the regression equation thereby increasing the predictive value of the regression model.

There is also no any known variable and value to measure the effect of the market noise on the value of share. This study attempt developing a model for this and attempt to test the same.

2. Literature Review

2.1 Efficient Market Hypothesis

The efficient market hypothesis (EMH) as popularised by Fama(1970) stated that the market value of share at all time reflect the base market information both technical and fundamental information which are automatically incorporated into the market value of shares. However, according to Malkiel(2003) It was generally believed that securities markets were extremely efficient in reflecting information about individual stocks and about the stock market as a whole. The accepted view was that when information arises, the news spreads very quickly and is incorporated into the prices of securities without delay, thus, neither technical analysis, (which is the study of past stock prices in an attempt to predict future prices), nor even fundamental analysis, (which is the analysis of financial information) would enable an investor to achieve returns greater than those that could be obtained by holding a randomly selected portfolio of individual stocks thus it is the random walk that count in determining the market value of share. Random walk theory gained popularity when Burton Malkiel(1973)wrote his book "A Random Walk Down Wall Street". Random walk is a stock market theory that states that the past movement or direction of the price of a stock or overall market cannot be used to predict its future movement. Maurice Kendall (1953) originally examined the random walk theory when he stated that stock price fluctuations are independent of each other and have the same probability distribution, but that over a period of time, prices maintain an upward trend and the chance of a stock's future price going up is the same as it going down. On the other research by Tversky(1974) has shown that psychological factors may result in exaggerated stock price movements. Psychological research has demonstrated that people are predisposed to 'seeing' patterns, and often will perceive a pattern in what is, in fact, just *noise*, means that a succession of good news items about a company may lead investors to overreact positively. A period of good returns also boosts the investor's self-confidence, reducing his (psychological) risk threshold the effect of the noise on the stock price movement is what this study is about to evaluate

2.2 Organization Performance and Share Price Change

The price of stocks often going up and down in the market, when there is good news or high profit reports on the other hand if there is ill news or massive loss of profit, the price goes down. Looking at the pattern, there seems to be relationship between share price movement and organization performance. Gidófalvi(2001) Examine the relationship between financial information availability and the share price movement and find in a careful experiment a

definite predictive power for the stock price movement in the interval starting 20 minutes before and ending 20 minutes after financial news become publicly available.

Therefore it is important to note that the share price is not 'directly' determined by the company's earnings and performance but by the forces of demand and supply. It would be noticed that when there is good news or when the company reports a good annual profit, the price would go up. But if there is ill news or negative earnings, the price would drop.

2.3 Factors Responsible for Share Price Change

The new issues (stock) prices are determined by issuing houses/stockbrokers. However, the price of existing issues in the secondary market is determined by stockbrokers only. The prices in the stock exchange are quoted daily on the stock exchange financial list.

The price of existing issues is determined by the force of demand and supply for shares on the trading flow of the stock exchange. The trading (buying and selling) in shares are done by the stockbrokers on behalf of their clients (investors). The trading is done using a computerized trading system known as the Automated Trading System (ATS) (kehinde,2006).

The price of the share can fluctuate either upward (price gain) or downward (price loss). However, the fluctuations cannot go beyond N5 increase or N5 decrease on daily (basis in Nigeria). This is done by the Nigeria Stock Exchange to allow stability of the system (Karel, 2007).

Stock prices do change over the course of time. Some can increase rapidly and make investors a fortune, whereas others can lose a lot of value quickly and bankrupt investors. Stock prices change because of the economics of market forces, and the supply and demand for the stock. This is all based on personal perception. If people think that a company will do better in the future, this will raise the demand and price of the stock, and if they think a company will do worse, this will lower the demand and price of the stock (Afrinvest, 2011).

Any stock trader or prospective investor would know that the share market is a highly volatile one. Prices of shares can change at any time and there are several factors that could cause these changes. The stockbroker would need to understand and study the share market trends in order to be able to predict and forecast what changes may come about in the days to come. What is of importance is that the investor is able to react to these changes well without allowing it to disrupt his stock trading plans.

So what causes this irrational share price changes? As with any form of buying and selling, when it comes to stocks too, the prices are

determined by market forces; that is, demand and supply. The higher the demand for particular shares the greater the price would increase and vice versa. These forces do not however always remain the same. The same shares do not always have the same amount of demand on any given day. The demand for shares may change with the reputation of the company, political climate and several other internal and external factors. Rise in oil prices, risk of the economy collapsing and even threat of war could cause serious fluctuation in market share prices that are often quite unpredictable. Looking at market trends alone therefore is not enough to be able to make predictions. This is why various forecasting methods are also used to aid in the process of making predictions so that a good, well-informed investment decision can be made. (Hot Copper, 2011)

2.4 Earnings

Amol Agrawal(2011) stated that Probably the most important factor that determines the price of a stock is its earnings. In essence, earnings are the profit that a company makes, and no matter how good a company is, if it does not make positive earnings at some point it can't survive. Companies that are traded on the stock market report their earnings four times a year, or once each quarter. Another important factor is the analyst reports.

