POLAC MANAGEMENT REVIEW (PMR)
DEPARTMENT OF ECONOMICS AND MANAGEMENT SCIENCE
NIGERIA POLICE ACADEMY, KANO

MARKET MICROSTRUCTURE AND THE NIGERIAN STOCK MARKET

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Abstract

Bis-ask spread as trading cost influence stock return and therefore constitute a risk to investors in the capital market. For this reason, this paper reviewed market microstructure models and examine the effect of bid/ask spread as trading cost on stock return in Nigerian capital market,using daily data of 12 banking stocks for the period 2nd December 2019 to 13th December, 2019. Data was collected from the Nigerian Stock Exchange daily official list. *The Fixed effect panel regression was implemented using E-view 9.0 computer software. The result reveals that bid-ask spread positively and significantly influence stock price in the Nigerian stock market. The study concludes that bid-ask spread constitute cost to trading and impact stock return in Nigeria. Based on the finding, the study recommends that investors should pay devoted attention to bid-ask spread as trading cost because of the potential it holding in influencing investment returns; and that the Security and Exchange Commission as regulatory authority should ensure a more transparent trading platform with a view to mitigating the implicit cost of trading.*

Keywords: Bid-Ask Spread, Dynamic Fixed Effect Regression, Market Microstructure, Nigerian Stock Exchange.

JEL Classification: G12, D82

Introduction

Market microstructure is an aspect of finance which deals with the mechanism by which investors' concealeddemand are eventually converted to transaction through prices and volumes (Madhavan, 2000). Market microstructure became an interesting field of study owing to the magnitude of trading frictions and asymmetric information which bring about disparity amidst actual and anticipated prices (Aigbovo & Osawmonyi, 2018). The interest is propelled in part by the fact that decision makers rely heavily on information; and information has remarkable effect on market outcomes.

Effort has been made in the past to forecast price in the financial market using data with high frequency. This leads to the development of various market microstructure models. Some of the models have been tested and results demonstrate that market microstructure can be used to foretell future stock price (Osamwonyi & Aigboduwa, 2011; Aigbovo & Osawmonyi, 2018). In financialmarket, the formation of prices for securities is very important and the market traders are confronted with twofold prices for financial assets via the bid and ask prices (Udih, 2016). It has been established that operation research model as well as market microstructure models are essential in pricing financial securities; therefore, devoted attention should be paid to some of the models such as inventory models, information-based models (Udih, 2016). Bagehot (1971) wasamong the first to differentiate liquidity traders from knowledgeable traders and noted that the bid-ask spread consists of three components namely: order processing costs (including costs of exchange infrastructure), inventory costs (needed to

compensate for the risk of holding a sub-optimal portfolio) and adverse selection costs (to compensate for the risk of losing to a superior informed trader). This means that, the bid/ask spread constitute cost to investors transacting in financial asset; and like every other cost, may influence trading outcomes. It is used by market makers to manage the inbalance in buy or sell orders (Udih, 2016).

Ogieva and Chijuka (2018) noted that one of the foremost concerns in literature about market microstructure are the issues of transaction cost proxy by bid ask spread and how they impact trading and prices. Therefore, research is needed to empirically examine the effect of bid-ask spread on prices in Nigeria Stock Exchange. Market microstructure models have been tested using Nigerian capital market data (Osamwonyi & Aigboduwa, 2011; Aigbovo & Osamwonyi, 2018; Aribaba, Ahmodu & Aribatise, 2017; Ogieva & Chijuka, 2018). However, these studies merely estimate the bid-ask spread and matched it against the next day price by way of comparison. To the best of my knowledge, Studies that utilise panel regressionto examine the effect of bid-ask spread on stock price in Nigeria is scarce, which is the gap in knowledge this study set out to fill. It is our belief that at the end of this paper, market participants will know the impact of bid-ask spread on trading activities, especially stock price movement.

Objective of the Study

The main objective of this paper is to examine the effect of bid-ask spread on stock prices in Nigeria.

