TESTING THE MARKET MICROSTRUCTURE MODEL IN THE NIGERIAN CAPITAL MARKET

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Abstract

This study empirically tests the market microstructure model in the Nigerian Exchange Limited Using daily traded stock of thirty (30) listed companies for May 27th and 28th, 2024. The objective of the study was to find out whether informed and uninformed traders in the stock market can have idea about/predict next day's securities prices using the Glosten and Milgrom (1985) model. findings revealed that Glosten and Milgrom model was able to predict exactly three (3) companies' shares (AFRIPRUD, CONOIL and VERITASKAP), representing approximately 10% of the sample of the study. On the other hand, the model was able to predict the next day share prices of 25 companies with minimal differences ranging around one percent to three percent respectively; and this accounted for about 83.3% of the sample size. The study recommends among others that, in order to continuously guarantee investors' confidence in the market about the efficacy of market microstructure model and its ability to predict next day stock prices, regulators and indeed relevant policy makers should be more proactive in checkmating all forms of market malfeasance such as price manipulations, insider trading among others.

Keywords: Market Microstructure, Trading Mechanisms, Bid-Ask Price, Stock Market Analysis

JEL Classification: D4, D47, E44, C4

1. Introduction

In recent years, market microstructure theory has brought about increased understanding of how the market trading process works, the market structure as well as asset pricing processes. This is crucial in assisting market regulators ensuring steady liquidity in electronic markets with respect to issues relating to high frequency trading. In view of the amount of available data and the development of high frequency trading (HFT), market microstructure is now a mature practical field where precise quantitative theories that has always been at the forefront

of innovation and development in finance can be tested with accuracy (Abregel, Bouchand, Fouccalt, Lahalle & Rosenbaum, 2012).

The widespread interest on securities markets on the part government and academia is an indication of the importance of market microstructure analysis, which addresses issues that concern investors, broker/dealer intermediaries, market regulators, exchanges and trading venues as well as the broad economy. According to Bernstein (1987), interest in market microstructure has increased sharply over the past three and half decades, which is as result of three events; the passage by the U.S Securities and Exchange Commission's SEC institutional investor report (1971), the passage by the U.S Congress of the securities Acts Amendments of 1975, and the sharp stock market drop on October 19, 1987. Furthermore, the advent of computer driven trading in recent years has enabled researchers to capture electronically the full record of all trades and quotes, and this has provided empirical researchers with far richer data (high frequency data) for analyzing trading and price setting (Economides & Schwartz, 1995; Francioni hazarika, Reck & Schwartz, 2008).

Over the years microstructure analysis has expanded, and stock exchange structure in several emerging economies of African has been strengthened a great deal. In view of this fact amassing liquidity is a primary function of the marketplace, as the market structure features are generally designed with liquidity implications in mind. Portfolio managers also take liquidity into account, along aside with risk and return on investment. Thus, difficulties in defining, measuring, and modeling liquidity are formidable; however, studies that deals with it directly are still relatively few today (Bernstein, 1987; Bassler, 2006). For example, in Nigeria empirical studies on market microstructure are still very scanty and this make it an area that is open to more empirical research. To the best of the researcher's knowledge, apart from the studies of Osamwonyi, Igbinosa and Aigboduwa (2011), Eguavoen (2016), as well as Aigbovo and Osamwonyi (2018), Osifo and Okuwhere (2018), no other prior empirical works have been

carried out in the Nigerian context. Hence, this study contributions to the body of knowledge in the aspect of market microstructure by testing the evidence or otherwise of market microstructure model in the Nigerian Exchange Limited (NGX).

2. Literature Review

2.1 Market Microstructure

Market microstructure is the area of finance that studies the process by which investors' latent demands are ultimately translated into prices and volumes (Madhavan, 2000). Webfinance (2015) opines that market microstructure is the underlying mechanism of trading in financial markets which is often analyzed in order to understand price discovery, efficiency in trade execution, impact of volume and other factors. According to Mohammad, Vijayalakshmi, Misbah, Sonam and Sumit (2021), "microstructure is a field of study based on the financial market activities, whose primary focus is on the analysis of market exchange, venues for trading and economic structure of the market which helps in discovering the price process and determines the spreads and quotes".