3.5 Rumor

Ricky Schmidt (2011) noted, however, that no market operates in a vacuum. In a borderless and interconnected world like the stock market, the slightest rumor or threat of war, rising oil prices or interest rate hikes for instance, can detonate a reaction on world markets which then react speedy and unpredictable.

To make matters worse, markets also react to less alarming news and events like a slip of the tongue. One wrong word said by mistake by an analyst or politician can cause a chain reaction and panic sending the markets into red territory.

But whichever way the wind blows, prices can rise as quickly as they fell especially after someone's blunder saying the wrong thing. Once investors come to their senses again the stock markets can even begin to rise the same day again.

3.6 Behavior of Share Prices

In economics and financial theory, analysts use random walk techniques to model behavior of asset prices, in particular share prices on stock markets, currency exchange rates and commodity prices. This practice has its basis in the presumption that investors act rationally and without bias, and that at any moment they estimate the value of an asset based on future expectations. Under these conditions, all existing information affects the price, which changes only when new information comes out. By definition, new information appears randomly and influences the asset price randomly. Empirical studies by Malkiel

(2003) demonstrated that prices do not completely follow random walks. Low serial correlations (around 0.05) exist in the short term, and slightly stronger correlations over the longer term. Their sign and the strength depend on a variety of factors.

Malkiel(2003) also found that some of the biggest price deviations from random walks result from seasonal and temporal patterns. In particular, returns in January significantly exceed those in other months (January effect) and on Mondays stock prices go down more than on any other day. Observers have noted these effects in many different markets for more than half a century, but without succeeding in giving a completely satisfactory explanation for their persistence.

Technical analysis uses most of the anomalies to extract information on future price movements from historical data. But some economists, for example Eugene Fama(, argue that most of these patterns occur accidentally, rather than as a result of irrational or inefficient behavior of investors: the huge amount of data available to researchers for analysis allegedly causes the fluctuations.

The behavioral finance school of thought attributes non-randomness to investors' cognitive and emotional biases. This can be contrasted with Fundamental analysis.

When viewed over long periods, the share price is directly related to the earnings and dividends of the firm. (Robert D. Coleman, 2011) Over short periods, especially for younger or smaller firms, the relationship between share price and dividends can be quite unmatched.

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2.7 Market noise and Share Price Change

Noise refers to meaningless price and volume moves, usually in the short term, which can muddy the interpretation of technical indicators. Market noise is the seemingly mindless back and forth movements on the smaller time frames. A trader's

definition of market noise is usually relative to the time frames that they are trading.(Russell,2011).

Noise refers to Random variations in price and volume, these can distract a trader from the real trend. Noise becomes more noticeable when looking at shorter time frames. Stock market activity caused by program trades, dividend rolls, and o Noise Trader Risk-A form of market risk associated with the investment decisions of noise traders. The higher the volatility in market prices for a particular security, the greater the associated noise-trader risk. Noise has two broad implications. It allows speculative trading to occur it also creates inefficiency in the market. (oraclewizard77, 2011).

Market noise is caused by buy and sells orders from all over the world entering the market for different reasons e.g. Liquidation of stocks for personal reasons, trading objectives that focus on different time periods, currency transactions that hedge international business exposure, etc all come in a steady flow into the marketplace.

Riskier long-term saving requires that an individual possess the ability to manage the associated increased risks. Stock prices fluctuate widely, in marked contrast to the stability of (government insured) bank deposits or bonds. This is something that could affect not only the individual investor or household, but also the economy on a large scale. (oraclewizard77,2011)

4. Research Method

The white-noise hypothesis stated noise stated that changes in the price movement that is not due to macroeconomics changes and performance of the organization but due to insider information, uncoordinated market impulse and irrational choice, insider trading etc this is called the white-noise factor. The white-noise model try to isolate these factors and produce a generally acceptable model tested and that could be used to generate a coefficient and value could be used for test of these variables this is done as below. The white-noise (U1) is the attempt to produce a known value for the hitherto unknown U1 of U in the share price model.

