POLAC INTERNATIONAL JOURNAL OF ECONOMICS
AND MANAGEMENT SCIENCE (PIJEMS)
DEPARTMENT OF ECONOMICS AND MANAGEMENT SCIENCE
NIGERIA POLICE ACADEMY, KANO

# FINANCIAL MARKET FRICTIONS AND TRADE IN THE NIGERIAN EXCHANGE LIMITED: EVIDENCE FROM AUTOREGRESSIVE DISTRIBUTED LAGS (ARDL) BOUND TESTING APPROACH

**Aigbovo Omoruyi, Ph.D** Department of Banking and Finance, University of Benin, Nigeria

**Isibor Britny Osaigbovo** Department of Banking and Finance, University of Benin, Nigeria

## Abstract

*This study examined the effects of financial market frictions on trading in the Nigerian Exchange Limited (NGX) using time series data spanning the period 1981 to 2019. Market frictions were considered both in terms of direct market costs of trading and tax-based factors. Tax-based frictions were decomposed into capital gains tax rates and dividend tax rates in order to improve the robustness of the study. A dynamic strategy was devised for the study and the short-run and long-run impacts were observed within an autoregressive distributed lags (ARDL) model. The results show that generally, tax-based frictions exert significant dynamic effects on trading in the Nigerian Exchange Limited. In particular, dividend taxes reduce trading activities, while capital gains taxes improve trading activities. Direct trading transaction costs were however shown to have no significant impact on trading in the Nigerian Exchange Limited. Essentially, though different set of trading patterns, expectations drive trading in the Nigerian Exchange Limited, direct costs may not contribute to these factors. Indeed, investors may have evolved trading awareness information that guides their trading activities which has resulted in consistently and efficiently allocating transaction cost elements within the trading system. Considering the results of the econometric analysis, the study recommends that government should reduce the existing dividend tax rate in order to reverse its adverse effect on trading activities in the Nigerian stock market.*

**Keywords:** Financial Frictions, Nigerian Stock Exchange, Transaction Cost, Dividend Tax Rate, Autoregressive Distributed Lags (ARDL)

**JEL Classification:** F21; G15

## 1. Introduction

The perfect market assumptions include frictionless markets with fully rational investors, having equal access to market information. However, researchers such as Leroy and Porter (1981) and Shiller (1981) have showed that the stock market is too volatile to be explained by the asset pricing equations associated with complete, frictionless financial markets. The failure of the frictionless Arrow-Debreu model to explain the volatility of asset prices in real world data is referred to in the literature as 'excess volatility' (Farmer, Nourry & Venditti, 2012). To explain excess volatility in financial markets, Bernanke and Gertler (1989, 2001), Bernanke, Gertler, and Gilchrist (1996) and Carlstom and Fuerst (1997) introduce financial frictions that prevent rational agents from exploiting Pareto improving trades. In financial markets, frictions represent anything which prevents a trade from being executed smoothly, in layman terms; it could mean any reason which influences the process of decision-making of the investor (Cerra & Saxena, 2008). Financial market frictions generate costs that interfere with trades that rational individuals make (or would make in the absence of market frictions). Any factor which deters a market participant from holding the market portfolio, which leads to altering his risk-return trade-off and graphically, moving away from the efficient frontier constitute market friction. It includes

non-financial factors such as human capital and investor's time and effort. It also includes financial factors such as cost of re-balancing the participant's portfolio to adjust the risk-return trade-off. However, a distinction must be made between market inefficiencies and market frictions. Pricing errors are not included in financial market frictions. In other words, market frictions only deal with factors that influence the decision-making of the market participant (DeGennaro & Robotti, 2007).

Taxes and transaction costs are common and obvious examples of market frictions as they undeniably affect virtually every transaction. However, as noted in Lippman and McCall (1986), a friction could be any factor that impacts how long it takes to trade a given amount of an asset (at the optimal price). Financial market frictions depend in part on market structure. Market structure, in turn, depends on both the risk of the traded asset and trading volume. In the markets for risky assets, participants search for counter parties directly because the fixed costs of capital investments (including communication) are too large to be offset by the lower marginal costs of each transaction if transactions are few. As trading volume increases, markets evolve from direct search through brokered, dealer, and continuous auction markets. This evolution is a simultaneous process: As volume increases, the structure evolves, and as the structure evolves, trading volume increases (Cerra & Saxena, 2008).

Previous studies have focused on the effect of frictions on stock returns (see, Amihud & Mendelson, 1986; Hou and Moskowitz , 2002; Eleswarapu and Reinganum, 2003; Akram, 2014 among others). Empirical studies on the implications of frictions on trade in the Nigerian stock market are scanty apart from the study by Idolor, Oshadare and Izedomi (2020). This study attempts to fill this gap. Consequently, the broad objective of this study is to ascertain whether financial market frictions affect trade in the Nigerian stock market. The specific objectives are to:

(i) ascertain the effect of transaction costs on trade in the Nigerian stock market; and

(ii) determine the effect of taxes (capital gain tax rate and dividend tax rate) on trade in the Nigerian stock market.

Following this introduction, the rest of this paper is organized as follows. Section two presents the literature review. The research method is discussed in Section three. Section four presents the results of data analysis and discussion of findings. The conclusion is presented in the final section.

## 2. Literature Review

### 2.1 Conceptual Review

**Trade**

Trade in stock market is measure with trading volume. Trading volume is the amount of traded shares in a particular time interval which can be daily, weekly, and on an annual basis or any other time interval which is appropriate for analysis. It has a time dimension advantage since the higher the volume the shorter the time needed to trade a specific number of shares. Thus, the values of volume-related measures should be higher in order to indicate high liquidity (Brennan & Subrahmanyam, 1996).

