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The causal relationship between coefficient of elasticity of trading and market return in an African emerging market

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Abstract

Purpose – The study aims to examine the appropriateness of the coefficient of elasticity of trading (CET) as a measure of liquidity using Nigerian stock market data. Given that liquidity is multidimensional, the CET is complemented with the popular measure of liquidity, turnover ratio to explore the causal relationship among the CET, turnover ratio and market return to determine their relevance in security valuation. In other words, an attempt is made to examine if either of these two measures of liquidity is a relevant factor in explaining stock market return.

Design/methodology/approach – The Toda-Yamamoto version of Granger causality test is applied to two sets of data on the Nigerian Stock Exchange (NSE). The available monthly time series data are from 2008 to 2019 while the annual data are from 1986 to 2018. The Toda-Yamamoto test is preferred because it is more robust to integration and cointegration of the variables.

Findings – The results of the Toda-Yamamoto version of the Granger causality test on monthly data reveal no causal relationship between CET and market return, turnover and market return and CET with turnover and market return. These results are consistent with those for several frontier countries reported by Rubio *et al.* (2005), Hartian and Sitorus (2015), Batten and Vo (2019) and Sterenczak *et al.* (2020). The results support the conclusion that the Nigerian economy is not fully integrated with the global economy. Market inefficiency due to order imbalances given the nature of the trading system can also explain the reported results. However, the results from annual data do not tally with the monthly results. There is causality running from CET to market return. There is also causality running from turnover to market return. Therefore, both CET and turnover are statistically significant causal predictors of market return. The results from annual data are consistent with those reported by Marozva (2019).

Research limitations/implications – The key limitation is availability of high-frequency transaction-level data to researchers to consider many measures of liquidity that have been employed in developed countries. The research implication is that more researchers will be encouraged to conduct more studies on liquidity and how the study results can drive policy recommendations. The standard asymptotic distribution of underlying the Toda-Yamamoto approach has been found to lead to overrejection.

Originality/value – This study is the first to apply Toda-Yamamoto model on data from Nigeria to investigate the causal relationship between stock market return and liquidity proxied by the CET given the nature of the automated trading system (ATS) in use. The CET is also complemented with the turnover ratio to explore the multidimensional nature of liquidity and its causal relationship with market return. The study is

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also interpreted as a determination of the integration of Nigeria's economy with the global economy with its implication on investment diversification.

Keywords Liquidity, Nigeria, Microstructure, Stock market, Economic growth, Coefficient of elasticity of trading, Turnover ratio

Paper type Research paper

Introduction

The challenge faced by many developing countries of the world over the years is how to achieve economic growth necessary to reduce poverty. Beck *et al.* (2000) and Dahou *et al.* (2009) hold the opinion that a vibrant financial market is an essential ingredient of macroeconomic stability to channel resources into productive projects that are capable of fostering economic growth. Stiglitz (1989) notes that the relevance of financial institutions to an economy's development process is essentially to focus on the crucial role of capital accumulation. The author further argues that even though the socialist economies record very high rates of savings, they failed to record a robust rate of economic growth. Therefore, capital accumulation is a necessary but not sufficient condition for economic growth to take place. The capital markets are charged with aggregating and allocating funds in a way that results in a choice among competing sectors in any economy. Aside from allocating funds, financial markets ensure that funds extended to demanders are utilized in the best interest of the providers. Thus, financial markets help to create diversification opportunities and consequently reduce risk facing market participants. On this premise, many developing countries pursue the establishment of securities markets.

Seriki (2019) argues strongly in favor of the Nigerian financial markets serving as tools to promote diversification and consequently, long-term economic growth. According to the author, the stock market must be healthy in terms of depth, access to foreign exchange and appropriate regulation. In such a market, the level of investor participation depends strongly on liquidity because it gives potential investors the required confidence to participate in the market. As at October 2019, Seriki (2019) reports that the Nigerian Stock Exchange (NSE) was the fourth largest in Africa with a market capitalization of NGN 12.8 trillion ($35 billion). The market has 161 listed firms from 11 different sectors of the economy. The financial services sector has the largest number of listed firms, but the technology sector dominates in terms of market capitalization.