Literature Review

Concept of Market Microstructure

The origin of market microstructure can be traced to Garman (1976) which arouse both theoretical and empirical research on the subject. With advancement in technology coupled with availability of high frequency daily data, empirical work on market microstructure is gaining momentum. Besides, new trading podiums distinct from dealers or traditional specialist markets in terms of information flow, frequency of trading, transparency, and order type are beginning to emerge. For example, in New York Stock Exchange, order is executed in exchange's anonymous super dot system- a platform which tend to hide the identify trader or agent behind an order (Madhavan, 2000). Market microstructure broaden our knowledge on the route to equilibrium as against the conventional capital market theories which focuses on equilibrium prices or quantity. Specifically, it focuses on the way market participants can benefit from trading process (by merely viewing of outcomes of the process), the speed with which price react to news or events, the magnitude of the impact of private information on prices as against pure noise trading (Oliver, 2010)

Osamwonyi and Igbinosa (2007) described Market Microstructure as that area of finance that focuses on price formation processes in financial market. Specifically, it addresses how the process and structure of financial market affect price, liquidity; and trading activities. Udih (2016) defined market microstructure as a subset of finance that is mainly concerned with the determination of market price of securities.

Bid-Ask Spread (BAS)

The bid-ask spread is the amount by which the bid price exceeds the ask price. Price discovery is an important game in the capital market, and the process generate cost for a set of agents,especially investors who provide immediacy. An investor who demands immediacy place market order: the bid price if he wants to buy and ask price if selling. The difference between the bid and ask price is described as the bid-ask spread (Copeland & Galai 1983; Glosten & Milgrom, 1985).The bid-ask spread (BAS) is a cost because it is the compensation for providing immediacy. It is used by market makers to manage the inbalance in buy (sell) orders (Udih, 2016). Stein (2016) estimates the bid-ask price as the difference between the highest price offering a buyer will pay (bid price) and the lowest price a seller will be ready to accept to relinquish his securities (ask Price); and the Constituents of it are inventory, fixed and adverse selection costs. It is a measure of liquidity in that the more reduced the spread, the more the liquidity and the reverse is also true. Similarly, BAS is an indicator of trading costs-an implicit transaction cost as

against brokerage charges, taxes which are explicit in nature.

Empirical Review

Osayi and Agabi (2019) examine the influence of bid/ask spread on market performance in Nigeria, applying GARCH model on time series data from 1985 to 2016. The result indicates that bid-ask spread positively and significantly determine market performance. Aigbovo and Osawmonyi (2018) used daily data to estimate the bid-ask spread and compare the outcome with next day price and reported that stock price is predictable with the assistance of microstructure modelin Nigeria. Ogieva and Chijuka (2018) applied Glosten and Milgrom (1985) model to predict stock price using Nigerian market data for the period 26th and 27th July 2017. Specifically, the bid-asks spread was computed and judge against the following day prices. The result reveals that future price can be predicted using past information. Aribaba, Ahmodu and Aribatise (2017) engaged Glosten-Milgrom modelusing Nigerian capital market data for the period 9th and 10th July, 2017. Precisely, the bid-ask spread was calculated and matched with the subsequent day prices. The result revealed that the model was only able to predict 16% (4 out of 25) of the investigated stocks with precision. Ryu (2017) explore the relationship between intraday price and spread in the structural market microstructure model framework in Republic of Korea from April 2003 to September 2006. It was documented that inventory holding cost significantly explain implied spread. Hagstromer, Henricsson, Norden (2016) employed structural model for price formation as well as liquidity to examine intraday price formation in future trade in Shanghai exchange. The result reveals that the cost of processing order account for 50% bid-ask spread of gold future. The study further revealed that asymmetric information and inventory costs also explain bid-ask spread.

Ryu (2011) study the intraday price formation and bid-ask spread using KOSPI200 in structural model. The result shows that implied spread and permanent spread are undervalued except option market information is added. The study further discloses that permanent spread component of in-the-money option of future market incur large adverse information cost compare to money counterpart. Ryu (2016) analysis all-inclusive trade indicator model comprising of duration of trade, order size, bid-ask spread and so on in Korea future market. It was reported that fast trading is a sign of informed trading. Also, in a highly liquid market, liquidity has significant effect on investors order submission actions. Amihud and Mendelson (1986) examine the relationship between bid-ask spread and asset pricing in US from1961-1980. It was found thatbid-ask spreadsignificantly and positivelydetermine returns. Amihud, Mendelson and Murgia (1990) inspect the impact of market microstructure on value discovery and volatility of stock return in Milan, Italy covering 2nd January 1984 till 30th April 1987, using time series regression model. Precisely, the study compared the return volatility of two different trading platforms. The result reveals that continuous market opening transaction produce higher volatility. Huang and Stoll (1994) desire to uncover whether market microstructure model can predict stock returns. Two econometric models which has predictive capacity were formulated. The generalised method of moments was applied on twenty markets index in Chicago exchange covering all the days in 1988. The result uncovers that the returns from expected quote is positively determines the difference between transaction price and quote midpoint. The study further reveals that expected return from transaction is negatively connected to the difference between transaction price and quote midpoint.