**Financial Market Friction**

Friction in financial markets is defined as those factors that measure the difficulty with which a financial asset is traded in the market (Stoll, 2000)). In the context of the capital asset pricing model (CAPM), DeGennaro and Robotti, (2007) defines a financial market friction as anything that interferes with trade. This interference includes two dimensions. First, financial market frictions cause a market participant to deviate from holding the market portfolio. By implication, these frictions can cause a market participant to be exposed to more or less risk than she might prefer. This definition at first seems very limited but is, in fact, only as limited as the definition of the market portfolio. Put differently and somewhat less obscurely, financial market frictions generate costs that interfere with trades that rational individuals make (or would make in the absence of market frictions). Poyry (2014) consider market imperfections as a similar concept to frictions and defines it as market features that contradict the basic assumptions of efficient market theories.

**Taxonomy of Financial Market Friction**

The universes of financial market frictions can be partitioned in many ways. Hence, there are many versions as there are researchers. However, in this study we will focus on the classification provided by DeGennaro and Robotti (2007). They build their

structure on the economic forces underlying financial market frictions. This structure also takes a step toward identifying those entities best able to reduce the costs of market frictions. DeGennaro and Robotti (2007) use five primary categories: transactions costs, taxes and regulations, asset indivisibility, non-traded assets, and agency and information problems.

**Transactions costs:** DeGennaro and Robotti (2007) partition transactions costs into two categories: the costs of trade and the opportunity costs of time. ***The costs of trade*** in financial markets include postage, telephone charges, computer power, and similar real expenditures of resources. These have been decreasing with technological improvements. Over some periods these costs may have risen in real terms, but the costs of communication and data analysis have fallen over time. For example, the cost of an e-mail message is effectively zero. And the costs of virtually all other mechanical costs of trade have fallen. ***The opportunity costs of time:*** Trading requires time, which includes both search costs, or the time to gather information (including finding a trading partner), and the time to make the trade itself. Minimizing these costs represents a profit opportunity. One partial solution is to automate the process by means such as automatic electronic payments. An example is dividend reinvestment plans, which let investors hold securities directly and automatically reinvest dividends **(DeGennaro, 2003).** In all these cases, investors need to act only once to make several investments over an unspecified and possibly very long period. Other reductions in the time required to trade are sure to follow, both because technology continues to advance and because the opportunity cost of time tends to rise over time.

Transactions costs are probably among the most familiar financial market frictions. Today, though, they might also be among the least important. Advances in communications and data-handling technology have reduced not only the costs of trade to a fraction of what they were just a few years ago but also the time needed to make trades. Together, these forces probably more than offset an increase in the opportunity cost of time itself (DeGennaro & Robotti, 2007). Vayanos (1998), for example, finds that realistically small transaction costs have negligible effects on asset returns and mainly affect the portfolio rebalancing frequency.

**Taxes and regulations:** DeGennaro and Robotti (2007) posit that the second major category in their taxonomy of financial market frictions is taxes and regulation. They use the term regulation loosely to encompass laws passed by legislative bodies as well as self-imposed rules by government agencies and industries. Privately imposed rules, therefore, such as exchange-imposed trading rules, count as regulations. Taxes and regulatory costs may be either explicit or implicit. The corporate income tax is explicit: The statute imposing the tax calls it a tax, and the corporation sends funds to the government. Other taxes are implicit, such as capital requirements that insured banks must meet (Buser, Chen, & Kane 1981). In this case, the statute authorizing the capital requirements does not refer to them as taxes, and the banks do not send funds to the government to discharge the liability. But these requirements still increase the cost of doing business and operate like a tax. Regulation varies widely across jurisdictions.

**Asset indivisibility:** If assets were infinitely divisible, then investors could hold an arbitrarily small portion of each asset. This practice would permit all investors, even those with little to invest, to hold the market portfolio of all investable assets. In fact, though, assets are lumpy - the minimum traded unit is finite. This means that most investors must decide whether to hold the smallest traded unit of an asset or to omit it from their portfolios. Either way, their resulting portfolios will not be invested in the same proportions as the market portfolio and thus will lie below the capital market line. Asset indivisibilities are important reason mutual funds and derivative securities exist. By pooling funds from many investors, they permit investors to hold portfolios that more nearly approximate the market portfolio. This process is costly, though, and some indivisibility remains because it is too expensive to eliminate them all (DeGennaro & Robotti, 2007).

**Non-traded assets:** Non-traded assets are those assets that simply cannot be traded or cannot be traded easily. For example, a person invests tens of thousands of naira in gaining education and skills cannot sell that 'human capital". However, constant financial market innovation is ever expanding what can and cannot be traded. The explosion of securitization – whereby people invest in the revenue streams arising from mortgages or credit card debts – shows the ingenuity

of financial institutions and their employees in overcoming friction inherent in non-traded assets. Bundling the assets reduces idiosyncratic risk. In others, the innovation permits unbundling the assets' risk and selling parts of it to investors who are better able to bear it (for example, credit-default swaps). This is not to say that if an asset begins to be traded, then the market friction has been eliminated. More accurately, the friction has been mitigated or exchanged for another (presumably) less onerous friction. Taking the example of human capital sales, one obvious problem is that it might not be legal to sell certain claims on future income. If not, then that legal restriction (in this article, a regulatory financial market friction) complicates the problem of an asset being non-traded. After all, traded assets are also subject to financial market frictions. Conflicts of interest, or what economists call agency problems, are another problem with human capital sales (DeGennaro & Robotti, 2007).