The NSE has witnessed several transformations since its inception. It currently operates an electronic platform, with a central order book for trading securities. The dealing members submit orders to the platform while market makers submit two-sided quotes into the electronic order book. Besides the central order book (COB), the exchange also maintains an Off Market/Negotiated Deal Book for executing and reporting prenegotiated deals and block trades among dealers (Nigerian Stock Exchange, 2018). All of the aforementioned transformations have not paid off significantly, in terms of the stock market's contribution to the Nigerian economy. Gwarzo (2016) identifies some Nigerian macroeconomic environmental factors as challenges. There is a general sense of uncertainty in the economy, which creates a risk factor for the Nigerian capital market. The size of the stock market relative to the rest of the economy is reflected in the market capitalization to the gross domestic product (GDP) ratio. Hearn *et al.* (2010) note that the average ratio in many Organisation for Economic Co-operation and Development (OECD) countries is in excess of 200%. Yartey (2007) also report a ratio of 135% for Malaysia, an emerging market. Throughout the period reviewed, Nigeria's market contribution is much lower than peer countries (see Figure 1), indicating that more needs to be done to make the stock market to become relevant in contributing to economic growth in Nigeria.

The development of the stock market is critical in attracting international investors as well as inflows of capital. Azeez and Obalade (2019) underscore the importance of stock market

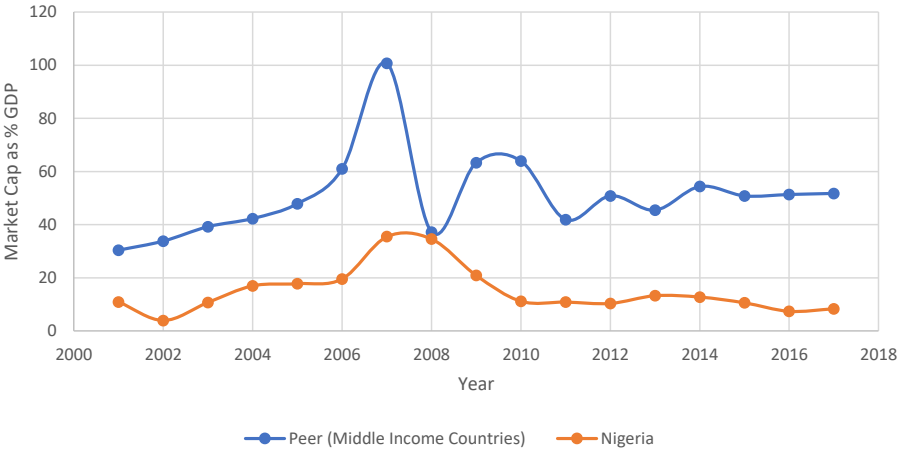


Figure 1.
Stock market capitalization (% of GDP)

Source(s): Chart by authors based on data from World Development Indicators

liquidity in the discussion of capital market development in Nigeria. They also note that movements in macroeconomic variables affect the level of confidence that local and foreign investors have in the stock market. Matadeen (2017) argues that the stock market indeed serves as a mirror that projects the level of economic performance. According to Naik *et al.* (2020), stock market liquidity is a multidimensional concept. The major challenge is the choice of an appropriate measure, especially in emerging markets.

The objective of this paper is to examine the appropriateness of the coefficient of elasticity of trading (CET) as a measure of liquidity using Nigerian stock market data. An effort is also made to expand the definition of liquidity by complementing CET with the popular measure of liquidity, turnover ratio. Finally, the causal relationship among CET, turnover ratio and market return is explored to determine their relevance in valuation as well as in portfolio diversification. In other words, it is important to examine if these two measures of liquidity are relevant factors in explaining stock market return and the consequent implication on the integration of the Nigerian economy with the world economy.