According to O'Hara (2014), markets are now different in fundamental ways, as high frequency trading (HFT) has clearly made things faster, considering the advent of (HFT) as being only about speed misses the revolution that has happened in markets. From the way traders trade, to the way markets are structured, to the way liquidity and price discovery arise – all are now different in the high frequency world. What is particularly intriguing is the new role play by microstructure.

According to Suthar (2024), "some basic components of market microstructure include: orderbook, market liquidity, bids and asks, order types, high frequency trading, dark pool.

2.2 Market Makers and the Role of Information in Price Formation

Market makers are also of importance because they provide liquidity to the market and permit continuous trading by overcoming the asynchronous timing of investor orders (Madhavan,

2000). They usually quote two prices: the bid price and the ask price. The difference between the bid and the ask price is the market maker's spread. According to Demsetz (1968), market makers provide a service of predictive immediacy in an organized exchange market, for which the bid-ask spread is the appropriate return under competition. They play passive role by simply adjusting the bid-ask spread in response to changing conditions.

According to Mohammad et.al (2021), "microstructure plays a big role in the market liquidity spiral where the liquidity of the stock market is linked to it; this was further buttress by Setiani et al. (2021), that the time period between the negotiation of the final seller and buyer is very crucial as it holds risk management issues". Therefore, the margin of trade is destabilized due to the crisis in the market that can be normalized and balanced with the help of market microstructure. Hence, market microstructure is a dominant factor in understanding stock market trading due to the difference components involved (Ivanova et al, 2020).

2.3 Empirical Review

Aigbovo and Osamwonyi (2018) **e**mpirically test for market microstructure model in the Nigerian stock market focusing on high and low prices published on 27th and 28th July, 2017. The Glosten and Milgrom information asymmetry model was employed in the analysis of data and the results indicate that the model can be used to predict or forecast next day's stock price; thereby assisting investors in profiting from their stock market investment.

Osifo and Okuwhere (2018) investigate the test of market microstructure in the Nigerian capital market using the Glosten and Miligrom (1985) model approach. The focus was on the determination of the bid – ask spread, given that asset can take two possible values such as high value and low value respectively. The outcome of the analysis demonstrated that the model was able to predict exactly thirteen securities prices which is 29.5% of the sample of the study. In the same vein, the model was able to predict prices of stocks with a minimal

differential hovering around one per cent to five per cent which is 14.9% of the sample of the study.

Schlepper, Hofer, Riordan and Schrimpf (2020) examined market microstructure on the basis of quantitative easing (QE) on intraday transaction-level data purchased under the Eurosystem's QE program in German bonds. The results from the analysis of data found ambiguity on the impact of market liquidity and functioning. A higher purchase volume lowers transaction costs but has an adverse impact on order-book depth. The price impact varies with market conditions and is higher for more illiquid bonds.

Fruet, Fernandes and Scherrer (2021) empirically examined Price Discovery and Market Microstructure Noise in the SSA, using price discovery intraday patterns by dividing each trading days into three non-overlapping time intervals: from 09:30:00am to 11:40:00am, 11:40:01am to 01:50:00pm, and 01:50:01pm to 04:00:00pm respectively. Employing the LS and GMM-based component share measures, the results were seen to be similar to those obtained with the daily CS measures, namely the GMM-based component shares assign NYSE as the market leader, whereas the LS estimates appear to bias the CS values towards 1=2 and assigns Nasdaq as the leading market.

Dube (2021) investigated the implications of domestic cross listings for the market quality of twenty-six firms that cross-listed for the period April 2018 to April 2020 in South Africa capital. The intraday trade data measure of crowding was employed, and it was observed that there was no sign of real changes in market quality in the six months after a cross limited, even after adjusting for market quality changes of firms that do not cross-list. The result demonstrated no support for a significant difference in market quality changes observed for high and low liquidity firms.

Bartlett and O'Hara (2024) in their paper titled Navigating the murky world of hidden liquidity demonstrated how the use of machine learning model can be useful by brokers and dealers in

spotting hidden liquidity pool better than the traditional statistical models. The study found out that there is a higher tendency of hidden liquidity in high priced stocks.

Doostian and Omid (2024) reviewed five different models on market microstructure models and concludes that, studying the theory and model of market microstructure leads to a more insightful understanding of market performance structure as well as understanding and description of market quality.

