TESTING THE MARKET MICROSTRUCTURE MODEL: EVIDENCE FROM THE NIGERIA BOURSE

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Abstract

This study tested the market microstructure model in the Nigeria stock market. Time series data on market capitalization, market activities, price inverse, risk of previous stock and bid-ask price suggested by Rolls model (1965) from 1986 to 2019 were sourced from CBN statistical bulletin. Preliminary test of descriptive statistic, ADF unit root test were carried out on the variables of interest. The co-integration technique and Error Correction Model Methodology were used to determine the short run dynamics and long run equilibrium relationship between bids-ask spread and it determinants. Findings show that risk and market capitalization appear to explain most of the variability in the bid-ask spread in the Nigerian stock market. Thus, this study concludes that asset prices need not equal full-information expectations of value because of a variety of market frictions and diffusional factors.

Keywords: Bourse, Nigeria, Co-integration, ECM, Market Microstructure

JEL Classification: G12, L1, L11, L22

1. INTRODUCTION

Market Microstructure (MMS) theory was developed to explain the process through which prices of assets are determined and it is an aspect of finance that deals with the information of how exchange happens in markets (O'Hara, 1987). The traditional asset pricing is aimed to understand what the price of asset should be and pay no attention to price formation process (i.e. how price is formed), how prices change to disclose or reveal news and how investors' idiosyncratic (subjective) asset valuations translate into the price, In reality and practice, news and investors' valuations (assessments) are transformed into asset prices via trading (Aigbovo & Osamwonyi, 2018). From economics view point, price is an intersection point of demand and supply schedules; in parlance of neoclassical finance, price is again a single integer or number which represents an intrinsic value of an asset on which all market participants agree and thus can trade a random quantity of shares at this single price (Nevmyvaka, 2005).

Either concepts fail to hold in practice because financial markets prices are in constant flux, participants have heterogeneous expectations about values, information is never fully accessible, investors behave under different constraints among others. Hence, financial markets engaged in a continuous, on-going process of price discovery – through a series of repeating negotiations among themselves, market participants are trying to determine true values of traded securities (Nevmyvaka, 2005). This appear to suggest that the trading rules, and the strategies developed by traders in response to these rules, impact the way security prices fluctuate over time in reaction to fresh information (Madhavan, 2000). Efficient market hypotheses and market microstructure are opposite side of the same coin, because the former posits that stock price should reflect all available information in the market while the later positioned that asset price need not equal full information value expectations due to the existence of various frictions in the market (Madhavan, 2000).

MMS is centralized majorly on price formation and price discovery, market structure and design, information and disclosure and lastly, the interaction with other areas of finance such as corporate finance, asset pricing, and international finance. Researchers have used these major areas of MMS to carry out state-of-the- art theoretical and empirical studied in developed, frontier and emerging market around the globe. Famous among these studies are Stoll (1978), Roll (1984), Kyle (1985), Glosten and Milgrom (1985), Glosten and Harris (1988), Glosten (1994), Isibor (2017) etc. While these literatures identified these costs theoretically they also developed empirical methodologies to analyse data on transaction prices and quantities and estimated trading costs, through the relation between trades and prices and the bid-ask spread (Glosten & Harris, 1988). Other studies that empirically tested MMS models are Nevmyvaka (2005), Madhavan (2000), Osamwonyi, Igbinosa and Aigboduwa (2011), Kehinde, Ishmael and Moruf, (2012), Eguavoen (2016), Ogbeide and Umana (2017), Igbinovia (2017), Osifo and Okuwhere (2018), Aigbovo and Osamwonyi (2018), Ogieva and Chijuka (2018), Kasimu and Igbinadion (2019). However, most of these studies like Osamwonyi and Aigboduwa (2011), Eguavoen (2016), Aigbovo and Osamwonyi (2018), Ogieva and Chijuka (2018) among others tested the Glosten and Milgrom model. Apart from the work of Madhavan, (2000), Igbinovia (2017), Kasimu and Igbinadion (2019); studies that tested the Rolls MMS model in the case of emerging and frontier stock market is very scarce in the literature and even worse in the case of Nigeria. Thus, leaving a gap in the literature and more studies are needed in this direction. Study that examines the effect of Rolls MMS model variables of market size, riskiness of security, market activity and price of security on stock return in frontier market in Nigeria, within Autoregressive Distributed Lag framework was not found in the literature to the best of the researcher's knowledge. Hence, this study fills these gaps in knowledge by testing Rolls MMS model within the ARDL framework in the Nigeria stock market.