From the foregoing, studies that utilise panel regression, and examine the effect of bid-ask spread as trading cost on stock return (stock price) in Nigeria are scarce. It is on this backdrop, this study engaged bid-ask spread as explanatory variable to fill the identified gap. It is our belief that at the end of this paper, market participants will know the impact of bid-ask spread on trading activities, especially stock price movement.

Theoretical Review

Price discovery is an important game in the capital market and effort has been made in the past to forecast price in the financial market. This led to the development of various market micro structure models.

Market micro structure models are grouped into inventory models and asymmetric models among others.

Inventory Model

In inventory models, the trading process is the matching problem where the market maker employs price as a tool to equilibrate buy and sell offers across time. The main variables are inventory position of the traders and uncertainty surrounding the order flow, especially in the face unbalance risk. The marker makers get hold of inventory by changing quotes about bid and ask to provoke the disparity in buy and sell orders. Inventory models are named after the contributors as follows:

Stoll Model

Stoll (1978) view the proportional discount on trade to equal the difference between the consensus price (P) and the bid price (Pb) divided by the bid price thus: $\frac{P-Pb}{P} = \frac{C}{Q}$…… (1)

Where, P = consensus price, Pb = bid price, Q = amount on trade and C= the proportional discount on trade.

Garman Model.

Garman model (1976) assumes a dealership market where dealers take up a monopolistic authority and aggregate supply and demand with the aim of maximizing expected profit. Garman (1976) assumes that market-maker is a price-settler. He sets ask price at which he will buy and a bid priceto sell, and conclude that it is optimal for the dealer to set bid and ask prices and that they are functions of the frequency at which buyer and seller arrive the market.

Amihud – Mendelson Model

Amihudand Mendelson (1980) model is an improvement on Garman (1976). The bottom line of the analysis is that the bid and asks prices depend on the inventory position of market markers. Amihudand Mendelson (1980) derived the optimal policy and Its characteristics, and compare it with Garman's model. The results are shown to be consistent with some estimations and observed phenomena.It was also revealed that dealers lower the bid as well as the ask prices according to growing inventory.

Asymmetric information models

The asymmetric information model focused on knowledgeable and uninformed investors and how they price asset in the market. It keeps the traders abreast of price information in securities market. Scholars have formulated models to capture this idea which is today known as information asymmetry model (Aribaba et al, 2017). The models in this group found relevant to this study are discussed below.

Copeland – Galai model

Copeland and Galai (1983) posits that market –maker improve his position by setting bid-ask spread and by so doing he take advantage of the difference between the benefitsexpected from those who demand liquidity andthe losses to information traders. They demonstrate that the bid-ask spread is a positive function of the price level and return variance and a negative function of measures of market activity amongst others.They further shown that unskillful dealer who cannot differentiate noise traders from informed traders would set a positive spread to compensate for the expected loss that would be incurred given the positive prospect from informed investors.

Glosten-milgrom model

Glosten and Milgrom (1985) further advance Copeland and Galai (1983) asymmetric information model. In the model, dealers and knowledgeable investors discover the correct price by observing the order flow. In their view, investors can forestall next day price and by so doing the magnitude of asymmetric information is minimised, which ultimately will create liquidity and depressed transaction costs. The model assumes that financial asset can be assign two values: high value (H_v) and low value (L_v) with same probability. Investors armed with information know the rightvalue and therefore assign probability (P). If the risk is neutral, knowledgeable investors price the asset at A = $\frac{(Hv + Lv)}{2}$

A = H_v + a (I – P) is the ask price, while the bid price (B) = L_v + a (I – P). However, the investor can only have a prior information about future (next day) price by means of A –B (called the bid-ask spread).

