



A Test of Market Microstructure: Evidence from Nigerian Bourse

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Abstract

This study seeks to empirically examine the test of market microstructure in Nigerian capital market. The goal of this study is to ascertain the extent to which market microstructure predicts prices of securities in the Nigerian bourse. The study extends Copeland and Galai (1983) model and adopts Glosten and Milgrom (1985) model. They opined that the determination of the bid – ask spread can be demonstrated by assuming that an asset can take two possible values, i.e. a value that is high, VH; and a value that is low, VL with probability that is homogeneous to the two possible values. This 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 between one per cent to five per cent which is 14.9% of the sample of the study. The study, therefore, recommends that awareness needs to be created for investors and potential investors who daily flood the market without adequate information of the dynamics of price changes. A strong formal system of market microstructure education is apt in our tertiary institutions and curriculum of most finance oriented professional bodies.

Key words: Capital Market, Microstructure, Bid-ask Spread, Securities

JEL Classification: O16, L1, G14, D63

Paper Classification: Research Paper

Introduction

The stock market is the engine of growth for any economy, the market helps to create liquidity for investors, that is buyers and sellers and also guarantee that prices mirror germane information about central value. Various institutional and market mechanism must be in place and function independently for the stock market to be effective. The study of market microstructure is how the real transaction method can impact formation of price and trading volumes in a stock exchange or bourse. Microstructure models vary from conventional financial simulations by identifying that reliable evidence associated with firms' value that are unevenly disbursed between and deduced contrarily by players in the market. Consequently, the assumption that stock values will mirror information instantaneously even if all market players or participants are rational cannot hold anymore (Randi & Johannes, 2003). Suppose stock market members have access to homogenous

information, behave rationally and stock price will reflect all accessible information around firms' fundamental value at most times, therefore equilibrium prices will mirror the competitive demand curves of all prospective stockholders. Asset pricing concentrates in determining this primary fundamental equilibrium valuation, studies in market microstructure has shown how short-term operation prices deviate from long-term equilibrium values.

That is to say, microstructure literature prompts the efficient market hypothesis by studying how prices convergence can be attained in the direction of informationally efficient symmetry prices for rational participants to act tactically (Biais, Glisten & Spatt, 2004). Strategic acts relate to uneven opportunity in regard to information in the secondary bourse. The efficient market postulate theorizes from the definite procedure of buying, selling and pricing, then the microstructure subject centers on the roles executed by the market mechanism. Short term abnormalities between transaction prices and long-term central values also comes up due to conflicts reflecting order-handling costs and insider information (Biais et al, 2004). The central objective of market microstructure analysis surveys the methods by which the working procedures of a market influences factors of transaction costs, prices, quotes, volume and trading conduct. Evolving areas in this aspect of finance have permitted an extension into the learning of the influence of market microstructure regarding the frequency of market exploitation and malfeasance which include and are not limited to insider trading, market modification and broker-client debacle (Wikipedia 2017). Although, the concept of market microstructure is quite clear, it is necessary to empirically test the validity of microstructure significance.

In the last two decades, researches regarding financial market microstructure has been carried out. The need for these numerous studies cannot be overemphasized because of the issues associated with the complex market mechanism identified by Bauwens and Gilt (2000) in the form of market structure and design, price formation and price discovery, transaction and timing cost, information and disclosure, as well as market maker and investor behavior. Market microstructure attempts to understand these various structures and how they affect the activities of market participants. Based on the foregoing, it is therefore appropriate to research the application of market microstructure model in predicting stock prices in the Nigerian stock market.

The objective of this study is to ascertain the extent of which market microstructure model can be applied in the Nigerian Stock Market using some selected set of variables. In specific terms, the research objective is to:

1. ascertain the extent to which microstructure predicts prices of securities in the Nigerian bourse.

Literature Review

A plethora of research in market microstructure has been carried out in time past which has concentrated both on conjectural and on practical models. A very brief summary of the models is highlighted below.

Concept of Market Microstructure

O' Ohara (1995) expresses market microstructure as the procedure and consequences of trading securities under obvious dealing guidelines. The term market microstructure was first applied to financial market in the elements d'Ecobomic Politique Pure (1874) where the workings of the Paris Bourse was espoused on (Biais et al., 2004).