OBJECTIVES OF THE STUDY

The broad objective of this study is to test the Rolls MMS model in the Nigeria stock market. The specific objectives are to:

1. Examine the influence of market size on stock market return in Nigeria
2. Study the effect of riskiness of security on stock market return in Nigeria
3. Investigate the effect of market activity on stock market return in Nigeria
4. Examine the influence of security price on stock market return in Nigeria

SIGNIFICANCE OF THE STUDY

This is the only study in the case of Nigeria to the best of my knowledge that used the longest recent data stream and ARDL techniques to test the predictability of Rolls MMS model in the short and long run period. Also this study is different from other studies (Igbinovia, 2017; Kasimu and Igbinadion, 2019) because this study uses the volatility of annual past asset return a proxy for security riskiness, as against other studies that used inflation rate at levels and volatility of the asset return using 3 months standard of stock returns as proxy for asset riskiness. Hence, this study contributed to knowledge and update existing literature up to date in this regards.

2. LITERATURE REVIEW

CONCEPTUAL LITERATURE

Market microstructure as a term is credited to Garman (1976) generally, as a title of an article that examined inventory costs and market making. Since then market microstructure has become a clear title for the study of economic issues influencing prices, quotes and trades. Madhavan (2000) defined MMS as the process where hidden (latent) demands of investors are eventually transformed into volumes and prices. MMS emerged as a field of study in finance as a consequence of trading frictions and asymmetric information that instigated discrepancy between actual and expected prices. Hence, MMS focuses on how good or bad exchange's rules facilitate effective trading (Aigbovo & Osamwonyi, 2018). Contrary to the model of efficient markets theory, market microstructure focused on how different frictions and departures from symmetric information affect the trading process. Specifically, microstructure relaxes different elements of the random walk model. And focuses on how specific trading mechanisms affect the price formation process and price-setting problem confronting market intermediaries (Kasimu & Igbinedion, 2019). Market microstructure is the study of financial markets and how they operate. Market microstructure research primarily focuses on the structure of exchanges and trading venues (e.g. displayed and dark), the price discovery process, determinants of spreads and quotes, intraday trading behaviour, and transaction costs. Market microstructure continues to be one of the fastest growing fields of financial research due to the rapid development of algorithmic and electronic trading (Kissell, 2014).

MARKET ARCHITECTURE

This refers to the set of rules governing the trading process, determined by choices regarding market types, price discovery, order forms, protocols (market rules), and transparency with respect to quantity and quality of information.

MARKET TYPES

On the basis of degree of continuity, reliance on markets makers and degree of automation the markets are classified:

1. **Degree of continuity:** whether trading is allowed at specific point in time or at any point in time while the market is open.
2. **Reliance on market makers:** auction or order driven markets feature trade between public investors without dealer intermediation while in a dealer (or quote - driven) market, a market maker takes the opposite side of every transaction (Madhavan, 2000).
3. **Degree of automation:** whether transaction in the market is based on floor or screen based electronic systems. The technology of order submissions and protocol governing trading differentiate the types of market.

ORDER FORMATION

An order is a way for an investor to initiate a transaction. If a trader wishes to make a trade, he submits a directive to either a broker or directly to the market (if he has such access) to either buy or sell a specified number of shares (Nevmyvaka, 2005). The basic order forms are:

1. **Market Orders:** which is the requests to buy or sell a given number of shares immediately at the best available price (usually associated with impatient traders). Market order is the order to buy or sell one round lot at the prevailing price.
2. **Limit Orders:** worst allowable price to transact within a given time limit; not always immediately transacted, limit orders are stored in a queue known as an *order book*
3. **Stop order:** is an order that becomes a market order if and when the market reaches a price pre-specified by the trader. Limit orders specify a

price either above the current ask or below the current bid and await the movement of prices to become active.

Some of the order types found in security markets is: ***Market-at-Close, Fill – or – Kill, Immediate-**or**-Cancel,*** allow traders to control the timing, quantity or execution of their trades.

TRANSPARENCY: O'Hara (2001) posits that transparency is a salient consideration in the competition among markets for trading volume, and thus in the prospects for further fragmentation of liquidity. A market is considered transparent when high quantity and quality of information regarding current and past prices, quotes, depths, volumes and the identities of market participants are rapidly available to the public. In this sense 'market transparency refers to the ability of market participants to observe information about the trading process' (O'Hara, 1995).