Liquidity risk and asset returns

The financial crisis of 2007/2009 opens a discussion on the role of liquidity as a risk factor in the securities market. Thus, it has become crucial to examine the impact of liquidity variation on overall market movements. According to Acharya and Pedersen (2005), with risk aversion and risky dividends and liquidity, the investor's conditional expected gross return on a security i at equilibrium is expressed by Amihud *et al.* (2015) as follows:

$$E_t\left(r^i_{t+1}\right) = r^f + E_t\left(c^i_{t+1}\right) + \lambda_t\left(\beta_t + \beta^{L1}_t - \beta^{L2}_t - \beta^{L3}_t\right) \tag{1}$$

$$\beta_t = \frac{\mathrm{Cov}_t\left(r^i_{t+1}, r^M_{t+1}\right)}{\mathrm{Var}_t\left(r^M_{t+1} - c^M_{t+1}\right)} \tag{2}$$

$$\beta^{L1}_t = \frac{\mathrm{Cov}_t\left(c^i_{t+1}, c^M_{t+1}\right)}{\mathrm{Var}_t\left(r^M_{t+1} - c^M_{t+1}\right)} \tag{3}$$

$$\beta_t^{L2} = \frac{\mathrm{Cov}_t\left(r_{t+1}^i, c_{t+1}^M\right)}{\mathrm{Var}_t\left(r_{t+1}^M - c_{t+1}^M\right)} \tag{4}$$

$$\beta_t^{L3} = \frac{\mathrm{Cov}_t\left(c_{t+1}^i, r_{t+1}^M\right)}{\mathrm{Var}_t\left(r_{t+1}^M - c_{t+1}^M\right)} \tag{5}$$

In the equations above, r^f is real risk-free rate, $E_t(r_{t+1}^i)$ is expected gross return in $t+1$, r_{t+1}^M is market return in time $t+1$, c_{t+1}^M is relative market liquidity and c_{t+1}^i is relative illiquidity cost at time $t+1$. Acharya and Pedersen (2005) interpret Equation (1) by stating that required excess return is expressed as the expected relative cost of illiquidity as in the basic model plus four betas multiplied by the risk premium. The four betas depend on a security's payoff and liquidity risk. The liquidity risk factors are β^{L1}, β^{L2} and β^{L3} with β^{L1} representing the covariance between assets' illiquidity and market illiquidity. This factor is positive for most securities because of commonality in liquidity as propounded by Chordia *et al.* (2000). An investor will require a compensation when an asset becomes illiquid simply because the asset market is illiquid. The second liquidity factor, β^{L2} is a measure of the exposure of a security to overall market illiquidity. Market illiquidity tends to reduce asset values. Thus, there is a negative relationship between required return and market liquidity. β^{L3} is a measure of the sensitivity of an asset's illiquidity to market conditions. When a market experiences a decline, investors' ability to sell easily is hampered. Therefore, investors are willing to accept a discount in required return on assets with low illiquidity cost. Commenting on the aforementioned relationship, Amihud (2002) notes that a high illiquidity today is a predictor of a high expected illiquidity in the next period, which implies a higher required return.

Hendershott and Seasholes (2014) identify two components of returns as temporary and predictable in the short run, which represents the compensation to liquidity providers for trading with impatient investors. El-Wassal (2005) reports results which point to a long-term association between overall market liquidity and returns in several countries including Malaysia, India, South Korea and Zimbabwe. Bhattacharya *et al.* (2016) report that market returns are partially explained by liquidity on Indian stock exchanges during the period 2002–2016.

Narayan and Zheng (2011) examine the impact of liquidity on returns on the Shanghai stock exchange and the Shenzhen stock exchange from 1997 to 2003. Their results are mixed. However, they find more evidence of a negative effect of liquidity on returns on both exchanges. Hartian and Sitorus (2015) explore the relationship between market return and liquidity in a group of 16 developing countries and ten developed countries. Using trading volume, turnover ratio and turnover volatility as measures of liquidity, they report mixed results. Higher market liquidity is associated with higher returns in developing countries while higher market liquidity is associated with lower returns in developed countries. Sterenczak *et al.* (2020) found no evidence of illiquidity premium in 22 frontier markets from 1991 to 2019.