**Agency and information problems:** Agency and information problems deal with the issue of incentive. Jensen and Meckling (1976) wrote the seminal paper in this area, but the concept has been known since at least Adam Smith (1776). Smith notes that the directors of large companies, who manage large amounts of other people's money, cannot be expected to exercise the same vigilance that they would exercise for their own money. He adds that negligence and inappropriate expenditures result. Smith's insight is consistent with the familiar adage, "If you want the job done right, then do it yourself." The problem is that for all but the smallest businesses, doing it yourself is simply impossible. With size comes the separation of ownership and control because so few individuals have the wealth to own an entire company, and no one can operate a firm of any size without hiring agents to assist him. Why is the separation of ownership and control a financial market friction? The separation can lead to incentive problems, and financial contracts cannot handle them at zero cost. While it may make rationales sense to purchase an asset controlled by another investors may hesitate to do so and give up direct control of their money or they may worry that the seller knows more about the liabilities that come with a particular asset and thus may hesitate to invest in it (DeGennaro & Robotti, 2007).

## 2.2 Theoretical Review

### Trading cost theory

This theory as originated by Amihud and Mendelson (1986) looks at the trading costs that are as a result of trading a stock. Real markets experience frictions which affect trading and asset prices hence these frictions should be incorporated when determining asset prices. Amihud and Mendelson (1986) in their study on how costs associated with the transaction affect stock prices concluded that stocks with larger bid-ask spreads had higher returns. In addition, they established that trade associated costs can either increase or decrease as a result of variations in time of transactional costs.

Transaction costs causes the market to be segmented, as short-term investors hold comparably more liquid stocks in comparison to long-term investors. However, even though most investors have the option to avoid stocks with higher costs of transaction Amihud and Mendelson (1986) found that the expected stock return has a positive concave relationship with transaction costs. Additionally, investors who hold their stocks for longer periods can get a premium as a result of illiquidity that exceeds the expected transaction costs through holdings tocks with higher spreads (Amihud, Mendelson & Pedersen, 2005). In Comparison to investors who hold stocks for a long period, investors who hold stocks for shorter periods, are more vulnerable to costs as a result of transacting on a more frequent basis. For long term investors, costs of transaction can be depreciated over the total holding period.

Moreover some investors are also large in comparison to others in a way that they are able to influence prices in the market, either due to their size or as a result of the advantage of the information they hold. To a market-maker, he always loses with informed traders and bears the costs of such trades; thus, they have to find ways to offset these losses through the uninformed traders. These gains arise from the bid-ask spread. Rational, competitive market-makers set their bid and ask prices accordingly, and more extreme information asymmetries lead to wider bid-ask spreads which shows that the market is less liquid (Ding, Nilsson and Suardi, 2013).

In a perfect market, for all periods, all market participants are present. Hence, a buyer has instantaneous accessibility to all the sellers in the

market. However, practically, this is not the case. Agents incur market participation costs like costs of monitoring movements in the market. In addition to market participation costs, agents incur execution costs per each transaction. Costs associated with the transacting process causes a significant difference between the buying price and the price at which the asset is being sold at. Transaction costs which are associated with trading such as transaction taxes, fees paid to process orders and brokerage fees also affects trading in the stock market. Costs such as transaction taxes are seen as primitive transaction costs while other types of transaction costs are as a result of other market imperfections (Atkins & Dyl, 2007).

The above costs have a direct effect on the trader's profit with both the buyer and being affected. These costs are a representation of presence of market frictions in the stock markets hence can be seen as a determinant of trading in the market since it affects the price investors are trading at in the market. Markets with high transaction costs are less liquid as compared to their counterparts with low exogenous transaction costs (Atkins & Dyl, 2007).

### 2.3 Empirical Review

Amihud and Mendelson (1986) carry out a study to find out if stock returns reflect the effect of market frictions on the US. Utilizing the Fama and MacBeth (1973) procedure of forming portfolios and using bid/ask spread as a natural measure of liquidity (friction), they found that assets that are not liquid could be owned by investors with longer time periods as returns and transaction costs formed an increasing and concave function. They also found that increases in the level of liquidity led to decreases in risk-adjusted returns.

Based on the Amihud and Mendelson (1986) model, Eleswarapu and Reinganum (2003) also used the bid –ask spread as their measure of friction to examine the behavior of liquidity premium in pricing assets. Using 49 equally –weighted portfolios, they found that liquidity was significant to returns. Moreover, even after spreads had been controlled for, the paper suggested that size effect is significant which differed from Amihud and Mendelson's results.

Hou and Moskowitz (2002) examine the effect of market frictions, price delay on cross section of expected returns. Findings show that small, volatile and neglected stocks exhibit significant delay. After controlling for microstructure and liquidity effects, the result showed that delayed firms exhibit a strong return premium in the cross-section that subsumes that of firm size, they conclude that accounting for firms facing significant friction is important for understanding the cross section of returns.

Similarly, Akram (2014) also used the bid-ask spread as the proxy on liquidity on his study to elucidate the association among liquidity and stock return. From a two stage regression on the data taken from ten listed firms on the Karachi stock exchange for a seven year period, Akram found a negative relationship between liquidity and stock returns supporting both Amihud and Mendelson (1986)and Eleswarapu and Reinganum (2003) findings.