PRICE FORMATION AND INFORMATION ROLE

The literature of MMS makes available a model different from frictionless Walrasian models of trading behaviour; models that specifically rely on perfect competition and free entry assumptions. It focused on analysing all areas of the security trading process (Madhavan, 2000). Models of how prices are determined in securities markets are needed to answer the underlying question of how prices come to impound new information in MMS. Prior to this time in the literature, attention was on market makers (agent) operations. They are professional traders who stand willing to buy or sell securities on demand. This pivotal role of market makers as price setters, liquidity provider and provide permit for continuous trading, position them on a logical starting point for an exploration of how prices are actually determined inside the "black box" of a security market (Madhavan, 2000).

DETERMINANTS OF THE BID-ASK SPREAD

Two prices are quoted by market makers:

a) Bid price: The maximum price at which they will buy.

b) Ask price: The minimum price at which they will sell. The difference between the bid and the ask price is the market maker's spread.

Demsetz (1968) contend that the term "predictive immediacy" in an organized exchange market is provided by market maker, and the bid-ask spread is the desired return under competition. The role of the market maker is passive as they adjust the bid-ask spread in response to changing conditions, and this first approximation is reasonable. Stoll (1985) supported this position by submitting that market makers specialist face competition from floor traders, competing dealers, limit orders and other exchanges.

THEORETICAL LITERATURE

ROLLS MODEL: The approach used in computing implementation or transaction cost with transaction price data was provided by this model. Quoted spreads are the basis for negotiation in majority of the market. Hence may overstate true costs for trades by investors who can extract favourable terms from dealers; for other trades, such as large – black trades, quoted spreads may understate true costs. With the mean and variance unit quantities known, we assumed with the convention that X_t + 1 for a buyer initiated trade, - 1 for a seller initiated trade, and 0 for a cross at the mid quote. The foremost set of models focused on how market or trade frictions are reflected in unpredictable pricing errors as stated in (Kasimu & Igbinedion, 2019).

INVENTORY-BASED MODELS: The difficulty a dealer experience from buyers and sellers with arriving time variation is the focus of this model. The models postulate the primary role of market-makers as liquidity providers and display exactly how the bid-ask spread rewards market-makers for price risk on inventory. In this model, the procedure for exchange is tricky (problem), matching where by the market maker that is being confronted by risk that is unbalance, utilizes price to stabilize demand and supply through time, with the main issues being the path of inventory and the doubt around the flow of order (Aigbovo & Osamwonyi, 2018). Market makers know the inventory mechanism by shifting the quotes to produce the difference of buy and sells orders. The spread between bid-ask goes with the risk aversion of the market maker, the amount of the deal, the risk of the security and the time limit, or it may reveal the dealer's market influence or power.

MODEL OF GLOSTEN AND MILGROM (1985): This model argued that Dealers do not have superior information and assume on the security's real worth through the past trade record. Also, there is a payoff for assets and this is either low or high with assumed probability which is shown after the market has closed. The entire traders consist of informed traders being aware of the real security payoff and uninformed traders who trade unsystematically with same chance. Traders that are informed buy (sell) if the real security price increased (decreased). The percentage of traders who have privileged information participate in the market is assumed (Glosten and Milgrom, 1985).

Glosten-Milgrom Bid-ask spread model can be demonstrated by assuming that security will have two likely values - a highest value, V^H, and a lowest value, V^L - with equal probability value.

Furthermore, the model also reveals that the first difference of trading price process is serially uncorrelated. Hence the spreads owing to monopoly power, transaction costs and risk aversion result in negative serial correlation, while spreads solely owing to adverse selection do not lead to negative serial correlation (Glosten and Milgrom, 1985).

