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AN EMPIRICAL ANALYSIS OF THE LAW OF DEMAND IN THE NIGERIAN CAPITAL MARKET (1985-2020)

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ABSTRACT

This study tests the applicability of the law of demand in the Nigerian capital market by analyzing annual time series data between 1985 and 2020. We specifically evaluated the nexus between price and quantity (unit) of securities demanded in the Nigerian stock market by applying Toda-Yamamoto Granger causality technique and Vector Autoregression (VAR) model. The study is based on ex-post facto research design. The annual time series data used in the study were obtained from Central Bank of Nigeria (2020)'s statistical bulletin. From the VAR analysis, we found that stock price exerts positive and significant effect on the quantity of securities traded in the Nigerian capital market. However, quantity of securities demanded is negatively signed but not a significant predictor of prices of securities demanded in the Nigerian capital market. Also found in this study is a unidirectional causality flow from price to quantity demanded in the Nigerian Stock Exchange. It can therefore be asserted that there is a short-run unidirectional causality flowing from price to quantity of securities traded in the Nigerian capital market. Going by the positive coefficient of price (26.91891), our finding is not in tandem with the law of demand which states that there is an inverse relationship between price and quantity demanded. Rather than inverse relationship, this study provides evidence of a direct (positive) association between price and quantity demanded in the Nigerian capital market. In other words, the higher the price, the more the quantity of securities demanded in the Nigerian capital market, suggesting a situation of abnormal demand.

Keywords: Law of demand, Nigerian stock exchange, quantity demanded, stock prices, trading volume

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1. Introduction

One of the most popular economic laws is the law of demand otherwise theory of demand. This is a general law in economics which simply postulates the existence of an inverse relationship between quantity

demanded and the price of a commodity in the market. This law has found its applicability in different markets based on the premise of rationality of consumers. Understanding whether the law of demand plays out in the financial markets, particularly the capital market, will help investors in their investment decision. Price-volume nexus is essential (Karpoff, 1987) in that, it provides insight into the structure of financial markets; facilitates event studies research on price and volume data from which decision and inferences could be made; the nexus guides arguments on the empirical distribution of speculative prices; and futures markets researches are also enhanced by the link between price and volume of securities.

The capital market is an important part of the financial market considering its roles in the economy. For instance, the market has been reputed to help facilitates the mobilization of savings and chanellization of the said savings into productive investments for the growth and development of commerce and industry and thus helping promotion of the capital formation and economic growth of the country (Jhingan, 2011; Onoh et al., 2017). The capital market also links savers with investors thus acting as the conduit pipe for the transmission of surplus financial resources between surplus units and deficits units of the economy and consequently the market promotes capital formation by providing incentives to savers in the form of interest or dividend and transfer of funds to investors; and ultimately, economic growth is also stimulated by the operation of the market (Jhnigan, 2011; Babarinde et al., 2020).

Statistics (Central Bank of Nigeria, 2020) reveals that as at 1981 the number of deals in the Nigerian Stock Exchange (NSE) stood at 10,199 units while the value of deals was ₦0.30 billion thus the average price in the capital market was ₦29414.65. However, after a decade (1991), 41,770 units, ₦0.24billion and ₦5745.751 was the quantity of securities traded (demanded), value of deals and average price of all securities traded, respectively in the Nigerian capital market. Furthermore, by year 2001, the quantity demanded became 1,235,467 units while the average price stood at ₦517,156.7; making a total of ₦638.93 billion value of securities in the market in that year. In 2020, the market traded 1,156,830 units of securities at an average price of ₦938,927 thus making ₦1086.18billion value of securities traded in the Nigerian capital market (CBN, 2020).

Studies on stock price nexus with trading volume is a cardinal aspect of technical analysis of the stock market (Wang et al, 2020). Trading volume has been linked to the information flow entering a market and as such it is posited that there is a significant relationship between trading volume and stock prices in the capital market (Ligocká, 2019). Though, price-volume nexus has been regarded as very important relationship in the securities market but the application of the economic law of demand is a relatively scarce study. This is based on the fact that extant studies have examined the determinants of stock prices, volume of trade, and relationship between the two mostly based on macroeconomic view of stock market behavior.

In Finance, there is a key role of trading volume in the pricing of financial assets due to the advent of new information in the market (Adhikari, 2020). However, the extent to which the assertion is valid or not has not been subjected to thorough empirical analysis by past studies. For instance, a review of extant studies shows that except study like Kamuti (2013) which established empirically, a positive and significant link between price levels and stock volumes transacted in Nairobi securities market. Likewise, Wang et al (2020) also established an evidence of a unidirectional causality running from security price to trading volume in China. However, most other past studies have been on the nexus between trading volume and stock returns (Adhikari, 2020; Akpansung & Gidigbi, 2015; Ali et al., 2021; Al-Jafari & Tliti, 2013; Anifowose & Suleiman, 2013; Onoh et al., 2017; Rostami et al., 2018). Furthermore, determinants of stock price have been investigated by some past studies also (Ejuvbekpokpo & Edesiri, 2014; Saibu et al., 2016). In the same vein, some crops of past studies focused on trading volume and stock returns volatility (Ananzeh et al., 2013; Shrestha, 2017; Wen-Cheng & Fang-Jun, 2010). This current study therefore aims to evaluate the validity or otherwise of the economic law of demand in the Nigerian capital market.