Idolor, Oshadare and Izedomi (2020) studied the effect of market frictions on stock market performance in Nigeria and the period of study was from 1981- 2018. The market frictions variables utilized in the study includes: Transaction cost (proxy with total value of market transaction), taxes and regulations (proxy with Treasury bill rate), asset indivisibility (proxy with total value of mutual funds transactions), nontrade asset (proxy with value of bonds and other instruments) and agency with information problem (proxy with value of equity sold). The result of the ARDL regression reveals that all the financial market frictions variables utilized in the study have positive effect on stock market growth. The result further reveal that transaction cost and agency and information problem has a significant effect on capital market growth while the effect of tax and regulatory rate, non-traded asset and market indivisibility on capital market growth were not significant.

## 3. Methodology

### 3.1 Research Design

In this study, the longitudinal research design was employed. Longitudinal research design involves the use of historical data to gain knowledge about some phenomenon over a period of time.

### 3.2 Population and Sample

The population of the study is the entire 161 listed companies in the Nigerian stock market. This total number also constitutes the sample.

### 3.3 Data and Sources

The study gathered time series annual data for the period covering 1981 to 2019 from the Central Bank of Nigeria (CBN) Statistical bulletin and World Bank Financial indicator Database. The choice of this period was because it captures pre and post global financial crisis.

### 3.4 Method of Data Collection

Secondary data collection method was employed. Secondary data is data collected by someone other than the actual user. It means that the information is already available, and someone analyses it. It may be either published data or unpublished data.

### 3.5 Theoretical Framework

The trading cost theory developed by Amihud and Mendelson (1986) underpins this study. The theory states that transaction costs which are associated with trading such as transaction taxes, fees paid to process orders and brokerage fees also affects trading in the stock markets.

### 3.6 Model Specification

The study adopts the Idolor, Oshadare and Izedomi (2020) model with slight modification. In their model they proxy financial market frictions with Treasury bill rate, total value of equity sold, total value of mutual funds transactions and value of bonds and other instruments. We utilized total transaction cost, capital gain tax rate and dividend tax rate to proxy financial market frictions. We therefore modeled total value of market transactions to be a function of total transaction cost, capital gain tax rate and dividend tax rate as follows:

TRA = f (TC, CGT, DGT) (1)

Where TRA represents trading (measure by the total volume of stock traded); TC represents transaction cost (measure by total value of transaction cost); CGT represents capital gain tax rate while DGT represents dividend tax rate (both are used as proxy for taxes); f = functional relationship.

The function in Equation (1) can be transformed into an econometric time series model with an error term as follows:

$\ln TRA = a_0 + a_1 \ln TC + a_2 \ln CGT + a_3 \ln DTR + \varepsilon_t$ (2)

Where;

$a_0$ = Intercept

$a_1 - a_3$= model parameters (coefficients of each explanatory variable)

$\varepsilon_t$= Error term

From the above Equation (2), we could derive the unrestricted error correction model to capture both the short-run and the long-run dynamics so as to test for co-integration relationship among the variables. The unrestricted error correction model (UECM) is specified as:

$$\Delta \ln TRA_t = \alpha_1 + \sum_{j=1}^{k} \beta\, \Delta lnTRA_{t-j} + \sum_{j=0}^{k} \Phi_j\, \Delta lnTC_{t-j} + \sum_{j=0}^{k} \delta_i\, \Delta lnCGT_{t-j} + \sum_{j=0}^{k} \lambda_i\, \Delta lnDTR_{t-j} + \prod_1 lnTRA_{t-1} + \prod_2 lnTC_{t-1} + \prod_3 lnCGT_{t-1} + \prod_4 lnDTR_{t-1} + \varepsilon_t \dots\dots\dots\dots (3)$$

To assess the long run relationship among the variables, two hypotheses are developed. The null hypothesis of no co-integration is $(H_o: \pi_1 = \pi_2 = \pi_3 = \pi_4 = 0)$ tested against the alternative hypothesis of the existence of co-integration relationship$(H_o: \pi_1 \neq \pi_2 \neq \pi_3 \neq \pi_4 \neq 0)$. This test is based on f-test by ordinary least square (OLS) estimation technique. The computed f-statistic value is compared with critical bound values developed by Narayan et al. (2004), which have a non-standard distribution that depends on whether the variables included in the model are purely I(0), I(1) or mixed. The f-test has a non-standard distribution which depends upon: (i) Whether variables included in the ARDL model are I(0) or I(1); (ii) The number of regressors, and (iii) Whether the ARDL model contains intercepts and/or a trend.

Critical values are reported by Pesaran (1997) and Pesaran, Shin and Smith, (2001). However, these critical values are generated for sample sizes of 500 and 1000 observations and 20,000 and 40,000 replications, respectively. Given the relatively small sample size in this study (39 observations), we adopt Narayan (2004) generated bounds f-statistic critical values specific for observation below 100. If the f-statistic is greater than the upper bound, there exists co-integration relationship. If the f-statistic is below the lower bound, there is no co-integration. However,

if the f-statistic lies in between upper and lower bounds, then the inference is inconclusive and therefore, unit root test of the variables need to be conducted before proceeding with the ARDL technique. Given that a long-run relationship exists, a further two-step procedure to estimate the model is undertaken; the long-run and short-run elasticity. Long-run model will be estimated to obtain the long-run coefficients of the relationship between trading and financial market frictions (total transaction cost, capital gain tax and dividend tax rate).

$$\Delta \ln TRA_t = \alpha_2 + \sum_{j=1}^{k} \beta_{2i}\, lnTRA_{t-i} + \sum_{i=0}^{k} \Phi_{2i}\, lnTC_{t-i} + \sum_{i=0}^{k} \delta_{2i}\, \Delta lnCGT_{t-i} + \sum_{i=0}^{k} \lambda_i\, \Delta lnDTR_{t-i} + \varepsilon_{2t} \quad (4)$$