EMPIRICAL LITERATURE

Ho and Macris (1984) investigated the model of dealer pricing in the New York Stock (NYS) exchange. The study used time series transaction data and regression methodology. Findings show that the amount of spread is positively related to security risk and inventory influences are significant. Also, both the bid and ask prices decrease (increase) when inventory is positive (negative). Hasbrouck and Sophiano (1988) tested the inventory control and asymmetric information models with New York Stock Exchange intraday data on volume and quoted prices, adopting the vector autoregressive method and granger causality test. Findings indicate that intraday buy and sell volume and quote revision display robust reliance in both ways, and this is in line with inventory control and asymmetric information models. Forster and George (1992) conclude that differences in market structure affect returns. Summarily for market structure there is not a uniform view on what structures offer the greatest liquidity complexity of real – world market structures. Goldstein and Kavajecz (2000) studied the liquidity provider's behaviour on the NYSE during extreme volatility periods. Findings revealed that following a rash drop in equity prices, traders abandoned limit orders in favour of floor brokers.

Madhavan (2000) presents a review-both theoretical, empirical and experimental literature on market microstructure with a special focus on informational issues relating to price formation and price discovery, including both static issues such as the determinants of trading costs and dynamic issues such the process by which prices come to impound information over time, Market structure and design, including the relation between price formation and trading protocols, information and disclosure, in the context of market transparency, i.e., the ability of market participants to observe information about the trading process, and interface of market, microstructure with asset pricing, international finance, and corporate finance. The study concludes that the subject matter has implications for the efficiency of market. Derman (2002) examines the perceptions of time, risk and returns during periods of speculation. He finds that time variance and risk greatly explains security returns volatility. Hasbrouck (2004) has also examined market microstructure in a comprehensive framework. Evidence points to the fact that market microstructure are largely explained by information fluctuations of security prices.

Gabaix (2006) examined the relationship between institutional investors and sock market volatility. Employing a GARCH model he finds that institutional investors as percentage of total stock investment is a market microstructure variable. Obizhaeva, (2009) examines portfolio transition and price dynamics using evidence from multiple data sources. The findings corroborate the view that price dynamics and portfolio transition path are correlated. Osamwonyi and Aigboduwa (2011) test the information asymmetry model of Glosten and Milgrom (1985) using data from the Nigeria stock market. Their result shows that the model can be used to predict upward/downward movement of stock prices in the Nigeria stock market. Kyle and Obizhaeva (2013) examine market microstructure. The authors employ a meta-model using a data set of 400,000 portfolio transition orders. The empirical results show that quantitative predictions of market microstructure invariance concerning beta sizes are explained by trading volume and volatility of stock returns.

Eguavoen (2016) tested the information asymmetry model of Glosten and Milgrom (1985) using data from the Nigeria stock market. The result reveals that the upward and downward movement of price for the following day can be forecasted in the Nigeria stock market. Ogbeide and Umana (2017) tested the Glosten and Milgrom (1985) model utilizing data from the Nigeria stock market. The result showed that the model forecasted correctly the prices of stock of about four listed firms, hence going against the random walk movement. Igbinovia (2017) empirically tested market microstructure in the Nigerian Capital market, using security returns, with five market microstructure explanatory variables of one lagged security returns, size of firms, measured by market capitalization, trading volume, which measures trading activity, and the inverse of security prices. Employing a multivariate regression estimation technique, the empirical findings show that volume, risk, price and firm size significantly explain most of the variability in security return. The coefficient of volume is found to be negative, apparently showing that dealers can achieve faster turnaround in inventory by lowering their potential liquidation costs and reducing their risk. Nevertheless, there is no evidence of economies of scale in market making. Osifo and Okuwhere (2018) examined the test of market microstructure in Nigerian capital market. The study extends Copeland and Galai (1983) model and adopts Glosten and Miligrom (1985) model, that determine the bid – ask spread with the assumption that an asset can take a value that is high, V^H; and a value that is low, V^L with homogeneous probability value. Result indicates that the model was able to predict exactly thirteen securities prices which are 29.5% of the sample of the study. In the same vein, the model was able to predict prices of stocks with minimal differentials, hovering around 1% to 5% which is 14.9% of the sample of the study.