The other sections of this paper focus on conceptual, theoretical and empirical review of literature in section two. This is followed by the description of the methodology of the study in section three. Thereafter, results and discussion are documented in section four. Finally, the conclusion and recommendations of the study are reported in section five.

2. Literature Review

Conceptual Review

Stock price is the market-determined price of securities that exchange hands between buyers and sellers in line with the market forces of demand and supply in the securities market. When the stock price is high, it means that the stock is actively traded, so the dealer will not keep the stock for too long (Parulian, 2020), and vice versa, a low price suggests that the securities in the market are not actively traded.

Trading volume is defined as the number of shares traded in the security market and as such with a large trading volume, it shows that these stocks are favored by investors (Parulian, 2020). Gworo (2016) also conceptualized traded volume as the frequency or number of deals on a security on a given trading day. Thus, trading volume is simply the quantity (unit) of securities that are demanded by the buyers of securities in the capital market. Trading volume can be regarded as the quantity demanded of the securities in the capital market.

The term “demand” is the quantity of goods and services which a consumer is willing and able to buy at various prices during a given period of time. Thus, demand for securities is the volume (units) of securities (shares, stocks, bonds, debentures, loan stocks, derivatives, etc) which a capital market operators have the willingness and financial ability (purchasing power) to buy at the prevailing stock prices in the stock market over a given period of time.

A law as defined by Jhingan (2013) ‘is the establishment of a general truth on the basis of particular observations or experiments which traces out a causal relationship between two or more phenomena”. According to the author characterizes economic laws as social laws in the form statements of economic tendencies; concerned with human behavior measurable in monetary terms. It can therefore be said that an economic law is a generalization about human behavior expressed in form of statements of economic tendencies and causal relationship capable of monetary quantification. They are non-precise and non-predictable, indicative, and hypothetical in nature unlike law of natural sciences.

Theoretical Review

Reviewed in this sub-section are four theories that are considered to be relevant to the study of price and volume of trade in the capital market. These theories are the sequential arrival of information model, the mixture of distribution model, the theory of demand, and the technical analysis theory.

“The Law of Demand simply indicates that, other things being equal, quantity demand varies inversely with price” (Jhingan, 2013). This simply means that the higher the price, the lower the quantity demanded of the same commodity, c*eteris paribus* (other things being equal). Although, there are other factors influencing demand aside price, the other factors (such as prices of other commodities, income of consumers, tastes of consumers) are assumed to be constant in stating the law of demand.

The main assumptions of the law of demand are prices of the related goods do not change; incomes of consumers are constant; there is no change in tastes and preferences of the consumers; there is no consumer’s expectation about price changes in respect of the commodity is also assumed not to vary in the foreseeable future. Other assumptions of the Law of Demand according to Jhingan (2013) include that there is no change in customs, the commodity to be sued do not confer distinction on the consumer, there should not be any substitutes of the commodity; there should not be any change in the prices of other commodities; there should not be any change in the quality of the product being used, habits of the consumers remain unchanged; and there should not be any possibility of change in the price of the commodity being used.

The Mixture of Distribution Model (MDH) was postulated by Clark (1973). According to the theory, the rate at which information penetrates the market determines asset’s price volatility- trading volume nexus. It is based on the assumption that price changes follow a mixture of normal distribution with the rate of information arrival to the market as the mixing variable. The theory argues further that stock returns and trading volume are related due to their joint dependence on underlying latent information flow variables and as such, a positive

contemporaneous relationship exists between trading volume, return and volatility (Clark, 1973). In other words, MDH states that stock prices and trading volume change only when information arrives and evolve at a constant speed in event time (Wen-Cheng & Fang-Jun, 2010).

The Sequential Arrival of Information Model (SAIH) was postulated by Copeland (1976). The theory states that information dissemination occurs sequentially to investors, thus causing a series of intermediate equilibrium prices, and leading to a final informational equilibrium price when all the investors are informed (Copeland, 1976). According to the theorist, trading volume is a positive logarithm function of number of traders and strength of new information. In the SIAH model, there is a positive contemporaneous, lagged and causal relations between price volatilities and trading activities (Shrestha, 2017; Wen-Cheng & Fang-Jun, 2010).

Technical analysis theory relates to the use of readily available market data, particularly, historical data in the prediction of the future performance of individual securities, as well as the aggregate stock exchange index (Gul & Javed, 2009). The theory assumes that the market has a memory and thus past pattern of prices, and market data could be used to determine the pattern of performance of the stocks.

This study is underpinned by the theory of demand. This is because it basically relates price to quantity of commodity demanded in the market.

