STOCK MARKET LIQUIDITY AND PERFORMANCE OF SUB-SAHARAN AFRICAN CAPITAL MARKETS

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Being an M.Sc thesis written in the Department of Banking and Finance, Faculty of Management Sciences in Partial Fulfillment of the Requirements for the Award of Master of Science (M.Sc) Degree in Finance of the University of Benin, Benin City, Edo State.

MARCH, 2024.

DECLARATION

I, Esther Edamwen OMOREGBE a Master of Science (M.Sc) candidate of the Department of Banking and Finance, Faculty of Management Sciences, University of Benin, Benin City, Nigeria hereby declare that the research work was carried out by me under the supervision of Dr. J. Obayabona, a lecturer in the Department of Banking and Finance, Faculty of Management Sciences, University of Benin. The research work has not previously been submitted for the award of a degree elsewhere. All idea and views are product of my personal research and where the views of others have been expressed they have been duly acknowledged.

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CERTIFICATION OF THESIS

This is to certify that this thesis was written by Esther Edamwen OMOREGBE in the Department of Banking and Finance, Faculty of Management Sciences, University of Benin, Benin City, Nigeria.

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ATTESTATION

We the undersigned attest that of Esther Edamwen Omoregbe has successfully carried out all the corrections as recommended by the external and internal examiners in this thesis titled Stock Market Liquidity and Performance of Sub-Sharan Capital Markets.

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DEDICATION

To God almighty for His love, faithfulness, strength, mercy and grace on me

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ABSTRACT

The study examined stock market liquidity and performance of Sub-Saharan African Capital Markets for the period 1988 to 2020. The specific objectives of the study were to examine the level of market liquidity in the sub-Saharan Africa capital market using turnover ratio, value traded, volume of trade; and the impact of these variables on the overall market performance. The sample of countries for the SSA countries include Nigeria, Côte d'Ivoire, Guinea, Ghana Kenya and South Africa.

Given that the focus is on liquidity of the markets, a dynamic structure was formulated for the analysis using the Pooled Mean Group (PMG) estimation for the panel data used for the study. Liquidity was measured both in terms of the market and the economy, while the volume of trade in the markets was also considered in the overall market performance analysis. The performance of the market as well as the basis for market depth was considered in terms of the capitalization of the stock markets.

The results from the analysis of data revealed that there is significant level of market liquidity in the Sub-Saharan Capital Markets generated from market turnover, but this liquidity is low for the markets; value traded also generated significant levels of liquidity in the Sub-Saharan Capital Markets, yet it was also found to be low; the level of market liquidity generated by volume of trade in the Sub-Saharan capital markets is significant but low; and market liquidity has significant positive impact on stock market performance in the Sub-Saharan capital markets. The study recommends among others that, there is the need for African stock markets to improve on the level of liquidity. This is because, the study has shown that liquidity generates both long run and short run positive outcomes for overall market performance in these economies. The liquidity can be further enhanced by promoting activities that enhance market participation as well as ease of trading and other forms of transfers. In this case more automated stock market activities can facilitate liquidity.

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CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Stock market liquidity is a critical aspect of financial market development across the globe because, it is an essential market characteristic that ensures smoothens market's activities, and its absence causes uneasiness among participants (Khang, 2020). According to Brennan et al. (2012), Naik and Reddy (2021) stock market liquidity is the ability of the market to absorb a large stocks volume at the lowest possible cost under a short period without significantly affecting market prices. However, Amihud, Mendelson and Pedersen (2006) earlier stated that market liquidity is the presence of buyers and sellers who unanimously agree and are willing to exchange a certain amount of securities at the current price swiftly. Thus, the existence of a highly liquid market enables active traders to ascertain the level of investment returns as well as formulating appropriate trading strategies to sustain same. Some notable studies like Cao and Petrasek (2014), Lee (2011), Bradrania, Peat, Satchell (2015) and Nadarajah, Ali, Liu and Huang (2018) have stressed the relevance of liquidity in terms of market returns as well as the impact of its fluctuations on investment decisions.

Stock market liquidity is also seen to be very important to the growth of the economy. Corroborating this submission, Ellington (2018) says that during the period of crisis, lower liquidity levels seriously weakens economic growth; and Apergis, Artikis and Kyriazis (2015) submitted that the growth and development of any economy is in part closely tied to investor's sentiments which are solely determined by liquidity conditions in the stock market. Thus, the ability of the stock market to withstand economic shocks is therefore a function of its strength which is measured by the level of liquidity (Smimou, 2014; Nneji, 2015).