While Minovic and Zivkovic (2014) report the existence of liquidity in asset pricing on the Croatian stock market, Hongxing and Duduchoge (2017) find results consistent with the presence of illiquidity risk in asset returns in the Ghanaian stock market. Marozva (2019) reports that liquidity is negatively related to returns in the South African securities market. Using Spanish market time series data over a ten-year period, Rubio *et al.* (2005) did not find any of the liquidity measures to be relevant. They conclude that market-wide liquidity risk factors are not priced in the Spanish stock market. The results reported by Batten and Vo (2019) are consistent with those of Rubio *et al.* (2005). Batten and Vo (2019) report that liquidity does not matter in asset returns in the Vietnamese stock market. Bolouprémo (2020) is the only relevant study using Nigerian stock market data from 1985 to 2015. The author

uses trading volume and turnover ratio as proxies for liquidity. The Johansen cointegration test results imply that higher liquidity leads to higher market returns.

Emna and Chokri (2014) argue that the critical question that researchers should address revolves around the estimation of liquidity in emerging markets. According to them, emerging markets exhibit thinness, which results in high volatility coupled with a lack of liquidity. Wu and Qin (2021) report a positive relationship between liquidity and market efficiency using data from China's emissions trading system. Liquidity defined as the demand for immediacy brought about by asynchronous arrivals of buy and sell orders can result in order imbalances which is captured by CET as defined. In a study done on South African data, Young and Auret report results in support of the hypothesis that increased liquidity is needed to enhance market efficiency. According to them, market illiquidity is evidence of trading friction. They conclude that the predictability of a security return is not impacted by liquidity in the South African market. Bekaert *et al.* (2007) advocate that more research efforts should be focused on emerging markets because they represent an ideal environment to examine the effect of liquidity on expected returns. They report results which indicate that local factors are relevant when exploring the importance of liquidity in asset pricing. According to Naik *et al.* (2020), liquidity is a multidimensional concept. The major challenge is the choice of an appropriate measure, especially in emerging markets.

Liquidity and coefficient of elasticity of trading (CET)

Keynes (1930) views a liquid asset as one which is immediately realized without loss. O'Hara (2003) reflects the reality of the situation by claiming that "liquidity is hard to define, but easy to feel it." Market liquidity refers to the likelihood of trading adequate quantities of securities at reasonable prices over a reasonable period of time. Gaston and He (2015) define liquidity as the market's ability to quickly conclude large security transactions within a framework of low transaction cost and with a minimal price impact. Investors are attracted to a market that provides liquidity with greater impact on the market's ability to process information. Amihud and Mendelson (1991) conclude that required returns on financial assets are impacted by the level of liquidity. Gaston and He (2015) note that a relatively high level of liquidity is needed to aid an efficient transfer of funds from surplus-spending units to deficit-spending units in order to elevate economic growth. When market liquidity is low, market prices become less informative by creating a misalignment between securities prices and economic fundamentals.

Liquidity is a multi-dimensional concept whose implication covers trading time and immediacy, tightness, depth, breath and resiliency. According to Naik *et al.* (2020) and Minovic (2012), trading time refers to ability to execute transactions immediately at prevailing market prices. The waiting time between one trade and another as well as speed are critical. Tightness refers to the gap between bid and ask prices and consequently addresses transaction cost. The depth of the market focuses on the ability to execute large transactions without undue pressure on price. The breath of the market is in terms of large quantity orders. Finally, market resiliency is the speed at which underlying asset prices are restored after a disturbance. These take into account the elasticity of demand and supply. Bekaert and Harvey (2000) conclude that the only measure of liquidity that is applicable to emerging markets is the LOT measure proposed by Lesmond *et al.* (1999), which is based on the frequency of zero-return days. Ahn *et al.* (2018) also confirmed that the relevance of LOT measure to emerging markets. However, Minovic and Zivkovic (2014) report that LOT measure of liquidity required a long enough period in order to yield a valid estimate. In addition, too many zero returns (more than 80%) in an estimation period render the LOT measure invaluable.

The financial economics literature on asset pricing had long relied on turnover or turnover ratio as a measure of liquidity or liquidity risk (Barinov, 2014). Datar (2000) concludes that the turnover ratio, which is defined as turnover as a proportion of market

capitalization, displays wide variations. Moreover, the author argues that the turnover ratio suffers from dimensional distortion because market capitalization is a stock measure while turnover is a flow measure. Moreover, the CET has superior information content in most emerging markets with infrequent trading, small trading volume and high fluctuations in prices of securities. More importantly, Solnik (2000) notes the unusual situation in which the turnover ratio tends to be higher in emerging stock markets than in developed markets.