Empirical Review

In a study, volatility-trading volume nexus in Taiwan stock market was examined by Wen-Cheng and Fang-Jun (2010). From the bivariate vector autoregressive test, the study found an evidence of a bidirectional causality trading volume and volatility in Taiwan. However, in a related study in Amman Stock Exchange, Ananzeh et al (2013) examined nexus of return volatility with trading volume. The authors indicate that trading volume has significant effect on return volatility.

In the Nigerian capital market, Anifowose and Suleiman (2013) assessed the link between trading volume and returns volatility using Engle-Granger bivariate causality test. The study finds evidence of causality flowing from stock return to trading volume unlike Ananzeh et al (2013) who found the opposite.

In another study, Kamuti (2013) examined the nexus between stock price volatility and trading volume in Nairobi securities market using GARCH and causality tests. The study found the existence of a significant positive relationship between price and volume in Nairobi securities exchange.

With a focus on the banking sector of Amman Stock Exchange, Al-Jafari and Tliti (2013) studied the relationship between stock return and trading volume using vector error correction model and pairwise Granger causality test. The found no significant relationship between trading volume and stock return but the relationship between trading volumes and return volatility was statistically significant. The study concludes that trading volume reacts positively to return volatility.

From the valuation of the factors affecting stock price movement in Nigeria carried out by Ejuvbekpokpo and Edesiri (2014), the scholars found that earnings per share, book value per share and dividend as determinants of stock prices in Nigeria in the study period.

Furthermore, Akpansung and Gidigbi (2015) examined the link between trading volume and stock returns in Nigeria. From the Granger causality test, the study found a unidirectional causality flowing from interest rate to change in the volume of trading while a bidirectional relationship was proved to exist between the exchange rate and change in the volume of trading in the Nigerian capital market.

Moreover, Saibu et al (2016)'s study focused on the determinants of stock trading volume using the demand for money approach. The study found that money supply has strong positive significant relationship with stock volume unlike interest rate and exchange rate whose impacts were negative and statistically significant.
In another study, Gworo (2016) investigated price-volume nexus in the Nairobi Stock Exchange using Karl Pearson's correlation and regression model. The study found an evidence of a weak correlation between

traded volume and the share price volatility in Nairobi. In the same Nairobi, an evidence of a positive contemporaneous relationship was found to exist between trading volume and stock return volatility (Shrestha, 2017). This was established in the author's examination of the contemporaneous relation between trading volume and stock returns volatility using ordinary least square method and Generalized Autoregressive Conditional Heteroskedasticity (GARCH) model.

In the Nigerian context, Onoh et al. (2017) investigated the effect of trading volume and market turnover on daily stock returns of the stock market. The study argues that volume of trade exerts negative but significant effect on stock returns unlike stock market turnover which has positive and significant effect on the stock market returns in Nigeria.

Furthermore, Rostami et al (2018) investigated the relationship between trading volume and stock returns in Tehran Stock Exchange using Granger causality test, VAR, and GARCH models The study shows among others, an evidence of no bilateral causal relationship between returns, volume, and return volatility but both stock returns and return volatility Granger-caused trading volume in Tehran Stock Exchange. Adhikari (2020) evaluated the relationship between trading volume and stock returns in the Nepalese stock market. From the Granger causality analysis, the study found no causal relationship between trading volume and return on the stock in Nepalese stock market.

In Chinese context, Wang et al (2020) examined price–volume nexus equation using VAR model with structural breaks and volatility thresholds. The study confirms the existence of a significant time-breaking effects with substantial high-low volatility effects. The study also found that an evidence of unidirectional causality flow running from price to volume in China stock market.

Aladwan et al (2021) studied the association between stock market exchange data and weighted price index in the Amman stock exchange market (ASE). The study indicates that market-weighted price index has strong and positive correlation with turnover ratio, price-earnings ratio, and dividend yield in the Exchange.
Ali et al (2021) investigated the impact of trading volume on market returns among the stock markets of SAARC countries using Granger causality tests. The study reveals that trading volume significantly Granger caused returns in stock markets of SAARC countries.

The empirical review reveals that most extant studies focused on the relationship of trading volume and stock return or returns volatility (Anifowose and Suleiman (2013), Akpansung and Gidigbi (2015), (Onoh et al. (2017), Adhikari (2020)); as well as determinants of stock prices (Ejuvbekpokpo and Edesiri (2014), Saibu et al (2016)). Although, Kamuti (2013) and Wang et al (2020) examined the link between stock price and volume trade but the studies were based on Nairobi and Chinese stock markets respectively. This reveals that Nigerian study on the subject of price-volume nexus, with a particular emphasis on testing the applicability of law of demand; appears scarce, if not, non-existent. Therefore, this current study attempts to fill the empirical lacuna by focusing on the testing empirically the nexus between stock price and quantity of securities traded (demanded) in the Nigerian capital market for the period, 1985-2020.

3. Research Methodology

This study aims to evaluate the nexus between price and quantity (unit) of securities demanded in the Nigerian stock market by applying Sims (1980)'s Vector Autoregression (VAR) technique of estimation. VAR is a flexible technique where there is no differentiation between exogenous and endogenous variables but all variables are regarded as endogenous and the technique is not limited by any theory but can be used to measure both the dynamic and interdependent link among variables of interest (Sims, 1980; Lesotho et al., 2016).