Market liquidity is an integral aspect of financial system stability because of its ability to absorb systemic shocks (IOSCO 2007); and it is especially important for frontier markets like those of Sub-Saharan Africa that are often exposed to flows of short-term investment (Santoso, Harun, Hidayat & Wonida, 2010). It is the basis of an active market that ensures efficient flow of information among market participants and efficient allocation of economic resources (IOSCO, 2007; Milos, Milos, Barna & Botoc, 2021). Thus, the Sub-Saharan African Capital Markets is a clear example of a frontier market. According to Morgan Stanley Capital International (2019) stock market classification, a frontier market is one that is characterized by low level of liquidity, absence of reliability, and less informed investors. Also, it has a small number of stocks with significant capitalization, outstanding shares, infrequent irregular trading and non-trading stocks (Khang, 2020). These factors could significantly affect market liquidity thereby posing serious market risk. These identified factors clearly differentiates frontier markets from developed markets. Hence, Rui, Hamish, Anderson and Marshall (2016) and Fong, Holden and Trzcinka (2017) concluded that low-frequency liquidity measures are the best proxy for price impact in frontier markets.

Market liquidity is a multi-dimensional concept that is often seen as the ability to convert shares into cash without reducing impact price Khang, 2020). Accordingly, Harris (1990) had earlier submitted that liquidity is of four broad categories, namely width, depth, immediacy and resiliency. On their part, Sarr and Lybek (2002) argue that liquidity is made up of five categories such as tightness, immediacy, depth, breadth, and resiliency. Tightness deals with cost of transaction measured by ask price minus bid prices. Immediacy hinges on efficiency of the trading systems, settlement and speed of orders execution; depth is the cumulative orders (both buying and selling). Breadth focuses on costs of providing liquidity, while resiliency deals with

the situation where orders flow swiftly in order to correct trading anomalies thereby causing prices to return to fundamental values. Thus, considering the peculiar nature of the Sub-Saharan African Markets (a frontier market) coupled with availability of data, this study will employ those specific measures of market liquidity as was also used by Tran, Hoang, Tand-ran (2018) and Khang (2020), such as volume of trade, value traded and turnover ratio in relation to market performance. These will enable us to effectively analyze and ascertain in "real time" the level of market liquidity, speed of adjustment as well as the effect of market performance on liquidity in the SSA frontier markets.

1.2 **Statement of the Research Problem**

The Sub-Sahara African Markets are not fully developed compared to its counterparts in other parts of the globe, because, they still have limited breadth and depth and investors often regard them as the promising sweet spot found in high-growth frontier market also known as the next generation of emerging markets (Oteh, 2010). The Markets are nascent, underdeveloped and illiquid with relatively poor structures and infrastructure where disposable incomes are low but rapidly growing, in an improved business environment; such countries like Nigeria, Ghana, Ivory Coast, South Africa and Kenya are topical examples of what is now classified as frontier markets (Morgan Stanley Capital International, 2019). Despite these promising prospects and the role played by the African Stock Exchange Association (ASEA) in enhancing capital market development in the sub region, the SSA market has continued to experience low level of liquidity, low market confidence, high level of inflation, and low standards of corporate governance with political interference, and slow pace of innovativeness (Oten, 2010). Given the relevance of market liquidity in ascertaining an efficient capital market, coupled with the above observed

weaknesses, one cannot clearly ascertain the current level of market liquidity and performance in the SSA markets, hence, it became imperative to empirically re-investigate this situation within the context of Sub-Saharan African Capital Markets with a view to ascertaining the nature and level of liquidity in relation to market performance.

The increasing interest among researchers in the role of liquidity in capital markets development has encourage numerous studies in this area in the past two decades. Despite these numerous studies, it was observed that ascertaining the level of market liquidity and the corresponding impact of market performance on same has not received serious attention it deserves till date. To the best of the researcher's knowledge, apart from the study of Obayagbona and Osayande (2020) who examined the level of liquidity and their impact on market performance, no other studies within the SSA countries did. Other earlier studies either examined the impact of liquidity on stock market returns, economic growth and profitability (Ujunwa & Salami, 2010); Eze, 2019; Yameen, Farhan & Tabash, 2019; Ezenduka & Joseph, 2020); or macro-economic aggregates (variables) and stock market liquidity (Igbinosa & Uhunmwangho, 2019); or liquidity, inflation and stock returns volatility (Nguyen, Phan & Nguyen, 2020). Thus, this study does not intend to examine the relationship between market liquidity and economic growth and returns, but examine the level of liquidity (as measured by value traded, turnover ratio and volume of trade) in the SSA markets and how this liquidity is impacted by performance.