According to Randi and Johannes (2003), the microstructure literature is sub-divided obviously into tripartite form:

- i. actual transaction process.
- ii. influences of market structure and trading rules on the transaction process.
- iii. transaction process's implication for fundamental economic decisions.

Market Microstructure Issues

As earlier stated, microstructure covenants with subjects of market structure and design, investor behaviour, price formation and discovery, transaction and timing cost and market information. (Wikipedia, 2017) and it deals with the method by which stockholders' hidden demands are eventually transformed into fees and volume (Madhavan, 2000).

a. Market Structure and Design

The motivation here is on the relationship between trading rules and how prices of securities are formed. In some financial markets, securities are traded through dealers who keep inventories in the other hand, markets are controlled by brokers who serve as mediators or intermediaries. The vital question here is, how market structure effects trading cost and to determine if one market structure is more efficient than the other. It relates the conduct of market members; hence it is fundamental factor that affects investment decisions. The central focus of market structure and design deals with how diverse guidelines influence the black box, liquidity and market quality.

b. Transaction Cost and Timing Cost

Microstructure also centers on the impact of operation costs such as order cost, processing costs, inventory holding cost and adverse selection costs on investment returns.

c. Information and Disclosure

This element centers on transparency of market information on market participants and its influence on their behaviour most especially investors. Market transparency according to O'Hara (1995) is the capability of market dealers to note information about dealing procedures. More also information in this perspective is the understanding of various prices, quotes, or volumes, the sources of order flow and the identities of market active participants. "Transparency in the market is both pre and post trade dimensions, the pre-trade dimensions include current bid and ask quotations, depths, and possibly limit orders why post trade transparency refers to the public and timely transmission of information on past trades" (Madhavan, 1995).

d. Price Formation and Discovery

This element deals with the procedure through which the price of a security is achieved. The degree to which the market affords autonomous price discovery or makes use of prices determined in an alternative market as the foundation for transaction. For instance, in some markets, prices are achieved via a mart procedure while in others, prices are haggled.

Types of Market

- a. Dealer market
- b. Limit order market
- c. Hybrid market

a. Dealer Market

A dealer market is a trading platform that involves a dealer who accepts to sell when an investor is willing to buy securities and vice versa.

b. Limit Order Market

A stock exchange i.e bourse where buyers and sellers mutually agree to offer liquidity by enlisting limit orders or request liquidity by placing market orders.

c. Hybrid Market

This type of market is the combination or fusion of a dealer market and limit order market, they possess the elements of both types discussed above. The New York Stock Exchange (NYSE) is a vibrant model of hybrid market because the mass of transaction pass through the limit order book but dealers are in charge for setting prices.

Significance of Market Microstructure

i. Transparency

This deals with the aggregate of information made accessible to market dealers or operators. Studies such as Chowdhry and Nanda (1991), Forster and George (1992) reported that better transparency nurtures better liquidity and drops transaction costs to the minimum. Nevertheless, Madhavan (1995) displays otherwise that liquidity has the tendency to reduce due to transparency. It can therefore be concluded that variations in transparency has the capacity to profit some market members.

ii. Dealer's Role

Most bourses are still fundamentally centered on dealers, due to the expensive nature of limit order providers to maintain the market. Additional reason is that dealers minimize the information costs in the market. (Benveniste et al., 1992). Conversely, previous finding (Randi & Johannes, 2003) posit that dealers can also intensify market information costs since they can trade at diverse periods.

iii. Market Fragmentation

Different sections exist in the market, these fragments have their advantages as well as disadvantages. Mendelson (1987) states that the advantages of fragmentation relate to increased quality of price signals while the disadvantage relates to condensed liquidity and amplified velocity in each submarket. However, Chowdry and Nanda (1991) argues that one ought to view the markets amalgamating overtime, their argument assumes for liquidity providers.