The study is based on ex-post facto research design where past data were in the Nigerian stock market. Central Bank of Nigeria (2020)'s statistical bulletin constitutes the source of the secondary, annual time series data used in the study for the period, 1985 to 2020.

The theory of demand which relates quantity demanded to the price of commodity provides a basis for the two-variable model specified in this study. Additionally, following two-variable model specifications in previous

studies on price-volume and stock return-price relationship like Ali et al (2021), Al-Jafari and Tliti (2013) and Wang et al (2020), the functional model for this study is specified in equations (1):

$$QUANTITY_t = \alpha_0 + \alpha_1 PRICE_t + \boldsymbol{u_t} \quad (1)$$

The model in equation (1) is transformed into VAR models in equations (1.1) and (1.2) respectively

$$QUANTITY_t = ß_0 + \sum_{i-1}^{k} ß_1 \boldsymbol{QUANTITY_{t-i}} + \sum_{j-1}^{k} ß_2 \boldsymbol{PRICE_{t-j}} + \boldsymbol{u_{1t}} \quad (\mathbf{1.1})$$

$$PRICE_t = \alpha_0 + \sum_{i-1}^{k} \alpha_1 \boldsymbol{QUANTITY_{t-i}} + \sum_{j-1}^{k} \alpha_2 \boldsymbol{PRICE_{t-j}} + \boldsymbol{u_{2t}} \quad (\mathbf{1.2})$$

PRICE is the average price of the securities traded in the Nigerian stock exchange. It is computed as the ratio of total value of securities to the volume of securities traded; QUANTITY is the volume of trade (units) of securities demanded in the Nigerian stock exchange; $\boldsymbol{u_{1t}}$ and $\boldsymbol{u_{2t}}$are the error terms; $\boldsymbol{\alpha_0}$ and $ß_0$ are the intercepts while$\boldsymbol{\alpha_1}$, $\boldsymbol{\alpha_2}$, $ß_1$, and $ß_2$ are the coefficients of the model; and, t is the time in years, from 1985 to 2020.

Additionally, the short-term causality between stock price and quantity demanded in the Nigerian Stock Exchange was determined using Toda-Yamamoto Granger causality test. The causality models are specified econometrically in equations (2.1) and (2.2).

$$PRICE_t = ß_0 + \sum_{i=l}^{k} ß_{1i} PRICE_{i-l} + \sum_{j=i+l}^{k=dmax} ß_{1j} PRICE_{i-j} + \sum_{i=l}^{k} \Psi_{1i} QUANTITY_{i-1} + \sum_{j=i+l}^{k+d\,max} \Psi_{1j} QUANTITY_{i-j} + u_{t3} \quad (2.1)$$

$$QUANTITY_t = \alpha_0 + \sum_{i=l}^{k} \alpha_{1i} PRICE_{i-l} + \sum_{j=i+l}^{k=dmax} \alpha_{1j} PRICE_{i-j} + \sum_{i=l}^{k} \gamma_{1i} QUANTITY_{i-1} + \sum_{j=i+l}^{k+d\,max} \gamma_{1j} QUANTITY_{i-j} + u_{t4} \quad (2.2)$$

Where K denoted the optimal lag length, dmax is the maximum order of integration; $ß_0$, $ß_{1i}$, $ß_{1j}$, Ψ_{1i}, Ψ_{1j} α_0, α_{1i} α_{1j}, γ_{1i} and γ_{1j} are the coefficients of the parameters, while u_{t3} and u_{t4} represent the distubance terms.

4. Findings and Results Discussion

The descriptive statistics of the price and volume of trade (quantity) of securities in the Nigerian stock market are presented in Table 1.

According to the descriptive statistics, quantity of securities demanded exhibits a wide dispersion from its mean unlike price (whose mean (16872.76) exceeds its standard deviation (15201.89)), which is considered to be relatively stable around its mean value. Quantity of securities demanded ranges from a minimum of 20,525 units to a maximum of 3,535,631 units but the series is not normally distributed. On the other hands, the average prices of securities demanded has a minimum and maximum value of ₦117.2833 and ₦50,424.70 respectively and the variable passes the normality test.