Therefore, the bid-ask spread model of asset price can be express as $A - B = P(H_v - L_v)$. For instance, if 7Up high and low stock price in a particular day are 14.50 and 13.40 respectively, with probability of 0.5, then, the bid-ask spreadwill be 0.55.

Glosten and Harris (1988) separate the bid-ask spread into two parts, the part due to informational asymmetries, and the remainder attributed to inventory carrying costs, risk aversion and monopoly rents. With the help of maximum likelihoodprocedures, they were able to subdue the challenges arising from discrete data (price) and unsigned transaction volume data which may limit result outcome.

Methodology

This study considers the effect of market microstructure mechanism on the Nigerian stock market, focusing on the bid-ask spread. Daily data from the Nigerian Stock Exchange daily official list for the period December 2nd to December 13th 2019 was used. The study target banking sector stocks because it's one of the most actively traded stocks and constitute a substantial part of market capitalization at the exchange. To this end, a total of 12 banks which were actively traded throughout the period form the sample size of the study. The banks investigated are Access bank, first bank, FCMB, Fidelity bank, Jaizbank, Stanbic IBTC, Sterling bank, UBA, Wema bank, union bank, Unity bank and Zenithbank. The cross-sectional research design was adopted to analyse the impact of bid-ask spread on stock prices. Cross-sectional design is activated when a phenomenon is study for a number of entities at different time period. The econometric tools employed include descriptive statistic (descriptive statistic was conducted to determine the characteristics of the variables), the panel unit root test (to ascertain the order of integration), correlation, and difference generalised method of moment (Difference GMM)in a dynamic panel regression framework.Dynamic technique is suitable for data with different time and cross-sectional individual observations.Cross-sectional data is susceptible to individual fixed effect, which is capable of influencing the regression outcome. Individual fixed effect is overcome by applying difference GMM canvassed by Arellano and Bond (1991). Differencing may introduce bias between the lag of the dependent variable and error term. However, this is eliminated in this study by bringing in instrumental variables (internal instruments). Blundell and Bond (1998) advocate the use of instruments at levels and at differenced forms. The analysis was carried out with the aid of E-view 9.0 econometric software.

Theoretical Foundation for the Study

This ongoing study is predicated on Copeland and Galai (1983) asymmetric information model, as amplified by Glosten and Milgrom (1985). Copeland and Galai (1983) submitted that market-makers enhance their trade by setting bid-ask spread so as to take advantage of the difference between the benefitsexpected from those who demand liquidity andthe losses to informed traders; and demonstrates that the bid-ask spread is a positive function of the price and return. Indeed, decision makers rely heavily on information; and information have effect on market outcomes because it generates cost for market participants which may have impact on price. For instance, bid-ask spread is a cost because it is the compensation for providing immediacy. It is an indicator of trading costs and inherent (implicit) transaction cost as against brokerage charges, taxes which are explicit in nature.

Model Specification

Glosten and Milgrom (1985) model is express thus:

$A - B = P(Hv - Lv)$. ……..(1)

Where:

$A - B$ = bid-ask spread,

Hv is the highest value of an asset, whileLv is the lower value,P = probability.

Kyle (1985) demonstrated that trading by ignorant investors is exogenous and normally distributed with mean zero and variance. Kyle model was implemented by Madhavan and Smidt (1991) using actual professional inventory data to separate the two effects

and evaluation the degree asymmetric information is a function (factor) ofasset pricing.

It can be demonstrated that stock price is a matrix generalization of *N* stocks of the form:

$\mathbf{SP} = \mathbf{X}_z + \mathbf{U}$ ……(2)

Where:

SP = stock price,

X is a matrix of factors affecting price movement including bid-ask spread and,

U is the vector of error terms.

Given that bid-ask spread is a cost, and cost have effect on trading outcome and by extension price of an asset, it can be shown that movement in stock price (S**P)** is a function of bid-ask spread thus:

SP= f(bas, vol)……(3)

Where:

SP = stock price,

Bas = bas-ask spread (P(Hv – Lv),

Vol = volume traded.