To obtain the short-run coefficients, the error correction mode of ARDL specification is specified as;

$$\Delta \ln TRA_t = \alpha_3 + \sum_{j=1}^{k} \beta_{3i}\, lnTRA_{t-i} + \sum_{i=0}^{k} \Phi_{3i}\, lnTC_{t-i} + \sum_{i=0}^{k} \delta_{3i}\, \Delta lnCGT_{t-i} + \sum_{i=0}^{k} \lambda_3\, \Delta lnDTR_{t-i} + \Gamma ECM_{t-i} + \varepsilon_{2t} \quad (5)$$

Where Γ is the coefficient of the error correction term, which provides information about long-run relationship and also measures the speed of adjustment at which the disequilibrium will be corrected in the long-run. The order of the lags in the ARDL model are selected by either the Akaike information criterion (AIC) or the Schwartz Bayesian Criterion (SBC), before the selected model is estimated by ordinary least squares. The SBC criterion was used in the lag selection. For annual data, Pesaran and Shin (1999) recommend choosing a maximum of 2 lags. From this, the lag length that minimizes SBC is selected. Lastly, to examine the reliability and efficiency of our estimates, diagnostics tests such as serial correlation test, normality test, heteroscedasticity test and stability test of CUSUM and CUSUMSQ would be conducted.

The *'a priori'* expectations as derived from theoretical literature are expressed as;

$\beta_0 > 0$ *and* $\beta_1, \beta_2, \beta_3 < 0$.

### 3.7 Method of Data Analysis

The estimation technique applied is the autoregressive distributed lag (ARDL) approach to co-integration. The ARDL approach has been chosen over the other methods of testing co-integration such as Johansen (1990) co-integration and the conventional Johansen (1998) co-integration tests due to its advantages. The estimates obtained from the ARDL method of co-integration analysis are unbiased and efficient (Pesaran & Shin, 1995). The statistic underlying the procedure is the Wald or F-statistic in a generalized Dickey-fuller regression, which is used to test the significance of lagged levels of the variables in a conditional unrestricted equilibrium correction model (ECM) (Pesaran, Shin and Smith, (2001)). Prior to the ARDL analysis, we assess the stationarity of the data using the Augmented Dickey-Fuller (ADF) unit root test while the properties of the variables were summarized with the descriptive statistics. The model was estimated with the aid of econometric software package, Eviews 9.0.

## 4. Results and Discussion

### 4.1 Descriptive Statistics

The analysis of the data and the estimated model for the study is performed in this section. The annualized summary of the dataset used in the study is presented in Table 1. Average annual changes in total trading volume in the Nigerian Stock Exchange are 20.57 percent, which is a really high rate of growth in terms of trading activities in the stock market. With a maximum value of 181.09 percent, it is seen that there were periods of very rapid annual increases in the trading activities, although there were also periods of sharp year-on-year declines in the trading activities, as seen by the minimum value of -62.43 percent. The standard deviation for the *TRA* variable is much higher than the mean value, suggesting that there were large swings or movements in the trading activities in the stock market over the period. This is also confirmed by the large kurtosis value of 5.74, which is higher than the 4.0 margin.

**Table 1: Descriptive Statistics**

| *Variable* | Mean | Max. | Min. | Std. Dev. | Skew. | Kurt. | J-B | Prob. |
|---|---|---|---|---|---|---|---|---|
| *TRA* | 20.570 | 181.094 | -62.437 | 45.253 | 1.120 | 5.748 | 19.896 | 0.000 |
| *TC* | 39.348 | 81.373 | 0.000 | 31.047 | -0.427 | 1.344 | 5.499 | 0.064 |
| *CGTAXR* | 0.105 | 0.200 | 0.000 | 0.101 | -0.105 | 1.011 | 6.334 | 0.042 |
| *DTAXR* | 0.117 | 0.150 | 0.050 | 0.031 | -0.449 | 2.513 | 1.650 | 0.438 |

**Source**: Researcher's Computation (2023) using E-views 9.0

Average transaction cost value was 39.34 billion over the period, with a maximum of 81.37 billion. The minimum value of 0.0 indicates that there was never a period when the trading cost was zero over the period. The standard deviation, relative to the mean value shows that trading cost did not vary too much over the years in the market. Average capital gain tax rate was 10.5 percent, while dividend tax rate was 11.7 percent on average for the period in the analysis. This shows that dividend taxes where higher on average than the rate of capital gains taxation in the country.

### 4.2 Unit Root and Cointegration Analysis

Two different tests of stationarity, namely, Augmented Dickey Fuller (ADF) and KPSS tests are utilized in this study to ascertain the time series characteristics of the data on the variables. The results obtained are presented in Table 2. The results in the Table do not take into consideration the trend in variables. The reason for this is that an explicit test of the trending pattern of the time series has not been carried out. The results indicate that each of the variables possesses ADF values that are less than the 95 percent critical values for the level series and greater than the critical value for the differenced series. In all cases, the four variables were non-stationary in levels but their first differences were found to be stationary. That is, all variables were integrated of order one.