Descriptive Statistics

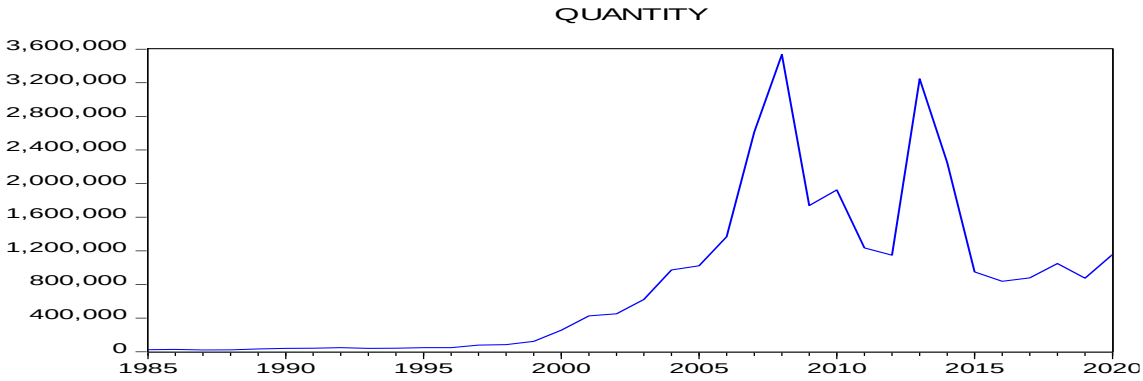
Table 1: Descriptive Statistics

Variables	Obs.	Mean	S.D	Min.	Max.	J.B.
Quantity	36	813487.3	941327.7	20525.00	3535631.	13.12316*
Price	36	16872.76	15201.89	117.2833	50424.70	2.608520

Source: Authors' computation using Eviews version 10

Furthermore, visual description of the variables of study (quantity and price of securities traded in NSE) are depicted in Figures 1 and 2.

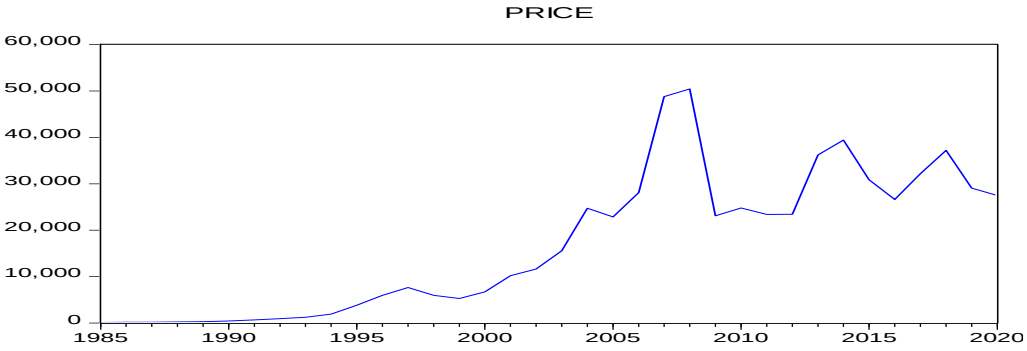
Fig. 1: Volume (Quantity) of Securities Traded in the Nigerian Stock Exchange (1985-2020)



Source: Authors' constructed adapting the data from Central Bank of Nigeria (2020)'s statistical bulletin (2022)

From the line graph of the quantity of securities traded in the Nigerian Stock Exchange (1985-2020) depicted in Fig.1, it is clearly shown that pre-2000, the quantity of securities traded in the Nigerian Stock Exchange was relatively small compared with those traded after year 2000. A gradual rise started from 2000 until it reaches its peak in about year 2008 before it nose-dived till 2012 and thereafter picked up to rise gradually to reach a very point in year 2014. It also fell in year 2015 and became relatively stable therefrom till 2020.

Fig. 2: Prices of Securities Traded in the Nigerian Stock Exchange (1985-2020)



Source: Authors' constructed adapting the data from Central Bank of Nigeria (2020)'s statistical bulletin (2022)

As depicted in Fig. 2, the line graph of the average prices of securities traded in the Nigerian Stock Exchange (1985-2020), indicates a gradual and predictable rise in the prices of securities starting from 1990 through about year 2008, where it reached its peak. Thereafter, the series fell in year 2009 and stabilize around the same level of 2009 until year 2012 and continued in a zig-zag movement until year 2020.

Correlation Analysis

The result of the Pearson's correlation test on the relationship between quantity demanded and price of securities traded in the Nigerian capital market is presented in Table 2.

Table 2: Correlation Matrix

	Quantity	Price
Quantity	[1.0000]	
Price	[0.8925]*	[1.0000]

Source: Authors' computation using Eviews version 10

*Note: * significant at 1%; Values in [ ] are the correlation coefficients.*

Revelation from correlation test's results (in Table 2) is that of a very strong, positive (r=0.8925) and statistically significant correlation between quantity and price of securities in the Nigerian Stock Exchange (NSE) in the study period (1985-2020).

Unit Root Tests

To determine the unit root properties of the two variables of study (price and quantity of securities), both Phillips-Perron (PP) and Augmented Dickey-Fuller (ADF) unit root tests were applied to each variable and the results are presented in Table 3.

Table 3: ADF and PP Unit Root Tests' Results

Variable:	**ADF at Level**	**PP at Level**	**Remarks**
Quantity	-2.1225[0.2373]	-2.0062[0.2830]	Not Stationary
Price	0.6618[0.9896]	-0.0967[0.9427]	Not Stationary
Variable:	**ADF at First Difference**	**PP at First Difference**	
Quantity	-6.0624[0.0000]	-7.7961 [0.0000]	Stationary
Price	-11.5980 [0.0000]	-11.6737 [0.0000]	Stationary

Source: Authors' computation using Eviews version 10 (2022).
Note: Values in () represent the probability values of the coefficients

The ADF and PP unit root tests' results (in Table 3) indicate that quantity and price of securities are not stationary in level but became stationary only after first difference. This implies both variables of integrated of order one.