Equation 3 is restatement in econometric panel regression form thus:

$SP_{it} = a + b_1(SP_{-1}) + b_2(BAS_{it}) + b_3(Vol) + U_{it}$ ……(4)

Where:

SP_{it} =price of stocki in dayt,

BAS_{it}= bas-ask spread:an implicit cost associated with stocki in day t,

Vol = volume of stock traded (control variable in this study)

SP_{-1} = stock price in the past (which is generated by the system)

B_1-b_3 = parameter to be estimated, U = error term,

BAS (P(Hv – Lv)is estimated as the different between high volume(Hv) and low volume(Lv) in a day multiply by 0.5(P)using Excel work sheet.

Data Analysis

The objective of the study is to test the impact of market microstructure (bid-ask spread) on price using Nigerian capital market data. The stock price and bid-ask spread BAS) constitute the main variables of the study. BAS was estimated using excel work sheet. The analysis was done in the order of descriptive statistic, correlation and panel least square regression using E-view 9.0 econometric software.

Descriptive statistic

Descriptive statistic is carried out to determine the attributes of the variables under investigation, particularly as it relate to the magnitude of occurrence. Table 1 below displays the summary statistics of the variables.

Table 1: Descriptive Statistic of Variables.

Variable	Mean	Max.	Min.	Standard Deviation	Skewness	Kurtosis	Jarque-Bera (Prob.)	No of Observation
PRICE	7.84	36.8	0.63	10.10	1.919	5.775	112.212(0.0000)	120
BAS	0.037	0.325	0.00	0.057	2.386	10.739	411.734(0.0000)	120
VOL	7361924	42592126	4514	8776746	1.608	5.284	77.823(0.0000)	120
*Probability reported in parenthesis								

Source: Researchers' estimation with the aid of E-view 9.0

Table 1 shows that the mean of price and bid-ask spread which stood at 7.84 and 0.037 respectively, tends to suggest there is great disparity between the variables. The table further reveals that the variables are positively skewed. The Jarque-Bera statistic confirms that the variables are not normally distributed as evidenced in their respective probability which is significant at 5% level. Meaning

that regression on the variables at levels may be bias, hence the use of difference generalized method of moment.

Correlation

Correlation is conducted in this study to ascertain the relationship dependent variable (Price) and explanatory variables (BAS and VOL). Outcome of the correlation matrix is display in table 2 below. The table shows that the variables are not perfectly related to themselves, which suggest that they may be measuring different entity. The table also revealed that BAS and VOL are positively related to price, which implies that one can influence the other in the same direction. However, the relationship is not significant at five percent level to substantiate the claim.

Table 2: Correlation.

Variable	Price	BAS	VOL
Price	1.000		
BAS	0.033 (0.7183)	1.000	
VOL	0.0498(0.5887)	0.6303(0.000)	1.000

Source: Researchers' computation, 2020 (Probability reported in parenthesis).

Regression

Regression estimation is under taken to ascertain the relationship between two or more variables (price and bid-ask spread in this study). The study implements the dynamic panel in difference GMM regression framework.

First, the claim that time series data has trend element in them was verified. The reason is to obviate spurious regression estimate and to know the order of integration of the variables. To achieve this, the panel unit root test was conducted on data set, and the result of the Levin, Lin and Chu as well as ADF-Fisher Chi^2 unit root are presented in table 3 below.

Table 3: Panel Unit root Test Result.

		At Levels				At First Difference			
Variable		Levin, Lin and Chu Statistic (assumes common unit root)	Remark	ADF-Fisher Chi2 Statistic (assumes individual unit root)	Remark	Levin, Lin and Chu Statistic (assumes common unit root)	Remark	ADF-Fisher Chi2 Statistic (assumes individual unit root)	Remark
Price		-6.50007 (0.0000)*	Stationary	48.2762 (0.0023)*	Stationary	-8.0898 (0.0000)*	Stationary	64.8574 (0.0000)*	Stationary
BAS		-5.9862 (0.0000)*	Stationary	41.4502 (0.0013)*	Stationary	-10.2234 (0.0000)*	Stationary	71.2982 (0.0000)*	Stationary
VOL		-8.4765 (0.0000)*	Stationary	75.3321 (0.0000)*	Stationary	-21.6049 (0.0000)*	Stationary	134.099 (0.0000)*	Stationary
* = Significance at 5% level (Probability reported in parenthesis)									

Source: Researchers' compilation 2020.