4.1 Method of Data Collection

To test the white-noise hypothesis we use data sourced from the Businessday(2011). The data is the quarterly result of 30 most capitalized firms in the Nigeria capital market for the fist quarter of 2011(December 06/ 2010 to April 06 / 2011) the data was primarily used by the businessday/ Afrinvest 30 index as at April 06 2011. The 30 firms form the times series data used for this study. The average earning, interest rate and price of shares for the quarter stands for a unit of data while the 30 firms the longitudinal data for the study. The analysis was done using the spss16.0 and multiple linear analysis

4.2 Model Specification

$$P_{share} = F(\text{div}, \text{intrate},)$$

Where

Pshare(P) = market price of the share
Div = dividend (representing the financial performance of firms)

Intrate = interest rate (representing the macroeconomics variable)

$$P = a_0 + a_1\text{div} + a_2\text{intrate} + U_0 \dots\dots\dots (1)$$

Where U is the unknown error term of the equation

$$P = a_0 + a_1\text{div} + a_2\text{intrate} + U_1 \dots\dots\dots(2)$$

$$\text{Change in } U = U_0 - U_1$$

Square both side

$$P^2 = a_0 + a_1\text{div}^2 + a_2\text{intrate}^2 + (U_0 - U_1)^2$$

Sum up the changes

$$EP^2 = a_0 + a_1E\text{div}^2 + a_2E\text{intrate}^2 + E(U_0 - U_1)^2$$

Factories the E (U₀ - U₁)²

$$EP^2 = a_0 + a_1E\text{div}^2 + a_2E\text{intrate}^2 + E U_0^2 - 2 U_0 U_1 + U_1^2$$

Get the marginal change in the equation and hence compute the white-noise variable.

Differentiate the equation thus

$$\frac{dEP^2}{du} = a_0 + \frac{a_1 dE\text{div}^2}{du} + \frac{a_2 dE\text{intrate}^2}{du} + \frac{E dU_0^2}{du} + \frac{2dU_0U_1}{du} + \frac{dU_1^2}{du}$$

$$\frac{dEP^2}{du} = -2EU_0 + 2EU_1$$

$$\frac{dEP^2}{du} = 0$$

$$EU_0 = EU_1$$

From the above it goes to say that changes in the white-noise (U₁) will equal the total change in the unknown variable (the basic error term of the organization model) at the equilibrium point of change.

Thus to get the white-noise coefficient a_n the method is to run the regression of the first equation

$$P = a_0 + a_1 \text{div} + a_2 \text{intrate} + U_0 \dots\dots\dots (1)$$

Having obtained the equation of the initial equation we then run the second regression equation thus

$$P = a_0 + a_1 \text{div} + a_2 \text{intrate} + a_n U_1 + U \dots\dots\dots (2)$$

Where U_1 is the white-noise variable and a_n is the coefficient

Result of analysis

$$P = -1.021 -6.242 \text{ intrate} + 17.436 \text{div} + U \dots\dots\dots (1)$$

$$R = 0.918$$

$$R^2 = .843$$

$$\text{Adjusted } R^2 = .831$$

$$F \text{ statistic} = 72.287$$

$$F \text{ statistic sign} = 0.000$$

$$P_2 = -8.496 + 10.255 \text{intrate} + 18.886 \text{div} -113 \text{wn} + U \dots (2)$$

$$R^2 = 0.902$$

$$\text{Adjusted } R^2 = 0.891$$

$$F \text{ statistic} = 79.701$$

$$F \text{ statistic sign} = 0.000$$

The above reveal the result of the regression analysis pre and post white-noise value. The pre white-noise regression an adjusted R^2 of 0.831 while the white-noise adjusted regression (P2) shows an adjusted R^2 of 0.891 .this shows that 89% of the influence on the market share exist when the white-noise (market noise) factor is included . This is an improve measure of influence and have a more reliable relationship inferred by the inclusion of the white-noise factor.

The individual coefficient or slope of interest variables, earning variable are higher with the inclusion of the white-noise variable than without it as shown in the regression model P2. Without the white noise the slope of the variable were -6.242 and 17.436 in (P1) while in P2 they were 10.255 and 18.886 for interest and dividend respectively

The error term of the regression also dropped from 10.009 (in P1) to 8.795 (in P2) this shows that post white-noise models are significant at 95% confidence level having an F-Statistic significant value of 0.0 for both models (P2 and P1) thus both regression models are good measure of the relationship between financial performance(measured by dividend) and macroeconomic variable (measured by interest rate) on the market value (price) of ordinary share at the stock market .

5 Conclusions and Recommendation

The result from the study revealed that financial and macroeconomics variable(s) are good influence or impact on the market value of share however the white-noise is also of value and without the measurement of the impact of the white-noise(market

noise) the predictive power of the macroeconomic and financial performance variable will be reduced and marred however, with the inclusion of the market-noise or the white-noise variable In the model the predictive power of all the variables will improve and become better off .

Recommendation

1. The white-noise model should be included in the regression model for market value relationship with other endogenous and exogenous variables impacting the market value of share for effective predictive ability.
2. The white-noise model should be used by market analysis for decision making purpose thus reducing the error of possible spurious regression.

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