3. METHODOLOGY

POPULATION, SAMPLE AND SOURCE OF DATA

Longitudinal research design that is a sub type of ex-post facto research design is used in this study because the variables under consideration are historical in nature and were collected over a period of time. The population of this study is data on all stock return indicator of the Nigeria stock market from 1963 to 2019. However, focus is on All Shares Index (ASI) data as the major indicator of stock return performance from 1986 to 2019 constitutes the sample of this study. This period was informed because it captures the pre and post global financial crisis of

2008. All variables were sourced from the Central Bank of Nigeria (CBN) statistical bulletin.

PRIMARY TEST AND DATA ESTIMATION TECHNIQUES

The preliminary test commence with the use of GARCH (1:1) as developed by Bollersleve (1986) to generate the volatility of past stock returns variable. Bollerslev (1992) argues that ARCH and GARCH models are among the best models to characterize the changes of uncertainty of speculative prices over time. The equation is given as:

$$Y_t^2 = \alpha o + \alpha_1 X_{t-1}^2 + \beta Y_{t-1}^2 \qquad (1)$$

Where

Y_t^2 = Measure of past stock return volatility
αo = Mean
α_1 and β = The coefficient
X_{t-1}^2 = The ARCH term, the lag of squared residual and captures news about volatility from the previous period
Y_{t-1}^2 = The GARCH term, the lag of volatility measure itself.

Ogundipe, Ojeaga and Ogundipe (2014) also used this conditional variance model in their study of volatility.

Descriptive statistic is used to provide property summary of the variables in a more convenient and simplified form. Correlation is used to determine the direction and strength of the relationship between the variables and the presence or absence of multi-co-linearity among variables. The stationarity of the variables were confirmed with Augmented Dickey-Fuller unit root test given as:

$$\Delta\partial_1 = \alpha_0 + \beta_{1^t} + \emptyset\partial_{t-1} + \sum_{i=1}^{n} \alpha_1 \Delta\partial_{t-1} + \varepsilon_i \qquad (2)$$

Where: ∂_1 = The series
t = time trend factor
Δ = the first difference operator
n = maximum lag length of the dependent variable

Upon the achievement of the same level of integration among variables, The Engle and Granger two stage co-integration techniques is adopted which is based on the unit root test for the residuals generated in the long run static regression of the dependent variable (stock return) to determine whether explanatory variables and dependent variable converge in the long run. This technique is adopted because it is better con-integration estimation with unsystematic equation (Engle & Granger, 1987). The equation is given as:

$$Y_t = \alpha_0 + \alpha_1 Z_t + \varepsilon 1_t \qquad (3a)$$

$$Z_t = b_0 + b_1 Y_t + \varepsilon 2_t \qquad (3b)$$

Where
Y_t = dependent variable in the vector
Z_t = independent variable in the vector
α_0 *and* b_0 = Constant
a_1 *and* b_1 = Parameter to be estimated
$\varepsilon 1_t$ = Error term

Finally, the Ordinary Least Square (OLS) long run and the Parsimonious ECM short run dynamics are estimated. The probability values in the OLS and ECM regression result were used to ascertain the significant effect of market microstructure variables on stock return in Nigeria.

THEORETICAL FRAMEWORK

This study is hinged on Rolls (1984) model because the model provides a method to estimate execution costs by simply using transaction price data. And it clearly recommends market microstructure variables of market size, riskiness of security, market activity and price of security that can significantly determine bid-ask price. Demsetz (1968) used this model to investigate the determinant of bid-ask price. The model is given as;

$$S_i = \alpha_0 + \gamma_1 Ln(M)_i + \gamma_2 \left(\frac{1}{P_i}\right) + \gamma_3 \sigma_1 + \gamma_4 Ln(V)_i + \varepsilon_i \qquad (4)$$

S_i = average % of Bid-Ask price
LnM_i = log of Market capitalization (Market size)
$\left(\frac{1}{P_i}\right)$ = Price inverse
σ_1 = Risk of past securities (proxy by past stock return volatility)
$Ln(V)$ = Market activities (proxy by log of Trade volume)
ε_i = Random error term
α_0 = Constant
$\gamma_1 - \gamma_4$ = Coefficient of explanatory variables with positive effect as deduced from *A priori* expectation.

Igbinovia (2017), Kasimu and Igbinedion (2019) also adapted this model in the Nigeria stock market.