Durable effects of the market microstructure

This segment will delve into the importance of market microstructure for long-term portfolio selection. The ability for market microstructure to influence long-term portfolio selection, liquidity and information risk therefore must influence investor's long-term decision. (O'Hara, 2003).

a. Liquidity Risk

Amihud and Mendelson (1986) studied the link amongst returns of shares, market risk and speed for choice of stocks in the NYSE, relate liquidity premium to the level of liquidity cost. That is, stock with high liquidity costs have greater returns than those with low liquidity costs. They further show that in the short run, if liquidity cost is on the high, it will evidently influence the disposable yield. Explaining how returns in the long run impact liquidity, Amihud and Mendelson interpret their results with a model where capital market investors vary from one another established different investment periods. Stockholders' investment in securities is occasioned by the payment of transaction cost which is in the form of a speed. This implies that only stockholders with a long-term period can clench the maximum illiquid asset. The model also suggests that the expected net return surges with the investment period with stocks that parade high speed provides stockholders with a higher net return. This is a clear indication that stockholders with a long investment period can profit from holding stocks with a high speed (Randi & Johannes, 2014).

Other studies have been carried out to investigate the relationship between speed and return. While some supported, others do criticize the assenting link between return and speed may be owing to the return not being properly risk-adjusted. The position of this school of thought is that the speed is a function of prices and prices can be adjusted with the stock market risk such that any association may be due to company's risk measuring error.

b. Information Risk

Most pricing models like CAPM and APT are built on the assumption that investors have symmetric information regarding expected return and risk for the generality of assets in the bourse. A major critic with this rationalization is that the equilibrium between expected return and risk is a function of the ability to determine market expectations. The submission of O'Hara (2003) reveal that when there is information asymmetry and if the uninformed investors discovers about informed investors, there will be no balance when everyone holds combination of securities in the market, because uninformed stockholders will hold a superior share of the stocks and demand compensation giving rise to a situation where idiosyncratic risk is priced.

Brennen and Subrahmanyam (1996) finds an affirmative association between returns and information costs, where information costs are measured as the coefficient in a regression which relates price changes to the size and sign of others flows. Easley, Hvitkjaer and O'Hara (2003) looks at the link between return and an estimate of the Probability of Informed Trading (PIN). Their analysis again proves to have an economically and statistically significant influence on return, even after correcting for beta and fama/French risk factors.

Theoretical Models

a. Market-Marker Model

Garman (1976) proposed the first theoretical model explaining market-marker's behavior. He took into cognizance the individual monopolistic market-maker who is faced with a lot of buy and sell orders, which are constantly presumed to be autonomous. In order to guide against lapse, the market-marker groups diverse buy and sell prices.

b. Information Based Model

These models involve a cost related with stockholders in possession of superior information

than others in the capital market. Information model was first introduced by Glosten and Milgromin 1985. In their model, they display in what manner private or insider information can be impounded into prices over time and how uninformed dealers and investors takes justification of information in the order flow when prices are set. Using this method, there are possibilities that prices tends to converge in the direction of informationally effective and efficient prices. However, more recent information model assumes that liquidity producers can make use of private information to behave strategically.

c. Inventory Model

The above model by Demsetz (1968) is of the view that there are costs connected with trading stocks. He pointed out that besides direct costs, indirect cost linked with timing trade (i.e getting to trade when you want to). As participants may not essentially need to trade about same time. The argument here is that investors willing to buy swiftly are expected to pay a higher premium to stimulate enduring sellers to sell and vice versa. The resulting inference of this study is that the price at which investor's trade depends on whether or not they intend to buy or sell swiftly (Randi & Johannes, 2003).

Empirical Literature

Hasbrouck (1991) examines the interface amongst security trades and bid-ask quote revisions for equities quoted on the New York Stock Exchange (NYSE), findings reveals the importance of trade information content. Chan, Christie and Schultz (1995) examines the influence of stock exchange daily open and closure activities on prices and resulting spread focusing on the behavior of the specialist for securities quoted on the NASDAQ exchange, their research reveals there may be fundamental variances amid a bourse with a dominant specialist and an exchange with competing market-makers. In the survey of Madhavan and Sofianos (1998) examines the significance and relative share of dealer trading by NYSE specialists. They submit that the fraction of the trades involving the specialist is relatively weak and depends very much on the stock. Biais, Glisten and Spatt (2003) in their research work they hinged on macro foundation of market microstructure. The study was able to decipher the importance of adverse selection, inventory and handling cost, market power how they impact on prices and full efficient allocations are in totality not realized or attained.