In summary, previous research shows that there are different models of market microstructure which can be employed by brokers or dealers trading in the stock market. Some of these studies have used the machine learning model, intraday trade data measure, Glosten and Milgrom 1985 model, quantitative easing method with their respective findings. This study employs the use of the Glosten and Milgrom 1985 model within the Nigeria Exchange Limited because of its popularity amongst the models of market microstructure models and also, because of the fact that findings of previous studies that use the Glosten and Milgrom (1985) model showed inconclusiveness on whether both informed and uninformed traders can exactly predict the next day stock prices by using the previous day price. To the best of the researcher's knowledge, this study will show that even with the so much economic instability that affects the capital market in Nigeria, that the Glosten and Milgrom (1985) model can still be used to predict the next day stock prices by both informed and uninformed traders.

3. Methodology

The study utilized the expost-facto research design, and the population of this study represents all the listed companies in the Nigerian Exchange Limited (NGX). As at 28th of May, 2024, a total of one hundred and thirty- three (133) firm's stock were actively traded on that day on the Nigerian Exchange Limited. Out of these number, a sample of thirty (30) traded securities for 27th and 28th of May, 2024 were selected using the filtering sampling technique on the basis of

securities whose addition of high and low values did not amount to zero. The relevant data for the study were sourced from the Nigerian Exchange Group (NEG) website.

3.1 Glosten and Milgrom Model

This model was advocated by Glosten and Milgrom (1985). According to them, there is a payoff for assets for whose prices are either low or high coupled assumed probability which is shown after the market has closed. In this context, market participants are both made up of informed and uninformed traders such that the informed ones have equal knowledge about current security payoff while the uninformed traders transact unsystematically with same chance. Traders that are informed buy (sell) if the real security price is increased (decreased). The total number of traders with privileged information are assumed, and dealers do not have superior information and assume on the security's real worth through the past trade record. They then fix the bid (ask) quote in a way to ensure that predictable profit from buyer (seller) who are uninformed are protected by the loss to buyer (seller) who are informed. After the ensuing trade, the dealer updates their beliefs on the asset's correct value using their previous views. The resultant bid-ask spread emanates from the security's possible prices (low vs. high), their resultant probabilities, and the comparative percentage of informed traders (Aigbovo & Osamwonyi, 2018).

Extending Copeland and Galai model in a sequential trade framework, Glosten and Milgrom (1985) demonstrated how insider information can be integrated into securities prices over time. Thus, with this model, dealers and indeed other uninformed shareholders are able to ascertain the right price using the flow of order.

3.2 Method of Estimation

The Glosten and Milgrom (1985) model in itself, is also used for estimation in analyzing the prices of stocks in the NGX using prevous day stock prices to predict the next day following the procedure below:

More specifically, Glosten and Milgrom (1985) demonstrated that a security can assume two likely values – a high value, Vo_LHi, and a low value, Vo_LLo - with equivalent probability. Informed investors who are aware of the true value are presented with probability (π). Assuming risk neutrality, informed investors estimate the security at $\bar{a} = 2 (Vo_LHi + Vo_LLo)$. The ask price A is then the anticipated value of the security dependent on trade at the ask price (Aigbovo & Osamwonyi, 2018):

$A= Vo_LHi\ \pi + \bar{a}\ (1-\pi)$ 3.1

The bid price is $B = Vo_LLo\ \pi + \bar{a}\ (1-\pi)$ 3.2

Therefore, adopting the model of Aigbovo and Osamwonyi (2018) in line with Glosten and Milgrom model; and given that informed traders trade at the bid (ask) only if they consider the security price is $Vo_LHi(Vo_LLo)$, the ask price is higher than the bid price. Thus, the bid-ask spread, is given by:

$A — B = (Vo_LHi - Vo_LLo)$ 3.3

Where: Vo_LHi = the high value of a security, Vo_LLo = the low value of the same security, π = probability of presence of informed investors, $\bar{a}$ = security estimate.