Lag Length Selection *Test*

The result of the VAR lag order selection criteria test is reported in Table 4.

Table 4: Lag Length Selection Result

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-838.8357	NA	4.64e+19	50.95974	51.05044	50.99026
1	-806.6118	58.58886	8.40e+18*	49.24920*	49.52129*	49.34075*
2	-806.1315	0.815195	1.04e+19	49.46251	49.91600	49.61510
3	-800.1006	9.503169*	9.30e+18	49.33943	49.97431	49.55305

Source: Authors' computation using Eviews version 10

Note: *LR: equential modified LR test statistic (each test at 5% level); FPE: Final prediction error;AIC: Akaike information criterion; SC: Schwarz information criterion; HQ: Hannan-Quinn information criterion; * indicates lag order selected by the criterion.*

The prescription of almost all the lag length criteria (that is, Final prediction error, Akaike information criterion, Schwarz information criterion and Hannan-Quinn information criterion) reported in Table 4 is that the modelling should be done based on lag length one formation. Accordingly, the optimum lag length for this study is one.

Multiple Breakpoint Tests

In this study, the multiple breakpoint test conducted was Bai-Perron tests of L+1 vs. L sequentially determined breaks. In the test, heterogeneous error distributions were allowed to differ across breaks with break test option that has a trimming of 0.15, while allowing for the maximum of 5 breaks at the 5 per cent significance level. Thus, the result of the Bai-Perron multiple breakpoint test is reported in Table 5.

Table 5: Bai-Perron multiple breakpoint test

Sequential F-statistic determined breaks:			2
Break Test	F-statistic	Scaled F-statistic	Critical Value
0 vs. 1 *	19.81088	39.62175	11.47
1 vs. 2 *	12.54603	25.09207	12.95
2 vs. 3	2.331478	4.662956	14.03
Break dates:			
	Sequential	Repartition	
1	2015	2008	
2	2008	2015	

Source: Authors' computation using Eviews version 10

Note: * Significant at the 0.05 level.

The Bai-Perron multiple breakpoint test's result (in Table 5) indicates the existence of two different structural breaks in years 2008 and 2015. Each of the two years has been linked with certain events which are capable of distorting the normal trend of the variables of this study. For instance, 2008 coincided with the stock market crash. In Nigeria, 2015 was the year of general election that saw to the advent of President Mohammadu Buhari as the democratically-elected president of the Federal Republic of Nigeria.

Cointegration Test

In order to evaluate the cointegration property of the I(1) series, the Johansen cointegration test are found suitable and hence applied to the series and the results are presented in Table 6.

Table 6: Johansen Cointegration Test

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized No. of CE(s)	Eigenvalue	Trace Stat.	0.05 Critical Value	Prob.
None	0.214026	10.90346	15.49471	0.2175
At most 1	0.076753	2.715195	3.841466	0.0994
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Stat.	0.05 Critical Value	Prob.
None	0.214026	8.188261	14.26460	0.3599
At most 1	0.076753	2.715195	3.841466	0.0994

Source: Authors' computation using Eviews version 10

As reported in Table 6, both the Trace and the Max-eigenvalue statistics of the Johansen cointegration test indicate no cointegration between price and quantity of securities demanded in the Nigerian stock exchange at the 0.05 level.

Vector Autoregression Model Estimation

The Vector autoregression (VAR) estimates are presented in Table 7.

Table 7: Vector Autoregression Estimates

	Q				P			
	Coeff.	**S.E**	***t-sta***	***p-val***	**Coeff.**	**S.E**	***t-sta***	***p-val***
Q(-1)	0.384042	0.23323	1.64664	0.1045	-0.003127	0.00277	1.12711	0.2639
P(-1)	26.91891	14.5180	1.85418	0.0683	1.055709	0.17271	6.11273	0.0000
C	81376.04	148867	0.54664	0.5865	2372.082	1770.93	1.33946	0.1852
R^2	0.641995				0.802718			
Adj. R^2	0.619620				0.790388			

Source: Authors' computation using Eviews version 10
Note: P: Price; Q: quantity; COEFF
Coefficient; SE: Standard errors; t-stat: t-statistics; p-val: p-values.

The reported VAR estimates in Table 7 shows a positive coefficient of 26.91891 and the associated probability value lower than 10% (0.0683). Thus, stock price can be said to impact positively and significantly on the quantity of securities demanded in the Nigerian capital market in the study period (1985-2020). However, quantity is negatively signed (-0.003127) and has a high probability value (0.2639) and as such quantity of securities demanded is not a significant predictor of prices of securities demanded in the Nigerian capital market. This implies, the price at which securities are traded in the Nigerian capital market determines the quantity (unit) of securities which an investor will be willing and able to buy in the market.