Christiansen (2009) investigates financial market microstructure and trading algorithms, the analysis gives rise to a two-way dynamic relationship between both events. Kyle and Obizhaeva (2016) in market microstructure invariance: Empirical hypotheses, investigates if bet size and transaction costs have specific relationship to observable dollar volume and volatility. The result shows that bet size and transaction cost explain an economically significant portion of the variation in portfolio transition order size. Yacine and Dacheng (2017) assesses if a high frequency data sample can be treated as reasonably free of market microstructure noise at a given sampling frequency for the purpose of implementing high frequency volatility. The results reveal a significant progress in capital market liquidity in the last ten years and which has culminated in the increase of the frequency at which simple, uncorrected, volatility estimators can be safely employed.

Methods and Data

This study extends Copeland and Galai (1983) model and adopts Glosten and Milgrom (1985) model. They opined that the determination of the bid – ask spread can be demonstrated

by assuming that there is a possibility for an asset to take two possible values, i.e. a value that is high, V^H ; and a value that is low, V^L with probability that is homogeneous to the two possible values. Investors that are informed who are aware of the current and exact value are presented with probability π . Informed investors value that asset at $a=(V^H+V^L)/2$ because of risk neutrality assumption. The ask price "A" is then the expected value of the asset conditional on trade at the ask price:

$$A = V^H \pi + a (1 - \pi); \dots\dots\dots (1)$$

$$\text{The bid price is } B = V^L \pi + a (1 - \pi) \dots\dots\dots (2)$$

The bid – ask spread, is given by:

$$A - B = \pi (V^H - V^L) \dots\dots\dots (3)$$

Where:

V^H = the high value of an asset

V^L = the low value of an asset

π = probability of informed investors presence

Population and Sample: The population of this study is all securities listed in the Nigerian stock exchange. The sample of the study are all securities traded in Nigerian stock exchange whose high and low price value was published as on 24th and 25th of October, 2017.

Source of Data: The data for this study was extracted from Nigerian stock exchange Stock Market Report of 24th and 25th October 2017.

Data Presentation and Analysis

| S/N | Security | $\pi (V^H - V^L)$ | $V^L - \pi (V^H - V^L)$ | Forecast | Actual price 25/10/2017 |
|-----|------------|--------------------|-------------------------|----------|-------------------------|
| 1. | Nascon | 0.5(14.33 - 14.33) | 14.33 - 0 | 14.33 | 14.50 |
| 2. | Dangcern | 0.5(219 - 219) | 219 - 0 | 219 | 219 |
| 3. | Dangflour | 0.5(72 - 6.99) | 6.99 - 0.105 | 6.89 | 7.44 |
| 4. | Dansugar | 0.5(14.39 - 14.1) | 14.1 - 0.145 | 13.96 | 14.47 |
| 5. | Honeyflour | 0.5(1.85 - 1.85) | 1.85 - 0 | 1.85 | 1.89 |
| 6. | Cadbury | 0.5(10 - 10) | 10 - 0 | 10 | 10.16 |
| 7. | Access | 0.5(10 - 9.6) | 9.6 - 0.2 | 9.4 | 9.9 |
| 8. | Afrprud | 0.5(3.85 - 3.71) | 3.71 - 0.07 | 3.64 | 3.83 |
| 9. | AIICO | 0.5(0.54 - 0.54) | 0.54 - 0 | 0.54 | 0.54 |