Datar (2000) introduced a measure of market immediacy referred to as the CET. According to Datar (2000) and Wanzala (2018), the CET relies on price elasticity measure, which takes into account impact cost of trading. The CET is defined as follows:

$$\text{CET} = \frac{\%\ \text{Change in Trading Volume}}{\%\ \text{Change in Price}} \tag{6}$$

To adjust this measure for unit root problem, Suresha and Murugan (2014) suggest a modified CET of the form:

$$\text{CET} = \frac{\log\left\{\text{Volume in Period } t/\text{Volume in Period } t-1\right\}}{\log\left\{\text{Price in Period } t/\text{Price in Period } t-1\right\}} \tag{7}$$

The calculated values of CET can vary between negative infinity and positive infinity. When the direction of changes in volume and price are the same, the CET is positive. If the CET is high, higher volume of transactions are associated with higher price changes. However, if large size transactions are associated with little or no price changes, the CET will approach infinity indicating increased liquidity. Table 1 shows a schematic presentation of the possible values of CET. Suresha and Murugan (2014) note that when large-sized transactions are associated with little or no change in price, the CET tends to grow to infinity, which is an indication that liquidity is high. The sign of CET is not really relevant.

Methodology

The data employed in this study are monthly and annual time series of stock market trading volume, market capitalization, market index and dividend yield spanning 1985–2019 for annual data and 2008–2019 for monthly data. The time series are sourced from the World Development Indicators, CEIC Data, the Central Bank of Nigeria and the Nigerian Securities and Exchange Commission. Using the time series data, the turnover ratio is calculated as the percentage ratio of value of stock traded to market capitalization. The stock return is calculated as the percentage of consecutive changes in market index plus an annual average dividend yield. The CET calculation is based on Equation (7). The

Price change	CET > 1	CET = 1	CET < 1
Price increase	Price increases supported by more than proportionate change in volume. This a reflection of real good news	Price increases matched by proportionate change in volume	Bull run: price goes up but buyers show no interest. Price increase is said to be speculative
Price decline	Price decreases supported by more than proportionate change in volume	Price decreases matched by proportionate change in volume	Bear hug: prices are going down, but buyers are not interested in buying

Source(s): Datar (2000)

Table 1. Possible values of CET and interpretation

choice of sample period for the monthly analysis is based on data availability. The period also coincides with passage of the Investment and Securities Act (2007), which strengthened the investment climate in Nigeria. The research approach is to explore a causal relationship between market liquidity proxies (CET and turnover ratio) and market return. If it is determined that market liquidity Granger-causes market return, then one can infer that market liquidity is a risk factor that is priced in return determination. The Granger causality test is employed in this analysis.

The Granger causality test can be defined in terms of two time series variables: X and Y. X Granger-causes Y if Y can be better predicted using past data on X and Y rather than past data on Y only. A test of Granger noncausality can be investigated within a vector autoregression (VAR) model of the form:

$$\begin{bmatrix} Y_{1t} \\ Y_{2t} \\ Y_{3t} \end{bmatrix} = \begin{bmatrix} \partial_{10} \\ \partial_{20} \\ \partial_{30} \end{bmatrix} + \sum_{i=1}^{k} \begin{bmatrix} \partial_{11,i} & \cdots & \partial_{13,i} \\ \partial_{21,i} & \cdots & \partial_{23,i} \\ \partial_{31,i} & \cdots & \partial_{33,i} \end{bmatrix} \begin{bmatrix} Y_{1,t-i} \\ Y_{2,t-i} \\ Y_{3,t-i} \end{bmatrix} + \sum_{j=1}^{d\max} \begin{bmatrix} \partial_{11,k+j} & \cdots & \partial_{13,k+j} \\ \partial_{21,k+j} & \cdots & \partial_{23,k+j} \\ \partial_{31,k+j} & \cdots & \partial_{33,k+j} \end{bmatrix} \times \begin{bmatrix} Y_{1,t-k-j} \\ Y_{2,t-k-j} \\ Y_{3,t-ik-j} \end{bmatrix} + \begin{bmatrix} e_1 \\ e_2 \\ e_3 \end{bmatrix} \tag{8}$$

In Equation (8), Y_1 represents CET, Y_2 is turnover and Y_3 is market return. Within the VAR model, the null hypothesis that causality runs from Y_{1t} to Y_{2t} means a test of $\partial_{21,1} = \partial_{21,2} = \partial_{21,3} = 0$. The same logic can be applied to testing causality among all variables in the model.