MODEL SPECIFICATION AND OPERATIONALIZATION OF VARIABLES

This study adapted the model of Demsetz (1968) as specified in equation (4), modified to suit the objectives of this study. The functional form of the model is stated as follows;

$$STR = f(MCAP, PI, RPS, MACT) \qquad (5)$$

The estimated version of the model with OLS assumption is stated as:

$$STR_t = \alpha_0 + \delta_1 lnMCAP_t + \delta_2 PI_t + \delta_3 RPS_t + \delta_4 MACT_t + \varepsilon_t \quad (6)$$

The Error Correction Model (ECM) incorporates the long run equilibrium with the short run dynamics without losing the necessary long run properties. Therefore, this study estimates the ECM using the Autoregressive Distributed Lag (ARDL) selected model of equation (6). Hence, the corresponding short run ECM for equation 3.6, used in this study is given as:

$$\Delta STR_t = \alpha_0 + \sum_{i=0}^{n} \delta_{1i}\, \Delta STR_{t-1} + \sum_{i=0}^{n} \delta_{2i}\, \Delta lnMCAP_{t-1} + \sum_{i=0}^{n} \delta_{3i}\, \Delta PI_{t-1} + \sum_{i=0}^{n} \delta_{4i}\, \Delta RPS_{t-1} + \sum_{i=0}^{n} \delta_{5i}\, \Delta lnMACT_{t-1} + \delta_{6i} ECM_{t-1} + \epsilon t \quad (7)$$

Lag length of *t-i was assumed for the ECM equation* above. Equation 7 represents the short run dynamics while equation 3.6 represents the long run equilibrium relationship.

Where:
ΔSTR = Changes in Stock Return
lnMCAP = Log of Market Capitalization (Market size)
PI = Inverse Price of security
RPS = Risk of past securities (proxy by past stock return volatility)
lnMACT = log of Market Activities (Proxy by Trade Volume)
α_0= Constant (Intercept)
δ_1 to δ_5 = Coefficients of explanatory variables
ε_t = Stochastic term
$Ecm(-1)$ = Error correction term
ϵt = Stochastic term
t = respective variables at time t

A priori expectation as derived from theoretical literature is expressed as:
$\alpha_0 > 0$, and $\delta_1, \delta_2, \delta_3, \delta_4, \delta_5 > 0$

4. DATA PRESENTATION AND ANALYSES

The data stream from 1986 – 2019 on annual bases is presented in the appendix of this study.

DATA ANALYSIS. DESCRIPTIVE STATISTIC

Table 1. *Summary Statistic*

	Mean	Median	Max	Min	Std. Dev.	Skewnes s	Kurtosis	J.B Stat	Prob
STR	3.88764 7	4.13	6.37	2.21	0.85837 4	-0.03725	3.84882 4	1.02857 2	0.598

MCAP	2.927647	3.005	4.34	0.83	1.209563	-0.35658	1.705772	3.093482	0.213
RPS	2.18E+11	2.44E+11	2.45E+11	4.43E+09	5.33E+10	-2.57859	9.487659	97.30542	0.0000
MACT	4.897353	4.95	5.03	3.89	0.193818	-4.36519	22.90378	669.2053	0.0000
PI	0.237559	0.19	0.702	0.07	0.155833	1.502269	4.491902	15.94179	0.0004

Source: Researcher's Computation Using E-view (2020).

The proportion (ratio) of mean to median is approximately one for all variables (except for RPS), with meaningful variations between minimum and maximum values. Peak property distributions were displayed by STR, RPS, MACT and PI respectively, only MCAP exhibit a flat property distribution as shown by the variables corresponding Kurtosis value that is > 3.0 and < 3.0 approximately. All variables exhibit a long tail to the left from the mean as indicated by their negative Skewness values (except for PI). STR and MCAP displayed a normal distribution as indicated by their corresponding JB statistic with non-significant probability values. Other variables were not normally distributed as shown by their corresponding significant probability values. Hence, unit root test becomes imperative for the variables stationarity.

UNIT ROOT TEST

Table 2. *Stationarity Test*

Variables	ADF Stat	Order	Remark
STR	-3.914344**	I(1)	Stationary
MCAP	4.551557*	I(1)	Stationary
RPS	-6.500072*	I(1)	Stationary
MACT	-4.318506*	I(1)	Stationary
PI	-4.803101*	I(1)	Stationary
Critical Values			
1%	-4.467895	First Diff	
5%	-3.644963	First Diff	
*****and ****** Means 1% and 5% level of Significance			

Source: Researcher's Computation Using E-view (2020).

In line with econometric theory, all variables are not stationary at levels. This induced taking the first difference of the variables. And table 2 revealed that all the variables became stationary at first different and integrated of the same order I(1). The variables are fit to be used to estimate the co-integration test.