**Table 2: Unit Root test for Variables**

| Variable | ADF Test | | KPSS | | Order of Integration |
|---|---|---|---|---|---|
| | *Levels* | *First Difference* | *Levels* | *First Difference* | |
| *TRA* | -2.302<br>(-2.941) | -8.903*<br>(-2.943) | 0.544*<br>(0.463) | 0.068<br>(0.463) | I[1] |
| *TC* | -1.510*<br>(-2.941) | -6.477*<br>(-2.943) | 0.578*<br>(0.463) | 0.147<br>(0.67) | I[1] |
| *CGTAXR* | -0.897<br>(0.778) | -6.083*<br>(2.943) | 0.634*<br>(0.463) | 0.092<br>(0.463) | I[1] |
| *DTAXR* | -1.909<br>(-2.941) | -5.927*<br>(-2.943) | 0.516*<br>(0.463) | 0.241<br>(0.463) | I[1] |

*Note: * indicates signifies at 5 percent; critical values are reported in parentheses below each test value*

**Source**: Researcher's Computation (2023) using E-views 9.0

To further confirm the stationarity tests in the ADF results, we report the test results using the KPSS test. This test is more relevant in capturing the actual stationarity patterns of the series since the test hypothesis particularly show whether the series are stationary or not and not in reference to the possession of unit roots. The KPSS tests the null hypothesis of stationarity (i.e., the null hypothesis for the test is that the data is stationary; while the alternate hypothesis for the test is that the data is not stationary). The result shown in the second panel of Table 2 therefore indicates that for each of the series, the null hypotheses of stationarity cannot be rejected for the variables in first differences (the tests statistics fail the test). This indicates that the series are difference-stationary. It is therefore "appropriate to use cointegration analysis to estimate the relationships between the variables, provided that the method chosen allows for the possible joint endogeneity of all four variables" as suggested by Guest and Swift (2008).

Given that the study focuses on error correction processes, test for a common stochastic trend is also conducted in this study. This involves testing for the existence of a cointegrating relationship between

trading and financial friction variables. Moreover, there is the need to determine whether the frictions factors are forcing variables in the equation specified. Thus, the Bounds test that includes all the variables as on the LHS is conducted (Pin, 2014; Ahmed, Muzib & Roy, 2013). Strong cointegration is only observed if and only if the equation with trading activities as dependent variable passes the cointegration test. The evaluation of the results shown in Table 3 is based on the critical F-statistic values for the lower and upper bounds as also reported in the results.

**Table 3: Results of Bounds Approach to Cointegration Test**

| LHS Variable | F-stat | I0 Bound | I1 Bound | Cointegration |
|---|---|---|---|---|
| *TRA* | 7.11 | 2.79 | 3.67 | Yes |
| *TC* | 3.24 | 2.79 | 3.67 | - |
| *CGTAXR* | 2.61 | 2.79 | 3.67 | No |
| *DTAXR* | 2.73 | 2.79 | 3.67 | No |

**Source**: Researcher's Computation (2023) using E-views 9.0

The evaluation of the results is based on the critical F-statistic values for the lower and upper bounds as also reported in the results. If at any significance level, the estimated F-value is greater than both the lower test (I0 Bounds) and the upper test (II Bounds) values, then there is no cointegration among the variables. If the estimated F-value lies between the two Bounds values, then there is need to proceed with a lesser structure of the ECM analysis. However, if the estimated value lies above both Bounds test values, then there is clear cointegration among the variables. The results in Table 3 show that only the equation with TRA as dependent variable has an F-value that passes the significance test at the 5 percent level. Thus, only the TRA equation exhibits cointegration among the variables and a long run relationship is established between trading activities and each of the dependent variables. The other equations fail the test, implying that TC, CGTAXR, and DTAXR are all forcing variables in the ARDL equation. Many of the studies on financial market frictions and trading activities (e.g., Bhattacharya, 2016; Idolor et al., 2020) have found evidence of cointegrating relationship between trading activities in the stock market and factors constituting market friction.

**Lag Length Selection**

As Greene (2011) noted, a cointegration-based analysis (such as the ARDL) is often susceptible to the lag structure of the autoregressive estimation. Hence, arising from the cointegration observed from the Bounds tests, the lag selection test is also performed to determine the maximum lag that can generate optimum values for the coefficients in the ARDL estimation. In the lag selection, optimality of the model was determined using both the Akaike Information Criterion (AIC) and Schwarz–Bayesian Criterion (SBC). The result is shown in Table 4 and indicates that, for each of the estimations, three lags are expected to be retained for the ARDL estimation since each of the selection tests indicates the third lag as the optimum lag length. Thus, a lag structure of three periods is selected as representing the structure that will ensure more stable coefficient estimates.

**Table 4: Lag Length Selection Criteria**

| Lag | LR | FPE | AIC | SC | HQ |
|---|---|---|---|---|---|
| 0 | 0.000 | 0.000 | 3.013 | 3.191 | 3.074 |
| 1 | 5.695 | 0.000 | 3.737 | 4.626 | 4.044 |
| 2 | 7.786 | 0.001 | 4.352 | 5.952 | 4.905 |
| 3 | 167.98* | 0.0006* | -2.369* | -0.058* | -1.571* |

Note: * *indicates significant at 5 percent* and acceptance of lag length.

**Source**: Researcher's Computation (2023) using E-views 9.0

In the lag selection analysis of the ARDL model, the study proposed a three-lag period based ion the AIC. The inverse root of the lag length selection is shown in Fig. 1. Since the roots from the various dots lie within the circumference of the circle, then it can be said that the selected lag length for the study is acceptable.