Toda and Yamamoto (1995) propose an approach to the test of causality, which is consistent with a chi-square distribution of the Wald statistic from an augmented VAR model. This approach is superior to the traditional method of testing causality, which is subject to specification bias and spurious regression (Giles, 1997). The first step is a unit root test of the variables. This is needed only to determine the maximum order of integration of the variables denoted as $d$max. Following this, a VAR model is applied to the level of the series. Then, the appropriate lag of the VAR system (k) is selected based on Akaike information criterion (AIC) and/or the Schwartz information criterion (SIC). Once the appropriate lag is determined, the VAR system should be run by adding $d$max to (to get $k + d$max) the lag of each variable in the system. The final VAR model should be checked for absence of serial correlation as well as ascertain the stability of the VAR model. Finally, the augmented Wald test is applied to test for Granger non-causality.

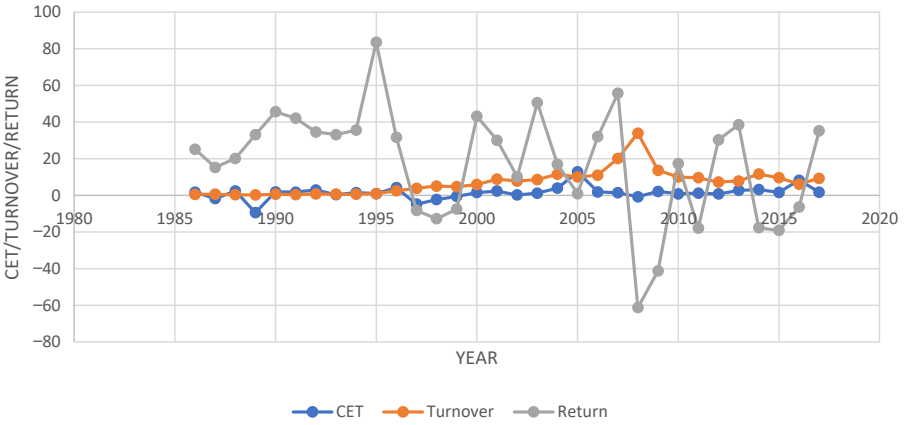
Empirical analysis of test results

The initial test shows that none of the variables is normally distributed. Test also shows that the CET varies more than the turnover ratio and market return. Figure 2 shows the annual time series with market return being more volatile than the CET and turnover ratio. The first step in testing Granger causality is to examine the stationarity of the three variables. In order to conduct a unit root test on each variable, the augmented Dickey–Fuller (ADF) and the Kwiatkowski–Phillips–Schmidt–Shin (KPSS) tests are employed. The results for the monthly data are reported in Table 2. The ADF test reveals that all the variables are stationary. However, the KPSS test shows that CET and return are stationary while turnover is not stationary but can be made stationary by differencing once. Therefore, $d$max (the maximum order of integration of the variables) is set to unity in our final VAR model that involves the value of $d$max as described in the last section.

The next step in the Toda-Yamamoto Granger causality approach is to estimate a VAR model on the level of the series and determine the lag length that guarantees absence of serial

correlation in the model. Both AIC and SIC indicate a zero-lag optimal length. When the lagrange multiplier (LM) test is applied to the residual, it shows that serial correlation is not present. The preferred VAR model with $k + d\max = 1$ additional lag of each of the variables is again estimated. The results are not reported in this paper, but the stability of the final VAR is tested. The inverse of the characteristic roots of the autoregressive polynomial are all within the unit circle, which is an indication that the chosen VAR is stable.