TWO STAGE CO-INTEGRATION TEST

Table 3. *Engle and Granger Co-integration*

Variables	ADF Stat	Critical Value	Prob.	Order	Remark
ECM (RESID)	-4.904238*	-4.262735	0.0020	I(0)	Stationary
* indicates 1% level of Significance					

Source: Researcher's Computation Using E-view (2020)

The ADF statistic value for the residual is greater than the critical value at 5% level of significance. Thus, the null hypothesis of there is no co-integrating relationship between the variables is rejected at 95% level of significance. This means that any variable that deviate in the short run will converge to equilibrium in the long run. All co-integrating variables embodied an error correction element. Hence, the parsimonious Error Correction Model (ECM) is estimated.

LONG RUN REGRESSION ESTIMATE

Table 4. *OLS Long Run Result*

OLS Long Run Regression Result			
Variable	**Coefficient**	**t-Statistic**	**Prob.**
Dependent Variable = STR			
Independent Variables			
C	-0.311700	-0.186704	0.8532
MCAP	0.647432*	11.80690	0.0000
RPS	3.03E-12**	2.400382	0.0230
MACT	0.342429	0.972296	0.3389
PI	-0.143744	-0.338827	0.7372
R-squared	0.859291		
Adjusted R-squared	0.839883		
F-statistic	44.27475		
Prob(F-statistic)	0.000000		
D.W Stat	1.783484		

** and ** = 1% and 5% level of Significance*

Source: Researcher's Computation Using E-view (2020).

Table 4 shows that 86% and 84% of systematic changes in bid-ask price (STR) has been explained by all the Rolls model variables of MCAP, RPS, MACT and PI taken together as indicated by the coefficient of determination R^2 and it adjusted version respectively in the long run. Only 16% dynamics in bid-ask price was not explained by the model was captured by the random error term, indicating a good fit of the regression line. All the explanatory variables have significant relationship with the dependent variable as shown by the F-stat value of 44.27 and significant at 1% level. MCAP, RPS and MACT are correctly signed and conform to *A priori* expectation. However, only MCAP and RPS significantly determine and influence bid-ask price (STR) in the Nigeria stock market. Only PI has a non-significant influence on STR in the long run during the period under review. The D.W statistic of approximately 2.0 may show the absent of serial correlation in the long run.

PARSIMONIOUS ECM ESTIMATES

Table 5. *ECM Short Run Result*

ECM Short Run Result			
ΔSTR Dependent Variable			
Variable	**Coefficient**	**t-Statistic**	**Prob.**
C	0.473517	0.062079	0.9513
STR(-1)	0.688381	0.236734	0.8159
MCAP	1.080693	1.499940	0.1531
MCAP(-1)	-0.220407	-0.103057	0.9192
MCAP(-2)	-0.675725	-0.817124	0.4259
RPS	1.37E-12	0.147208	0.8848
RPS(-1)	-7.69E-13	-0.041526	0.9674
MACT	0.000118	8.39E-05	0.0399
PI	-0.476086	-0.518642	0.6111
PI(-1)	0.155600	0.131500	0.8970
PI(-2)	0.153444	0.155024	0.8787
ECM(-1)	-0.807858*	-2.658449	0.0458
R^2	0.791529		
$Adj\ R^2$	0.622147		
F-statistic	4.673031		
Prob(F-statistic)	0.002318		
Durbin-Watson stat	2.114550		

** indicates 5% level of Significance

Source: Researcher's Computation Using E-view (2020).

From table 5, the ECM coefficient of -0.81 approximately is correctly signed and significant at 5% level of significance. This means that any variable deviation due to shock in the short run will adjust to long run equilibrium at an approximate speed of 81% which is relatively high. The F-statistic value of 4.67 and significance at 1% level shows that the variables together can be employed to predict bid-ask price (STR). 79% and 62% of systematic changes in bid-ask price (STR) has been explained by all the explanatory variables in the short run taken together as indicated by R^2 and it adjusted version respectively. Only the 38% changes in STR was not captured by the variability in stock return model but was captured by the stochastic term. Hence, the model has a good fit of the regression line. None of the explanatory variables pass their significant test at 5% level of significance respectively in the short run only.