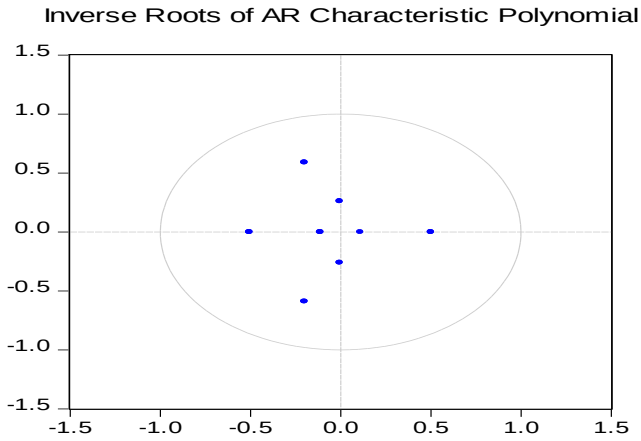


**Fig. 1: AR Test for Lag Selection**

**Analysis of Regression Results**

The results of estimated long run relationships for both the ARDL and FMOLS techniques are presented in Table 6. In the lag selection, optimality of the model was determined using the Schwarz–Bayesian Criterion (SBC). The initial test of the pattern of the relationships is shown in the Granger Causality test shown in Table 5. It should be noted that the causality tests indicate a unidirectional relationship between trading and friction variables, with cause-effect running from transaction cost and dividend tax to trading activities. This outcome has been a major finding for previous studies, both for Nigeria and other countries. Thus, there is evidence of transaction cost and tax-led frictions in the trading activities in the Nigerian Stock Market. There is also uni-directional causality between the two tax rates and between transaction cost and tax-rates.

**Table 5: Granger Causality Test Result**

| Null Hypothesis: | Obs | F-Statistic | Prob. |
|---|---|---|---|
| LTC does not Granger Cause LTRA | 37 | 4.926* | 0.014 |
| LTRA does not Granger Cause LTC | | 0.288 | 0.751 |
| LDTAXR does not Granger Cause LTRA | 37 | 2.921** | 0.008 |
| LTRA does not Granger Cause LDTAXR | | 0.850 | 0.437 |
| LCGTAXR does not Granger Cause LTRA | 37 | 0.172 | 0.843 |
| LTRA does not Granger Cause LCGTAXR | | 6.101** | 0.006 |
| LDTAXR does not Granger Cause LTC | 37 | 0.009 | 0.991 |
| LTC does not Granger Cause LDTAXR | | 6.340** | 0.005 |
| LCGTAXR does not Granger Cause LTC | 37 | 0.028 | 0.973 |
| LTC does not Granger Cause LCGTAXR | | 2.852 | 0.073 |
| LCGTAXR does not Granger Cause LDTAXR | 37 | 0.914 | 0.411 |
| LDTAXR does not Granger Cause LCGTAXR | | 13.62** | 0.000 |

Note: *, ** indicate significance at 10 and 5 percent level. Source: Author's computations

**Source:** Researcher's Computation (2023) using E-views 9.0

The result of the error correction representation of the relationships is presented in Table 6 which reports both the short run and long run estimates. It should be noted that the parsimonious estimates based on an optimal lag structures from the SBC is (1,0,0,0). The short run results along with the ECM characteristics are reported in the upper panel of Table 6. The coefficient of the lagged dependent variable is positive at 0.272, indicating that only about 27 percent of the trading activities of the previous period are translated into the current period. Thus, previous information in the market may not matter extensively in the current trading activities. Only the coefficient of dividend tax is significant in the short run equation, indicating that a short term movement in trading by participants in the stock market is only influenced by dividend taxes. The

coefficient is negative and therefore shows that dividend taxes reduce the short term flow of trading volume in the stock market. Apparently, therefore, only dividend taxes constitute financial frictions in the stock market in the short run. Both transaction costs and capital gains tax do not appear to create frictions for the market in the short run. The result therefore highlights the role of tax-based friction mechanism and an essential component of frictions experienced in the market in the short run. Given that short term financial movements are critical for the market, the study therefore shows that policies aimed at taxation of dividends can play strong roles in explaining market frictions in the Nigerian Stock Market.

**Table 6: Error Correction Representation of the Selected Model**

| Short run Result | | | |
|---|---|---|---|
| Variable | Coefficient | t-Statistic | Prob. |
| C | 2.380 | 1.804 | 0.080 |
| $TRA_{t-1}$ | 0.272* | 2.597 | 0.014 |
| CGTAXR | 0.295 | 1.429 | 0.162 |
| DTAXR | -0.497* | -2.094 | 0.047 |
| TC | 0.083 | 1.437 | 0.160 |
| $ECM_{t-1}$ | -0.272** | -4.296 | 0.000 |
| Adjusted R-squared | 0.268 | | |
| Durbin-Watson stat | 2.481 | | |
| Long Run | | | |
| Variable | Coefficient | t-Statistic | Prob. |
| CGTAXR | 1.086* | 2.402 | 0.022 |
| DTAXR | -1.826* | -2.044 | 0.041 |
| TC | 0.305 | 1.579 | 0.124 |
| C | 8.748** | 4.094 | 0.000 |

Note: *, ** indicate significance at 5 and 1 percent level. Source: Author's computations

**Source**: Researcher's Computation (2023) using E-views 9.0.

The coefficient of the error correction term has the expected negative sign and is significant in the equation, which indicates the presence of long run stability in trading activities of the Nigerian Exchange Limited (NGX). The coefficient of the ECM term is highest relatively low at -0.272, suggesting that the adjustment to long run equilibrium in trading volume is slow. Just about 27 percent of the adjustment is completed in the first period.

The result of the long run relationship is shown in the second panel of the Table 6. In the long run result, the coefficients of capital gains tax and dividend tax are both significant at the 5 percent level, while the coefficient of transaction cost (TC) fails the test at the 5 percent level. The result therefore shows that transactions cost do not matter as a fraction mechanism in the trading activities of investors in the Nigerian Stock Market. Idolor et al. (2020) found similar results, suggesting that direct costs of trading do not affect trading outcomes. It appears that investors tend to efficiently internalize direct costs of trading which makes it easier to adjust to changes in costs without strong effects on trading. Rather, it is the tax-based factors that are significant as frictions in the market. From the result, dividend tax rates significantly reduce trading both in the short run and in the long run, suggesting that dividend taxes exert dynamic negative impacts on trading in the market.