According to Toda and Yamamoto (1995), the final step is to apply the block exogeneity Wald test. The test results are reported in Table 3 for monthly data and Table 4 for annual data. With monthly data, there is no causal relationship between CET and return and



Source(s): Chart by authors based on data from World Development Indicators

Figure 2. Comparison of CET and turnover with return 1986–2018

Variable	ADF statistic	Probability	Remark	KPSS statistic	Remark
CET (Level)	−12.9980	0.0000	Reject null	0.2550	Cannot reject null
Turnover (Level)	−11.0150	0.0000	Reject null	0.7470	Reject null
Turnover (1st difference)	NA	NA	NA	0.0788	Cannot reject null
Return (Level)	−9.4680	0.0000	Reject null	0.3280	Cannot reject null

Note(s): NA *means* "not applicable." The KPSS asymptotic critical values for LM statistic are 0.739 for 1% level, 0.463 for 5% level and 0.347 for 10% level. The null hypothesis for the ADF test is "series is nonstationary." The null hypothesis for the KPSS test is as follows: "series is stationary"

Table 2. Unit root test results for monthly data (2008–2019)

Null hypothesis	Chi-square	Probability	Remarks
Turnover does not Granger-cause CET	1.3958	0.4976	Cannot reject null
Return does not Granger-cause CET	0.1712	0.8098	Cannot reject null
Turnover and return do not Granger-cause CET	1.5943	0.8204	Cannot reject null
CET does not Granger-cause turnover	0.4417	0.8018	Cannot reject null
Return does not Granger-cause turnover	1.0979	0.5775	Cannot reject null
CET and return do not Granger-cause turnover	1.4752	0.8310	Cannot reject null
CET does not granger-cause return	0.3184	0.8528	Cannot reject null
Turnover does not Granger-cause return	1.8363	0.3993	Cannot reject null
CET and turnover do not Granger-cause return	2.1560	0.7071	Cannot reject null

Note(s): *indicates statistical significance at the 10% level. **indicate statistical significance at the 1% level

Table 3. Toda-Yamamoto causality (modified Wald) test results for monthly data 2008–2019

between CET and turnover. Moreover, there is no causal relationship between return, on the one hand, and CET and turnover, on the other hand. The results of the Granger causality test applied to annual data are different from the monthly results. The CET is found to Granger-cause market return. There is Granger causality from turnover ratio to return. The results also show Granger causality from CET and turnover ratio to return. Finally, there is Granger causality from CET and return to the turnover ratio.

Summary, conclusion and policy recommendations

Liquidity research has significant implications for market traders, regulators, exchanges and listed firms. For example, an investor will require a compensation when a financial asset becomes illiquid simply because the asset market is illiquid. Chordia *et al.* (2000) note that initial attempts to study the impact of liquidity in securities markets were devoted to the effect of individual asset liquidity on returns. According to Ahn *et al.* (2018), research on liquidity in emerging markets is limited due to paucity of transaction-level data. Kumar and Misra (2015) observe that the paucity of research on emerging markets are as a result of researchers' focus on quote-driven markets at the exclusion of order-driven emerging markets. The attempt in this paper is to examine the appropriateness of the CET as a complementary measure of liquidity using Nigerian stock market data. Moreover, the causal relationships among the CET, turnover ratio and market return are explored to determine their relevance in valuation. In other words, it is important to examine if these two measures of liquidity are relevant factors in explaining stock market return. It must be noted that this research effort is significant because the approaches taken by previous researchers on African markets are based on one-directional measure of liquidity. Many of the previous research studies define liquidity in terms of the turnover ratio.

The results of the Toda-Yamamoto Granger causality test on monthly data from 2008 to 2019 reveal the absence of causal relationship between CET and market return, turnover and market return and a combined CET with turnover and market return. This means that either CET and/or turnover are not appropriate measures of liquidity on the Nigerian stock market or liquidity is not considered a risk factor in the determination of market return. These results are consistent with those reported on the Spanish market by Rubio *et al.* (2005). Batten and Vo (2019) reported similar results on the Vietnamese market. The results from annual data from 1986 to 2018 on the Nigerian market do not tally with the monthly results. There is causality running from CET to market return. There is also causality running from turnover to market return. In addition, both CET and turnover are statistically significant causal predictors of market return. In essence, one can conclude that both CET and turnover ratio are relevant factors in the determination of stock market return in Nigeria. The annual results are consistent with Bolouprem o (2020).