The outcome of the panel unit root test in table 3 above demonstrates that the variables are stable both at levels and their first difference, as evidence in their respective probability values which is significant at 5 percent. The result suggest that the variables are integrated of order 1[1], meaning there is no trend element in the data series. The hypothesis that the data set has unit root is therefore rejected.

Since the variables are stationary at level and integrated of order 1[1], the study went adhered to implement the dynamic modelusing difference GMM.The dynamic model is implemented when a regression equation contains one or two lagged values of the dependent variable (Gujarati, 2009). To test for autocorrelation in the regression outcome, the Arrellano and Bond technique in E-view was applied. The result is depicted in table 4.

Table 4: Arrellano-Bond Serial Correlation Test

Order of Test	M-Statistic	RHO	SE(rho)	Probability
AR(1)	-0.8244	-322.7331	391.4709	0.4097
AR(2)_	0.2729	7.1605	26.2336	0.7849

Source: Researchers' computation from E-View 9.0 output.

Table 4 exposes that both AR(1) and AR(2) is not significant at 0.05 level judging by the probability values. This suggests the absence of autocorrelation and the acceptance of the regression outcome.

The outcome of the panel difference generalized method of moments regression is displayed in table 5.

Table 5: Panel Difference Generalized Method of Moments Regressionwith Price as dependent Variable [price(-2), BAS, VOL(-2) as instruments]

Independent Variables	COEFF.	T. STAT.	PROB.
Price(-1)	0.0723	0.4509	0.6533
BAS	6.0982	4.4524*	0.0000
VOL	1.3908	3.1369*	0.0024
J-Stistic	8.4395		
Probability of J-Stistic	0.4905		
Ranking of Instrument	12		
* = Significance at 5% level.			

Source: Researchers' computation using E-view 9.0 econometric software.

The DGMM regression result in table 5 reveals that the coefficient of previous stock price which stood at 0.0723, suggest that the speed of adjustment to equilibrium after the dislocation due to the asymmetric information is about 7.23%, indicating that the market is inefficient informationally. However, the outcome is not significant at 5 percent level to substantiate the claim. Bid-ask spread (BAS) positively and significantly affect stock price in the exchange. The positive coefficient of BAS (4.4524), implies that an increase in this implicit cost component of trading in the financial market will affect stock price in no small magnitude. The T. Statistic value of BAS which stood at 2.0185 is significant at 5% level. The implication of the result is that asset illiquidity which capture the risk inherent in the security significant determine stock market movement in Nigeria. Meaning, liquidity risk affect stock market performance in Nigeria is no small dimension.

The J.stistic which measure the over or under restriction of the estimation technique is not significant at 0.05 percent judging by the probability value. This tends to suggest that the model is valid as proposed by Roodman (2009).

Discussion of Findings

The outcome of the investigation shows that bid-ask spread (asymmetric information cost) determines price movement in the Nigerian Stock Market. The positive and significant effect of bid-ask spread suggests that a rise in implicit cost of trade in the market will impact price directly, thereby denying investors of the desired return on investment. Therefore, the illiquidity of the securities constitute risk to investors and as such should be priced by

through higher reward to compensate them for the risk.The outcome of this study is in line with Amihud and Mendelson (1986) who reportedthat bid-ask spreadpositively and significantly related to returns; and Osayi and Agabi (2019) that bid-ask spread positively and significantly determine market performance. It is also in agreement with Copeland and Galai (1983) model of asymmetric information.

7. Conclusion and Recommendations

This paper review market microstructure models and examine the effect of bid-ask spread (as trading cost) on stock price using Nigerian capital market daily data from2nd December 2019 to 13thDecember, 2019, focusing on the banking sector. The difference generalized method of moment in a dynamic model framework was implemented using E-view 9.0 computer software. The result reveals that bid-ask spread positively and significantly influence stock return in the Nigeria. The study concludes that bid-ask spread constitute cost to trading and impact stock return in Nigeria.

Based on the findings, the following were therefore recommended:

i. that market participants should pay devoted attention to bid-ask spread as trading cost because of the potential it holding in influencing investment returns,and

ii. that the Security and Exchange Commission as regulatory authority should ensure a more transparent trading platform aim at mitigating the implicit cost of trading.

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