The negative elasticity of trading with respect to dividend taxes increase significantly in the long run, suggesting that when there is sustain increase in dividend tax rates, trading activities will reduce persistently. On the other hand, capital gains tax rates exert only long run effects on trading as seen in the results. The long run impact is however positive, which shows that rising capital gains tax rates tend to stimulate long term trading activities in the market. This therefore provides a clear policy direction to the fiscal system in Nigeria. Any policy that increases capital gains tax will directly promote trading in the

stock market, while policies that increase dividend taxes will directly reduce trading in the stock market, both in the short run and in the long run.

Our study however appears to be a form of improvement on the outcome of the study by Idolor et al. (2020). In their study, tax regulation was found to be insignificant in the trading equation. This current study however demonstrates that overall tax strategy (as used in the Idolor et al study) may not provide adequate basis for evaluating frictions. Rather a decomposition of tax rates provides better information on the dynamic relationships between tax rates as frictions and trading in the Nigerian Exchange Limited (NGX).

In order to test the stability of cointegration parameters, the $L_c$ test formulated by Nyblom (1989) and Hansen (1992) is employed. According to Balcilar et al., (2013, p.12), the "Nyblom-Hansen statistic tests for parameter constancy against the alternative hypothesis that the parameters follow a random walk process"; from the results in Table 7 (also shown in Figure 2), there is clear indication of parameter stability in each of the equations. This is demonstrated by the insignificant values for the Hansen $L_c$ coefficients in the estimation. Thus, a stable long run relationship is shown to exist between financial market frictions and trading in the Nigerian Exchange Limited. Also, the respective J-B and LM tests for the normality and serial correlation show that the residuals are normally distributed and are devoid of serial correlation.

**Table 7: Test of Stability of Cointegration Parameters**

| ***Variable*** | ***Gdppc*** |
|---|---|
| *$L_c$value (Bootstrap p value)* | 0.343 (0.123) |
| *Normality test (J-B)* | 1.785 (p = 0.409) |
| *Serial Correlation LM Test* | 2.551 (p = 0.094) |

**Source**: Researcher's Computation (2023) using E-views 9.0

Finally, robustness checks are provided by testing the stability of the estimated data set across the cross sections in the sample. This helps to eliminate doubt about possible outlier regression for any of the groups in the sample. The chart in Figure 2 shows the result of the CUSUM of squares test. It can be seen that the CUSUM of squares line for the result lies entirely within the dotted 5 percent significance bound line throughout the chart. This reveals that the estimation is stable within the analysis.

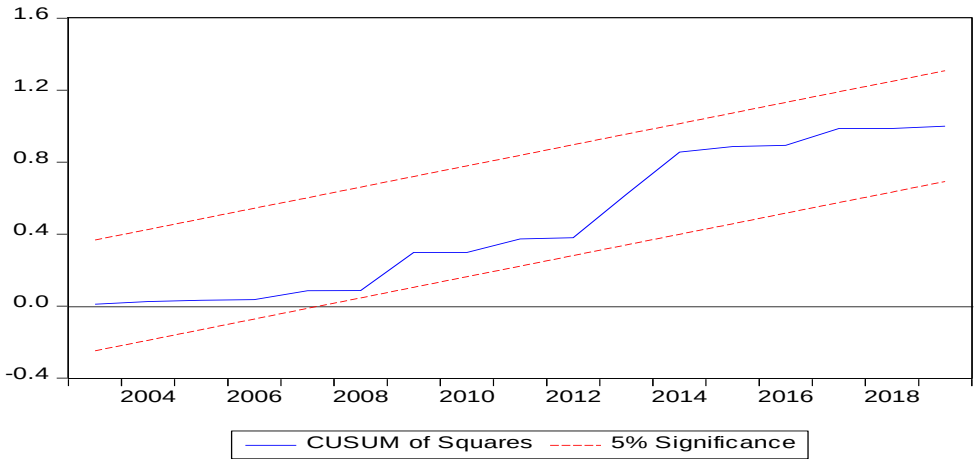


**Fig 2: Parameter Stability Charts**

## 5. Conclusion and Recommendations

Market frictions often constitute significant modifications to trading systems in the Nigerian Exchange Limited. In this study, the effects of financial market frictions on trading in the Nigerian Exchange Limited(NGX) was examined using time series data covering the period 1981 to 2019. Market frictions were considered both in terms of direct

market costs of trading and tax-based (or regulatory) factors. Tax-based frictions were decomposed into capital gains tax rates and dividend tax rates in order to improve the robustness of the study. A dynamic strategy was devised for the study and the short run and long run impacts were observed within an autoregressive distributed lags (ARDL) model. The results show that generally, tax-based frictions exert significant dynamic effects on trading in the NGX. In particular, dividend taxes reduce trading activities, while capital gains taxes improve such activities. Direct trading transaction costs were however shown to have no significant impact on trading in the stock market. Essentially, though different set of trading patterns, expectations or characteristics drive trading in the NGX, direct costs may not contribute to these factors. Indeed, investors may have evolved trading awareness information that guides their trading activities which has resulted in consistently and efficiently allocating transaction cost elements within the trading system. Considering the results of the econometric analysis, the study recommends that government should reduce the existing dividend tax rate in order to reverse its adverse effect on trading activities in the Nigerian stock market.

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