Table 4.
Granger causality (Wald) test results for annual data 1986–2018

Null hypothesis	Chi-square	Probability	Remarks
Turnover does not Granger-cause CET	3.7120	0.7156	Cannot reject null
Return does not Granger-cause CET	4.0927	0.6641	Cannot reject null
Turnover and return do not Granger-cause CET	5.4381	0.9417	Cannot reject null
CET does not Granger-cause turnover	5.2037	0.5180	Cannot reject null
Return does not Granger-cause turnover	9.8741	0.1301	Cannot reject null
CET and return do not Granger-cause turnover	20.4427	0.0595*	Reject null
CET does not Granger-cause return	37.7521	0.0000**	Reject null
Turnover does not Granger-cause return	11.2707	0.0804*	Reject null
CET and turnover do not Granger-cause return	65.0770	0.0000**	Reject null

Note(s): *indicates statistical significance at the 10% level. **indicate statistical significance at the 1% level

Following the results reported in the financial economics literature, including Hartian and Sitorus (2015), the relevance of liquidity as a risk factor in valuation depends on the level of development of the market. Market liquidity represents a way to raise the profile of a securities market. In view of the results reported in this study, especially with monthly data, policy measures should be put in place to raise the level of liquidity in the Nigerian securities market. Seriki (2019) notes that *Jumia,* a company that operates in Africa, is not listed on the Nigerian stock market but chose to list on the New York Stock Exchange on account of liquidity. According to the author, the Nigerian government has pursued anti-market policies, which led to a decline of 20% in foreign transactions between 2014 and 2018.

In order to promote liquidity, the Nigerian securities market should imbibe a culture of technological innovation, which is common in many countries of the world. Technology must be employed in electronic order books with an opening call auction to be followed by continuous trading sessions as practiced in many OECD countries. Moreover, regional integration should be promoted to take advantage of economies of scale. Regional integration will bring several benefits in the area of increasing market size, reducing exposure to external shocks, attracting international investments, reducing regulatory burdens and integrating information systems to reduce screening and monitoring costs. Batten and Vo (2019) conclude that a lack of integration was responsible for the irrelevance of liquidity in valuation in emerging markets. The lack of significance of liquidity in the valuation of stock is evidence of a segregated market. Therefore, this is critical for investors who pursue diversification of their portfolios. The study by Wu and Qin (2021) imply that the low level of liquidity of the Nigerian securities market is evidence of market inefficiency.

A notable program is the recent cooperation between the NSE and the London Stock Exchange in the promotion of dual listing of securities. These endeavors represent potential sources of innovation.

The management of the Nigerian securities markets should strive to promote transparency and accountability. There are documented cases of listed firms failing to disclose information on a timely basis (Masry, 2015). Masry notes that inadequate provision of information is detrimental to the functioning of a stock market because it can lead to market responses that are considered irrational and thereby threatening economic efficiency. Moreover, a lack of information about available investment opportunities has consequences on risk and return evaluation. Therefore, it is critical for rules on information disclosure to be enacted and seriously enforced. In addition to this, the management of the stock market must promote posttrade transparency by quickly making available information about completed market transactions.

Seriki (2019) argues for a serious pursuit of financial literacy to enhance investor participation in the market. Nnorom (2020) reports the size of unclaimed dividends in Nigeria to be NGN 158.44 bn ($416.40 m). Owolabi and Obida (2013) document some of the reasons why dividends remain unclaimed reflecting a flawed system, which the government of Nigeria should be held responsible. An aggressive approach to financial literacy and an investor-friendly government policy can help to encourage Nigerians as well as foreign investors to invest through the stock market. Yaghoobnezhad *et al.* (2011), Baber *et al.* (2012), Ding *et al.* (2013) and Jacoby and Zheng (2010) conclude that ownership dispersion and presence of foreign institutional investors promote market liquidity.

Finally, the Nigerian federal government still owns shares in electric companies. There is no reason for government to be involved in such a business other than to create an enabling environment through regulation. Pension funds and other potential institutional investors should be encouraged to expand their investment horizons in terms of more product choices including equities.

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