| | | | | | |
|------|---------------|--------------------|---------------|--------|--------|
| 10. | Caverton | 0.5(1.26 -1.2) | 1.2 – 0.03 | 1.17 | 1.17 |
| 11. | Cleang | 0.5(1.79-1.71) | 1.71 – 0.04 | 1.67 | 1.79 |
| 12. | Continsure | 0.5(1.35 – 1.35) | 1.35 – 0 | 1.35 | 1.31 |
| 13. | Custodins | 0.5(3.9 – 3.87) | 3.87 – 0.015 | 3.86 | 3.86 |
| 14. | Diamondbank | 0.5(1.1 – 1.03) | 1.03 – 0.35 | 1.00 | 1.07 |
| 15. | ETI | 0.5(17 – 16.82) | 16.82 – 0.09 | 16.73 | 16.75 |
| 16. | FBNH | 0.5(6.13 – 5.95) | 5.95 – 0.09 | 5.86 | 6.01 |
| 17. | FCMB | 0.5(1.05-1.02) | 1.02 – 0.015 | 1.01 | 1.03 |
| 18. | Fidelity Bank | 0.5(1.55-1.49) | 1.49-0.03 | 1.46 | 1.60 |
| 19. | Fidson | 0.5(3.4-3.36) | 3.36-0.02 | 3.34 | 3.52 |
| 20.. | FirstAlum | 0.5(0.52-0.52) | 0.52-0 | 0.52 | 0.52 |
| 21. | Guaranty | 0.5(42-41.72) | 41.72 – 0.14 | 41.58 | 42 |
| 22. | Interbrew | 0.5(61.98 – 56.22) | 56.22-2.88 | 53.34 | 54.5 |
| 23. | Jaizbank | 0.5(0.67-0.64) | 0.64-0.015 | 0.63 | 0.67 |
| 24. | Law Union | 0.5(0.71-0.71) | 0.71 – 0 | 0.71 | - |
| 25. | Learn Africa | 0.5(0.79 – 0.79) | 0.79 – 0 | 0.79 | 0.82 |
| 26. | Link Assure | 0.5(0.88 – 0.8) | 0.8 – 0.04 | 0.76 | - |
| 27. | Livestock | 0.5(0.89 – 0.85) | 0.85- 0.02 | 0.83 | 0.9 |
| 28. | Mansard | 0.5(2.08-2.04) | 2.04 – 0.02 | 2.02 | 2.70 |
| 29. | Maybaker | 0.5(2.91-2.77) | 2.77 – 0.07 | 2.70 | 2.70 |
| 30. | NAACO | 0.5(3.27-3.27) | 3.27 – 0 | 3.27 | 3.27 |
| 31. | NB | 0.5(16.1 – 157.95) | 157.95-1.53 | 156.42 | 161.85 |
| 32. | Skyebank | 0.5(0.51-0.5) | 0.5 – 0.005 | 0.5 | 0.5 |
| 33. | Sterlnbank | 0.5(1.01-1.01) | 1.01 – 0 | 1.01 | 1.0 |
| 34. | Transcorp | 0.5(1.43-1.36) | 1.36-0.035 | 1.33 | 1.42 |
| 35. | Transexpre | 0.5(0.81-0.81) | 0.81-0 | 0.81 | 0.81 |
| 36. | UACN | 0.5(17.73-17.57) | 17.51 – 0.11 | 17.4 | 17.5 |
| 37. | UBA | 0.5(9.13-9.00) | 9.00 – 0.065 | 8.94 | 9.1 |
| 38. | UBN | 0.5(6.1-6.1) | 6.1 – 0 | 6.1 | 6.1 |
| 39. | UCAP | 0.5(3.04-2.98) | 2.98-0.03 | 2.25 | 3.1 |
| 40. | Unity Bank | 0.5(0.52-0.52) | 0.52 – 0 | 0.52 | 0.5 |
| 41. | VETGRIF30 | 0.5(17 – 17) | 17 – 0 | 17 | 17.13 |
| 42. | Wemabank | 0.5(0.5-0.5) | 0.5 – 0 | 0.5 | 0.5 |
| 43. | Zenithbank | 0.5(25.85 – 25.02) | 25.02 – 0.415 | 24.61 | 25.88 |