4. Result and Discussions

In this section, to reduce information asymmetry and effectively predict next day stock prices, the Glosten and Milgrom model was employed in the analysis of data involving 30 selected listed firms in the Nigerian Exchange Group on the basis of high and low-price values for two days (27th and 28th May, 2024) share prices. Furthermore, we assumed the probability of having informed and uniformed traders in the market as π, and this was assigned 50% (0.50). The results of this Bid-Ask Spread analysis are presented in Tables 3.1 and3. 2.

A closer look at Table 3.1 and Table 3.2 below revealed that the application of Glosten and Milgrom (1985) model was well able to predict exactly three (3) companies' shares (AFRIPRUD, CONOIL and VERITASKAP). From the forecast column on table 3.1, we can

see the forecasted stock prices using the method of estimation; which is the Glosten and Milgrom 1985 model. We expect that if the model works effectively, it should be able to give us same stock price value for the next day which we will see clearly from Table3.2. Following from Table 3.2, we can clearly see the differences between the forecasted prices and the actual prices of the stock the next day and the model was able to predict exactly the stock price of three companies' shares representing approximately 10% of the sample of the study. This suggesting that both informed and uninformed traders in the stock market can have a clue about the following day's share prices.

However, for the other traded stock, which we can also see from table 3.2, the model was able to predict upward or downward movements the next day share prices of 25 companies (with the exemption of GUINNESS and JAIZBANK) with minimal differences ranging around one percent to three percent respectively; and this accounted for about 83.3% of the sample size. Thus, this result simply demonstrated that there is no significant difference between the actual price and forecast price in the Nigerian Exchange Limited. This is a further confirmation of the effectiveness of the use of Glosten and Milgrom (1985) model in estimating bid/ask spread for predicting next day's stock price. Indeed, this finding agrees with those of Osamwonyi, Igbinosa and Aigboduwa (2011), Osifo and Okuwhere (2018), Aigbovo and samwonyi (2018) who unanimously submitted that uninformed traders in the stock markets could effectively have idea about next day's securities prices using the Glosten and Milgrom model.

Table 3.1: Bid-Ask Analysis for Daily Stock Price in the Nigerian Exchange Group

S/N	Security	Vo_LHi	Vo_LLo	II	$\pi(Vo_LHi - Vo_LLo)$	$Vo_LLo - \pi(Vo_LHi - Vo_LLo)$	Forecast	Actual Price as @ 28/05/2024
					N : K	N : K	N : K	N : K
1	ACCESSCORP	17	16.7	0.5	0.15	16.55	16.55	16.95
2	AIICO	1.04	0.99	0.5	0.025	0.965	0.965	1.00
3	AFRIPRUD	6.96	6.95	0.5	0.005	6.95	6.95	6.95
4	CAVERTON	1.3	1.26	0.5	0.02	1.24	1.24	1.26
5	CHAMS	1.65	1.5	0.5	0.075	1.425	1.425	1.5
6	CONOIL	105	105	0.5	0	105	105	105

7	CWG	5.95	5.4	0.5	0.275	5.125	5.125	5.4
8	DEAPCAP	0.39	0.38	0.5	0.005	0.375	0.375	0.39
9	FBNH	22.3	21	0.5	0.65	20.35	20.35	21.1
10	FCMB	6.85	6.7	0.5	0.075	6.625	6.625	6.75
11	FIDELITYBK	9.1	8.5	0.5	0.3	8.2	8.2	9
12	FTNCOCOA	1.28	1.1	0.5	0.09	1.01	1.01	1.1
13	GTCO	37.95	37.35	0.5	0.3	37.05	37.05	37.75
14	GUINNESS	49.75	49.75	0.5	0	49.75	49.75	0.31
15	JAIZBANK	2.32	2.29	0.5	1.175	1.115	1.115	2.29
16	JAPAULGOLD	1.85	1.8	0.5	0.025	1.775	1.775	1.83
17	MANSARD	5	4.97	0.5	0.015	4.955	4.955	5
18	MBENEFIT	0.56	0.52	0.5	0.02	0.5	0.5	0.56
19	NB	25	24.85	0.5	0.075	24.35	24.35	24.85
20	ROYALEX	0.56	0.54	0.5	0.01	0.53	0.53	0.56
21	RTBRISCOE	0.49	0.44	0.5	0.025	0.415	0.415	0.44
22	STERLINGNG	4.12	4.05	0.5	0.035	4.015	4.015	4.05
23	TANTALIZER	0.53	0.5	0.5	0.015	0.485	0.485	0.5
24	TRANSCORP	10.55	10.25	0.5	0.15	10.1	10.1	10.5
25	UBA	20.95	20.3	0.5	0.325	19.975	19.975	20.3
26	UNITYBNK	1.57	1.55	0.5	0.01	1.54	1.54	1.55
27	UNIVINSURE	0.36	0.35	0.5	0.005	0.345	0.345	0.36
28	VERITASKAP	0.59	0.58	0.5	0.005	0.58	0.58	0.58
29	WEMABANK	6.65	6.3	0.5	0.175	6.125	6.125	6.5
30	ZENITHBANK	32	30.7	0.5	0.65	30.05	30.05	30.75