Going by the positive coefficient of price (26.91891), our finding is not in tandem with the postulate of the law of demand which states that price and quantity demanded are inversely proportional. Rather than an inverse (negative) relationship, this study provides an evidence of a direct (positive) association between price and quantity demanded in the Nigerian capital market for the period, 1985 to 2020. In other words, the higher the price, the more the quantity of securities demanded in the Nigerian capital market, suggesting a situation of abnormal demand. Our finding is in consonance with that of Kamuti (2013) which concluded that price levels cause a positive change in stock volumes transacted in Nairobi securities market. Also, Wang et al (2020) confirms the existence of a unidirectional causality flow from security price to trading volume in China.

Post-Estimation Diagnostic Tests

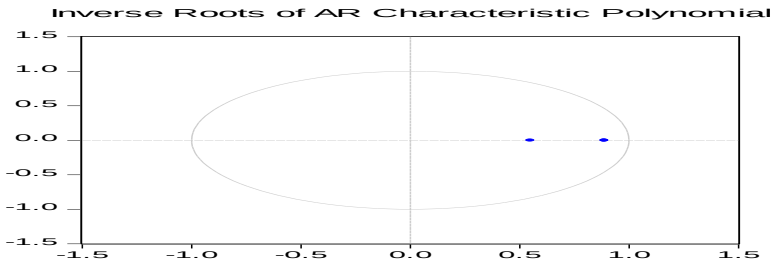
Summarized in Table 8 and Fig.3 are the post-estimation diagnostic tests of the VAR model.

Table 8: Post-Estimation Diagnostic Tests' Results

Diagnostic Tests:	Type	P-value	Null hypothesis	Decision
VAR Residual Serial Correlation LM	LRE	0.9398	No serial correlation	Accept
VAR Residual Serial Correlation LM	Rao F	0.9399	No serial correlation	Accept
VAR Residual Heteroskedasticity	Chi-sq	0.1007	No Heteroskedasticity	Accept

Source: Authors' computation using Eviews version 10

Fig.3: Inverse Roots Autoregressive (AR) Characteristic Polynominal



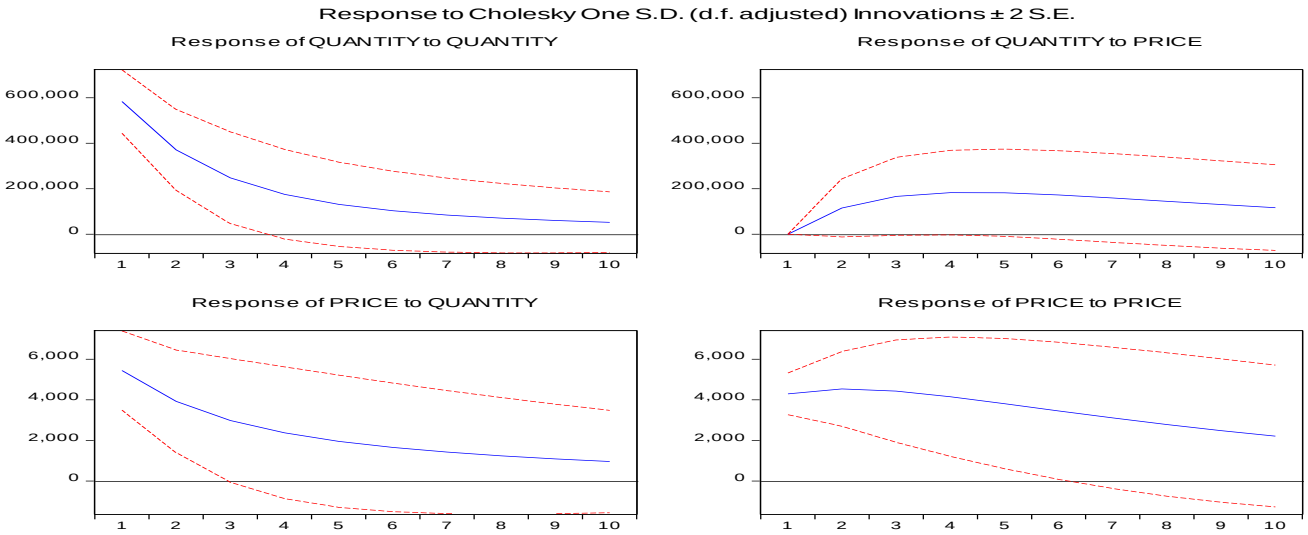
Source: Authors' constructed using Eviews version 10

As per the diagnostics in Table 8, the VAR residual serial correlation LM tests (LRE and Rao-F) attest to the lack of serial correlation of the residuals of the VAR model. The VAR residual heteroscedasticity test also confirms homoscedastic nature of the residuals of the VAR model.
Furthermore, in the VAR stability test depicted by the inverse roots AR characteristic polynomial in Fig.3, no root lies outside the unit circle. Thus, VAR satisfies the stability condition. In sum the VAR diagnostics confirm that the model does not suffer serial correlation, heteroscedasticity and instability problems.