Source: Author's computation, 2017

Table 2: Comparative Presentation between 24th October and 25th October, 2017

| S/N. | Security | Forecast | Actual price as at 25/10/2017 | Difference |
|------|--------------|----------|-------------------------------|------------|
| 1. | Nascon | 14.33 | 14.50 | 0.17 |
| 2. | Dangreen | 219 | 219 | 0 |
| 3. | Dangflour | 6.89 | 7.44 | 0.55 |
| 4. | Dangsugar | 13.96 | 14.49 | 0.51 |
| 5. | Honeyflour | 1.85 | 1.89 | 0.04 |
| 6. | Cadbury | 10 | 10.16 | 0.16 |
| 7. | Access | 9.4 | 9.9 | 0.5 |
| 8. | Afriprud | 3.64 | 3.84 | 0.2 |
| 9. | AIICO | 0.54 | 0.54 | 0 |
| 10. | Caverton | 1.17 | 1.17 | 0 |
| 11. | Cleang | 1.67 | 1.79 | 0.12 |
| 12. | Continsure | 1.35 | 1.31 | -0.04 |
| 13. | Custodins | 3.86 | 3.86 | 0 |
| 14. | Diamondbank | 1.00 | 1.07 | 0.07 |
| 15. | ETI | 16.73 | 16.75 | 0.02 |
| 16. | FBNH | 5.86 | 6.01 | 0.15 |
| 17. | FCMB | 1.01 | 1.03 | 0.02 |
| 18. | Fidelitybank | 1.46 | 1.60 | 0.14 |
| 19. | Fidson | 3.34 | 3.52 | 0.18 |
| 20. | First Alum | 0.52 | 0.52 | 0 |
| 21. | Guaranty | 41.58 | 42 | 0.42 |
| 22. | Interbrew | 53.34 | 54.5 | 1.16 |
| 23. | Jaizbank | 0.63 | 0.67 | 0.04 |
| 24. | Law union | 0.71 | NA | - |
| 25. | Learnafrica | 0.79 | 0.82 | 0.03 |
| 26. | Linkassure | 0.76 | NA | - |
| 27. | Livestock | 0.83 | 0.20 | 0.07 |
| 28. | Mansard | 2.02 | 2.70 | 0.68 |
| 29. | Maybaker | 2.7 | 2.7 | 0 |
| 30. | NAACO | 3.27 | 3.27 | 0 |
| 31. | NB | 156.42 | 161.85 | 5.43 |
| 32. | Skyebank | 0.5 | 0.5 | 0 |
| 33. | Sterlnbank | 1.01 | 1 | -0.01 |
| 34. | Transcopr | 1.33 | 1.42 | 0.09 |
| 35. | Transexpre | 0.81 | 0.81 | 0 |
| 36. | UACN | 17.4 | 17.5 | 0.1 |
| 37. | UBA | 8.94 | 9.1 | 0.16 |
| 38. | UBN | 6.1 | 6.1 | 0 |
| 39. | UCAP | 2.95 | 3.1 | 0.15 |
| 40. | Unity bank | 0.5 | 0.5 | 0 |
| 41. | VETGRIF30 | 17 | 17.13 | 0.13 |
| 42. | Wemabank | 0.5 | 0.5 | 0 |
| 43. | Zenith bank | 24.61 | 25.88 | 1.27 |

Source: Author's computation, 2017

From the Tables (1 and 2), clearly indicate that there is no significant deviation or difference between the forecast price and the actual price. This give credence to Glosten and Milgrom (1985) model in the computation of bid – ask spread which is handy in the prediction of stock prices in different stock exchanges. This model was able to predict exactly thirteen securities prices (DANGCEM, AIICO, CAVERTON, CUSTODYINS, FIRST ALUM, MAYBAKER, NAHCO, SKYEBANK, TRANSEXPR, UBN, UNITYBANK, WAPIC and WEMABANK) which is 29.5% of the sample of the study. In the same vein, the model was able to predict prices of stocks (HONEYFLOUR, CONTINSURE, ETI, FCMB, JAIZBANK, LEARNAFRICA and STERLNBANK) with a minimal differential hovering between one percent to five per cent which is 14.9% of the sample of the study.

Conclusion and Recommendation

This paper examined market microstructure, an arm of finance that surveys the practice in which stockholders' hidden demands are eventually transformed into dealings. The conjectural, practical and experimental demonstration of the applicability of market microstructure model in Nigerian capital market was established. The Glosten and Miligrom (1985) model adopted in this paper was able to predict with precision the prices of a considerable number of our sampled securities which gives credence to the applicability of the model in Nigerian bourse.

This paper recommends that awareness needs to be created among investors and potential investors who daily flood the market without adequate information of the dynamics of price changes. A strong formal system of market microstructure education is apt in our tertiary institutions and curriculum of most finance oriented professional bodies. The regulatory institutions need to be seen as enforcing the rule of procedure in the Nigerian stock market in order to reduce suspected cases of price manipulation, information asymmetry (insider trading) and other market malfeasance, and this will ultimately help in restoring investors' confidence in the market.

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