In terms of method of data analysis, it was observed in the reviewed empirical literature that most of the studies such as Kim and Murphy (2013), Eze (2019), Capelle-Blancard and Havrylchyk (2014), Abdullahi and Fakunmoju (2019), Igbinosa and Uhunmwangho (2019), Ezenduka and Joseph (2020), Boloupremo (2020), and Bri`ere, Lehalle, Nefedova and Raboun (2020) either employed, Granger causality test, ARDL, panel data analysis, cointegration and

OLS, Vector auto-regression model or Fama-French model in their empirical analysis. It was obvious that, apart from those of Obayagbona and Osayande (2020) who employed the partial adjustment model, no other studies did. The partial adjustment model technique is adjudged by finance and econometrics scholars as the appropriate method for measuring liquidity level and market performance simultaneously. It was developed by Nerlove (1968) to explain the process of a factor moving from a given level to a desired level and also the speed at which the movement occurs. Hence, the study defers from previous ones in that it employed the partial adjustment model technique in the analysis of data to ascertain the level of liquidity, market performance and the speed of adjustment in the SSA capital markets.

Lastly, it was also observed in the empirical literature that some studies like Batten and Vo (2011) used only one measure of liquidity (turnover ratio) in relation to stock returns; while Tran (2018) used four measures for liquidity (relative spread, turnover ratio, Amihud's (2002) measure, and the zero-return). However, this study differs from the above because, it employed three different standard measures of market liquidity (volume of trade, value traded and turnover ratio) which are "real time" measures of stock markets liquidity.

1.3 Research Questions

The study seeks to provide answers to the following research questions:

(i) What is the level of market liquidity (as measured by turnover ratio) in the Sub-Saharan Capital Markets?

(ii) What is the level of market liquidity (as measured by value traded) in the Sub-Saharan Capital Markets?

(iii) What is the level of market liquidity (as measured by volume of trade) in the Sub-Saharan Capital Markets?

(iv) What is the relationship between stock market performance (proxied by market capitalization rate) and market liquidity in the Sub-Saharan Capital Markets.?

1.4 Objectives of the Study

The main objective of the study is to examine stock market liquidity and performance of Sub-Saharan African Capital Markets. However, the specific objectives are to examine the effect of:

(i) Turnover ratio on market capitalization rate in Sub-Sharan Africa Capital Markets.

(ii) Value traded on market capitalisation rate in Sub-Saharan African capital Markets.

(iii) Volume of trade on market capitalisation rate in Sub-Sharan African Capital Markets.

(iv) Turnover ratio , value tradedand volume of trade on stock market return in Sub-Sharan African Capital Markets.

1.5 Hypotheses of the Study

The hypotheses tested in the course of this study include:

(i) There is low level of market liquidity (as measured by turnover ratio) in the Sub-Saharan Capital Markets.

(ii) There is low level of market liquidity (as measured by value traded) in the Sub-Saharan Capital Markets.

(iii) There is low level of market liquidity (as measured by volume of trade) in the Sub-Saharan Capital Markets.

(iv) There is no significant relationship between stock market performance and market liquidity in the Sub-Saharan Capital Markets.

1.6 Significance of the Study

This study is significant in the following respects:

First, since liquidity significantly affect stock markets depth and performance, therefore, the outcome of this study will assists market regulators in the SSA in creating rooms and making available more streams of investment investible assets like derivatives, convertibles, futures, swaps, and options in the market. This will enhance and stimulate broader interest for SSA Stock Markets thereby raising the overall level of liquidity of the market.

Secondly, the outcome of the study will be of immense benefit to policy makers by providing them clear understanding and information on the multifaceted nature of liquidity and its role in stock market performance in the Sub-Saharan Africa Markets, thereby assisting in formulating appropriate policy to enhance and sustain liquidity level.

Finally, it will also provide relevant data and information on SSA markets to researchers and academia to carry out further studies in the same area, similar areas of interest or delve into new areas that can be analyzed to extend the understanding and applicability of stock market liquidity.

1.7 Scope of the Study

The study focused on market liquidity and performance of Sub-Saharan African Capital Markets. It covers six Sub-Sahara Africa capital markets of Nigeria, Côte d'Ivoire, Guinea, Ghana, Kenya and South Africa, for a period of 33years (1988 to 2020). The period is long enough to provide a comprehensive analysis and a reliable result. The reason for the choice of these countries is that they are the first set of countries among the Sub-Saharan African countries to attain some level of market liquidity. Also, the choice of the six SSA markets is based on two additional reasons. First, they represent some of the most active capital markets in the sub-region and second, for reason of data availability.