Impulse Response Analysis

The impulse response functions (IRFs) of the variables of study, by way of the response of Cholesky one standard deviation (degree of freedom (d.f.) adjusted) innovations are depicted Figure 4.

Fig. 4: Response of Cholesky one standard deviation (d.f adjusted) innovations



Source: Authors' constructed using Eviews version 10

The IRFs (in Figure 4) indicate that a shock to the quantity of securities demanded produces a positive effect on itself throughout the study period. Likewise, the response of Cholesky one standard deviation (d.f.

adjusted) innovations of quantity of securities to the price of the securities is also positive from the first to the last period of study. Similarly, the response of Cholesky one standard deviation (d.f adjusted) innovations of price to quantity demanded is positive throughout the time horizon. The response of Cholesky one standard deviation (d.f adjusted) innovations of price to own shock is also positive in the entire study period.

Variance Decomposition Output

The variance decomposition analysis indicates the quantity of information each variable contributes to the forecast error variance of other variables in a VAR model (Lesotho et al., 2016). The results of the variance decomposition are presented in Table 9.

Table 9: Variance Decomposition Outputs

	Variance Decomposition of Quantity			**Variance Decomposition of Price**		
Period	S.E.	Quantity	Price	S.E.	Quantity	Price
1	582912.8	100.0000	0.000000	6934.358	61.61472	38.38528
2	700248.7	97.27236	2.727643	9167.919	53.56472	46.43528
3	761254.1	92.90783	7.092171	10608.90	47.91237	52.08763
4	802395.9	88.40903	11.59097	11637.55	43.98147	56.01853
5	833216.0	84.47415	15.52585	12401.35	41.22451	58.77549
6	857121.0	81.27637	18.72363	12979.58	39.26271	60.73729
7	875845.9	78.76284	21.23716	13422.30	37.84493	62.15507
8	890547.8	76.81478	23.18522	13763.81	36.80529	63.19471
9	902097.5	75.31199	24.68801	14028.69	36.03300	63.96700
10	911174.1	74.15279	25.84721	14234.95	35.45288	64.54712

Source: Authors' computation using Eviews version 10 (2022)

The variance decomposition outputs in Table 9 indicate that variation in quantity demanded is explained mostly by itself in the long run, at about 74% while the remaining balance (about 26%) is attributed to fluctuation in the prices of securities traded in the Nigerian Stock Exchange. However, in the short run, particularly, in period one, the entire variation in quantity demanded is accounted for by own shock with no contribution from price of securities traded in the market.

It is also observed in Table 9 that the contribution of price to quantity demanded kept increasing from about 3% in period two to roughly 25% in period nine, while the contribution of quantity demanded to own shock kept reducing correspondingly, from 97% in period two to about 75% in period nine.

Granger Causality Tests

The result of the VAR Granger causality/block exogeneity wald tests, otherwise called Toda-Yamamoto Granger causality test is summarized in Table 10.

Table 10: Result of the Toda-Yamamoto Granger Causality Test

Null Hypothesis	Chi-sq	df	Prob.	Decision
PRICE does not Granger Cause QUANTITY	3.437975	1	0.0637*	Reject
QUANTITY does not Granger Cause PRICE	1.270367	1	0.2597	Accept

Source: Authors' computation using Eviews version 10

Note: * represents significant level at the 10%.

According to the results of the Toda-Yamamoto Granger causality test (in Table 10), the null hypothesis that security price does not Granger-cause quantity demanded, is rejected at the 10 per cent significant level. However, the null hypothesis, quantity demanded does not Granger-cause price, cannot be rejected. This implies that there is a unidirectional causality flow from price of securities to quantity demanded of the

securities in the Nigerian capital market. This finding is in consonance with finding of Wang et al (2020) who found that an evidence of unidirectional causality flow running from price to volume in China stock market.

5.Conclusion

This study tests the applicability of the law of demand in the Nigerian capital market for the period, 1985 to 2020. It specifically aims to evaluate the nexus between price and quantity (unit) of securities in the Nigerian stock market by applying Sims (1980)'s Vector Autoregression (VAR) model and Toda-Yamamoto Granger causality test as techniques of estimation.

Empirical findings from the VAR estimation reveal that price impacts positively and significantly on the quantity of securities traded in the Nigerian capital market However, quantity of securities. demanded is negatively signed but is not significant predictor of prices of securities demanded in the Nigerian capital market. Toda-Yamamoto Granger causality test reveals that there is a short-run unidirectional causality flowing from price to quantity of securities demanded in the Nigerian capital market in the study period. This suggests that, the price at which securities are traded in the Nigerian capital market determines the quantity (unit) of securities which an investor will be willing and able to buy securities in the market. Going by the positive coefficient of price (26.91891), our finding is not in tandem with the theory of demand which establishes the existence of an inverse relationship between price and quantity demanded. Rather than inverse relationship, this study reveals that there is a direct (positive) association between price and quantity demanded in the Nigerian capital market. In other words, the higher the price, the more the quantity demanded in the Nigerian capital market, suggesting a situation of abnormal demand.

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