Source: Author's Computations (2024)

Table 3.2: Comparative Results for 27/05/2024 and 28/05/2024

S/N	Security	Forecast	Actual Price as @ 28/05/2024	Difference
		N : K	N : K	N : K
1	ACCESSCORP	16.55	16.95	0.40
2	AIICO	0.965	1.00	0.035
3	AFRIPRUD	6.95	6.95	0.00
4	CAVERTON	1.24	1.26	0.02
5	CHAMS	1.425	1.5	0.075
6	CONOIL	105	105	0.00
7	CWG	5.125	5.4	0.275
8	DEAPCAP	0.375	0.39	0.015
9	FBNH	20.35	21.1	0.75
10	FCMB	6.625	6.75	0.125
11	FIDELITYBK	8.2	9	0.8
12	FTNCOCOA	1.01	1.1	0.09
13	GTCO	37.05	37.75	0.70

14	GUINNESS	49.75	0.31	-49.44
15	JAIZBANK	1.115	2.29	1.175
16	JAPAULGOLD	1.775	1.83	0.055
17	MANSARD	4.955	5	0.045
18	MBENEFIT	0.5	0.56	0.06
19	NB	24.35	24.85	0.5
20	ROYALEX	0.53	0.56	0.03
21	RTBRISCOE	0.415	0.44	0.025
22	STERLINGNG	4.015	4.05	0.035
23	TANTALIZER	0.485	0.5	0.015
24	TRANSCORP	10.1	10.5	0.40
25	UBA	19.975	20.3	0.325
26	UNITYBNK	1.54	1.55	0.01
27	UNIVINSURE	0.345	0.36	0.015
28	VERITASKAP	0.58	0.58	0.00
29	WEMABANK	6.125	6.5	0.375
30	ZENITHBANK	30.05	30.75	0.7

Source: Author's Computations (2024)

5. Conclusion and Recommendation

5.1 Conclusion

The study empirically tests for the application of market microstructure model in the Nigerian capital market using the Glosten and Milgrom (1985) model. The rationale for the study was based on the realization that informed and uninformed traders in the stock market can have idea about/predict next day's securities prices. For this reason, and in order to ascertain the extent to which informed and uninformed traders can predict next day's securities prices in the Nigerian Exchange Limited, daily traded stock of thirty (30) listed companies for May 27th and 28th, 2024 were analyzed using the Glosten and Milgrom (1985) model. The study therefore concludes that in determining the next day stock prices, the use of the Glosten and Milgrom (1985) model by informed and uninformed stock traders is very effective.

5.2 Recommendation

Based on these findings, the study recommendations are as follows:

Firstly, since Glosten and Milgrom model is proven to be very effective in predicting daily stock prices, Nigerian investors should take the advantage of utilizing this technique to predict future share price movement in order to maximize returns on investment in the market on daily basis.

Secondly, more enlightenment campaign should be embarked upon by market regulators in Nigeria to create more awareness to investors on the need to embrace market microstructure model in stock market investment. This awareness will enable them to understand how high and low prices of previous day share prices can be used to predict next day prices and then make predictable profits

Lastly, in order to continuously guarantee investors' confidence in the market about the efficacy of market microstructure model and its ability to predict next day stock prices, regulators and indeed relevant policy makers should be more proactive in checkmating all forms of market malfeasance such as price manipulations, insider trading among others. To this end, rule and regulations should be strengthened in this regard so that daily share prices should actually and genuinely be a true reflection of the outcome of the interaction of market demand and supply.

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