1.8 Limitations of the Study

One of the limitations of this study has to do with the number of variables used as proxies for market liquidity. Since we used volume of trade, value traded and turnover ratio, whereas some previous studies (Harris, 1990; Sarr & Lybek, 2002; Khang, 2020) employed bid ask prices, speed of orders execution, cumulative orders, market capitalization among others. Nevertheless, since, the three variables used to measure liquidity in this study are “real time” determinants of liquidity level, it will not invalidate the final results of the study.

In terms of method of data analysis used in this study (the partial adjustment model), it is not without some weaknesses because, market imperfections may result in incomplete adjustment thereby making investors not able to realize their desired holdings immediately.

However, appropriate steps will be taken by carrying out preliminary tests (descriptive statistics, panel unit root test and correlation coefficient) to ensure that the potential for incomplete adjustment to occur is strongly minimized.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter centers on the theoretical review of relevant literature on stock market liquidity in Nigeria, Sub-Saharan Africa and other parts of the globe. The chapter is divided into three main sections namely, conceptual review, theoretical review and empirical review.

2.2 Conceptual Review

2.2.1 Stock market Performance

This is a measure of how well a company is doing which may not only depends on the efficiency of the company itself but also on the market where it operates (Dobbs & Koller, 2005). Several measurement have been employed for firms' performance and some of the common financial measures are: revenue, return on equity, return on assets, profit margin, sales growth, capital adequacy, liquidity ratio, and stock prices, among others (Crook, Ketchen, Combs & Todd, 2008). However, with respect to stock market, IGI Global (2021) sees stock market performance as the relative behaviour of a traded assets in the stock market overtime. According to them, "stock market performance means the relative stock performance of a share measured as the price earnings ratio of the share divided by the price earnings ratio of the market, compared to the simple average of the price earnings ratios of those companies within a peer group of companies determined by the Committee".

Stock market performance is often measured by market capitalization rate which represents the aggregate worth of all quoted equities, which in turn depends on the current price and quantity of equity issued and paid up capital. Market capitalization is the most important measure for assessing the size and performance of a capital market (Osaze, 2007:134). In real

world situation, stock market performance is measured in order to see how well it is doing. The most common approach to measuring a company's stock market performance is to calculate its total returns to shareholders over time, and this method nevertheless has some weaknesses occasioned by over short periods which covers changes in expectations about a company's future performance and health (Dobbs & Koller, 2005). But where firms always meet high performance standards it may not be able to meet total returns to shareholders thereby making the market to believe the management is doing very well, but this belief has already been factored into share prices (Dobbs & Koller, 2005).

2.2.2 Concept of Stock Market Liquidity

Stock market liquidity is an integral part of a well-functioning stock market and where it does not exist, it creates uneasiness among participants. According to Naik and Reddy (2021), "SML describes the degree to which an asset can be quickly bought or sold in the market at a price reflecting its intrinsic value; where high levels of liquidity arise when there is a significant level of trading activity and when there is both high supply and demand for an asset, as it is easier to find a buyer or seller". If there are only a few market participants, trading infrequently, it is said to be an illiquid market (Naik & Reddy, 2021). According to IG Analyst (2020), liquidity shows the speed to which an asset can be bought and sold at stable prices. That is to say, liquidity measures how many buyers and sellers are present, and whether transactions can take place easily. Brennan et al. (2012), see stock market liquidity as the ability of the market to absorb high level of securities at a lower cost rate over a specified time such that it does not significantly affect current share prices. On their part, Amihud et al. (2006) see liquidity as the presence of ready and willing buyers and sellers who decide to sell to one another a certain amount of stocks at the current market price speedily and without delay.

Liquidity volume is very important to stock market as it provides one of the means of attracting investors both domestically and internationally to the market. Nneji (2015) argues that along this line that market liquidity is an indication of the strength of the market as well as the capacity to withstand economic shocks. It is also being seen as a relevant parameter for predicting the future state of the economy (Smimou, 2014). Again, the relevance of market liquidity lies in the fact that "it determines how quickly investors can open and close positions, because, a liquid is often associated with less risk, as there is usually always someone willing to take the other side of a given position". This can attract speculators and investors to the market, which adds to the favourable market conditions (IG Analyst, 2020). It is also a key factor for determining market spread which invariably increases the probability that the bid-offer spread will tighten (that is, the highest price any buyer is prepared to pay and the lowest price any seller is happy to accept will move closer together) (IG Analyst, 2020; Naik & Reddy, 2021).