The one period Lag STR(-1) coefficient of dependent variable considered in the model has a non-significant positive influence on current year STR. The one and two period lag of MCAP considered has a non-significant negative effect on current year MCAP. The one period lag of RPS(-1) has a non-significant negative effect on current year RPS and the one and two period lag considered for PI has a non-significant positive influence on current year price inverse (PI). Finally, MCAP, RPS and MACT have a non-significant positive effect on bid-ask price (STR) in the short run with only PI having a non-significant negative effect on STR. The Durbin-Watson statistic values of 2.0 approximately may show absent of serial correlation in the model in the short run. However, because of the lag value of the dependent variable on the right hand of the model (being an ARDL model) the Durbin Watson statistic is no longer sufficient to authenticate the absence of serial correlation in the model. This informed the estimation of second higher order correlation test of Breusch-Godfrey Serial Correlation LM Test and Q-statistic test.

POST HIGHER ORDER SERIAL CORRELATION TEST

Table 6. *Breusch-Godfrey Test*

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	Obs*R-squared	Prob. F(4,12)	Prob. Chi-Square(4)
0.932098	7.111454	0.4778	0.1301

Source: Researcher's Computation Using E-view (2020).

The result in table 4.6 rejects the alternate hypothesis (H_i) of there is serial correlation up to order four (4). Thus, the null hypothesis (Ho) of there is no serial correlation is accepted since the probability value 0.13 > 0.05. This indicates the absence of serial correlation in the model. Thus the model is valid and can be used for policy recommendation without further re-specification.

DISCUSSION OF FINDINGS AND POLICY SUGGESTION

The one lag period coefficient of excess return variable is positive but not significant, is an indication of volatility persistence in stock return results from a combination of market imperfections, market dynamism, anomalous diffusion and information asymmetry regarding the market. This conforms to the findings of Igbinovia (2017), Obizhaeva (2009) and Plerou (2010).

The coefficient of risk of past securities (RPS) is positive and significant at the 5 percent level, implying that high degree of riskiness of the security- measured as the volatility tend to induce stock market volatility in the long run. Invariably, higher risk tends to provoke stock market vacillation, with cyclical fluctuation in returns in the long run. Also, the coefficient of size proxy by market capitalization is positive and significant at the 1 percent level Thus, higher degree of market capitalization tend to induce higher stock return in line with market microstructure in the long run. These findings are in line with Igbinovia (2017) in the literature. The coefficient of market activities proxy by trading volume is positive and not significant at 5 percent level, apparently showing that dealers can achieve faster non-significant turnaround in inventory by increasing their potential liquidation costs and increasing their risk both in the short and long run period. This finding is contrary to the findings of Madhaven (2000) and Igbinovia (2017). Finally, the coefficient of inverse of price is negative but not significant at the 5 percent confidence. Price inverse is typically used because the minimum tick induces a convexity in percentage spreads. Finally, there is no serial correlation in the model specified implying that there may not be problem of short –run return predictability in the market. The absence of serial correlation confirms the statistical significance of the variables in determining variation in the bid – ask spread. This finding is in line with Kasimu and Igbinedion (2019).

5. CONCLUSION AND RECOMMENDATIONS

Indeed, one of the major achievements of the microstructure literature has succeeded is illuminating the "black box" by prices and quantities that are determined in financial markets. It has provided clearer understanding of the role of inventory and asymmetric information in determining the responsiveness of prices to order flows. This study tested the market microstructure model in the Nigeria stock market. Time series data on market capitalization, market activities, price inverse, risk of previous stock and bid-ask price suggested by Rolls model (1965) from 1986 to 2019 were sourced from CBN statistical bulletin. Preliminary test of descriptive statistic, ADF unit root test were carried out on the variables of interest. The co-integration technique and Error Correction Model Methodology were used to determine the short run dynamics and long run equilibrium relationship between bids-ask spread and it determinants. Findings show that risk and market capitalization appear to explain most of the variability in the bid-ask spread in the Nigerian stock market. Thus, this study concludes that asset prices need not equal full-information expectations of value because of a variety of market frictions and diffusional factors. Thereby affirming the validity of Rolls (1965) model in determining bids-ask spread in the Nigeria bourse. From the findings the following policy recommendation were made:

1. Frictions do matter, and might serve to explain many observed empirical phenomena as demonstrated by market capitalization and risk of past securities.
2. Markets and trading protocols are a great deal more complicated than originally thought and influence the observed return distribution in fundamental ways.
3. Market microstructure awareness needs to be propagated for mass investors who daily flood the market without knowing the ways and processes of price movement.
4. We must guard against consequence of the points above, such as "one size fits all" or one model-fits –all approach to regulation and policy making in the Nigeria stock market.

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