2.2.3 Value Traded and Market Performance

The total amount of assets being executed in domestic and foreign market divided by prices is known as value of shares traded. Traded value is calculated by multiplying volume with share price. According to Chen (2021), value traded represents the worth of traded assets in the stock exchange or the value investors attached a particular stock over a trading period. It is often used to indicate the market capitalization of a publicly traded firm, and is estimated by multiplying the number of its outstanding shares by the current share price (Yartey, 2008). Therefore, "value traded is easiest to determine for exchange-traded instruments like stocks and futures, since their market prices are widely disseminated and easily available, but is a little more challenging to ascertain for over-the-counter instruments like fixed income securities". However, the greatest difficulty in determining market value lies in estimating the value of illiquid assets like real

estate and businesses, which may necessitate the use of real estate appraisers and business valuation experts respectively (Chen, 2021; Catalano, 2021)

Value traded is often affected or determined by many factors like the sector the given company belongs, profitability, debt level, and operating environment. Value traded affect firms' market capitalization because the higher the share price the higher the overall worth of the firm at the market place and vice versa (Yartey, 2008; Catalano, 2021). Value traded is also very relevant when dealing with the issue of mergers and acquisitions especially where it involves shares price as part of the deal. Even with issuance of shares decisions, it can also affect overall stock market performance, especially when the particular stock is doing well. Hence, management might be more willing to issue more shares in order to raise more funds at a higher value. Chen (2021) added that increases in stock traded values can attract new interests from investors for a particular company or sector thereby enhancing the overall growth of the company.

2.2.4 Turnover Ratio and Market Performance

In determining the activeness of a stock market at any given point in time, aggregate shares executed divided by market capitalization, is what is known as turnover ratio, and also indicates the level of liquidity of the market. Share turnover ratio shows the swiftness of trading companies' shares in a market over a given period of time. According to Gadre, Bhargava and Mehta (2021), stock turnover indicates how much trading activity took place within a trading period, and it can be in two forms such as components of stock turnover. Where it is very high, it simply means that market liquidity is also high and that it is easier and faster to trade shares in a specified market.

Liquidity condition and market sentiment are two large factors that impact the market turnover. Hence, researchers like Qamruzzaman and Wei (2018) found a strong positive relationship between market liquidity (measured by turnover ratio) and stock market performance. “High turnover is often used as an indicator of low transactions costs, while low turnover is an indicator of high transactions costs; therefore, turnover ratio complements market capitalization because a small but active market will have small market capitalization but high turnover”.

2.2.5 Trade Volume and Market Performance

Warsh (2007, p. 5) posits that, “the volume of trade refers to the total number of shares or contracts exchanged between buyers and sellers of a security during trading hours on a given day, and it is also a measure of the market's activity and liquidity during a set period of time”. When securities are more actively traded, their trade volume is high, and when securities are less actively traded, their trade volume is low (Warsh, 2007).

Trade volume tells investors about the market's activity and liquidity; and higher trading volume is indicative of higher liquidity, better order execution, and a more active market for linking investors (Alexandra, 2022). It also helps investors take decisions on the exact time to execute trade in view of the average volume of trade on daily basis. It can also be used to gouge several technical analysis indicators involving trade volume. (Alexandra, 2022)

The concept of the trade volume effect is based on the fact that prices need volume to move, and high stock price fluctuations is as a result of volume of trading activities (Sabri, 2008). Several studies have shown that significant positive link between traded volume and stock performance, occasioned by swiftness of information. Saatccioglu and Starks (1998) observed that traded volume has positive effect on stock price changes, while Blume *et al.* (1989) found

that losses in stock market returns was associated with the level of trading volume. The technical analysts believe that "it takes volume to make price move" (Rutledge, 1984; Kapoff, 1987; Sabri, 2008). Thus, earlier studies such as Nneji (2015) concluded on a strong positive relation between volume and performance; while those of Gervars, Kaniel and Mingelgrin (2001)submitted that large individual stocks trading volume over a short period (usually a day or a week) tend to experience higher level market returns consistently over a period of time.

2.2.6 Brief Overview of Sub-Sahara African Capital Markets

Generally, financial systems in many Sub-Saharan African Countries are still underdeveloped (Allen et al., 2014) which results in credit constraints for households and firms, especially small and medium-sized enterprises, and low investment rates. According to Soumaré (2020), the sector is mostly dominated by deposit money banks, with very few investment banks. Apart from the African Development Bank and the Development Bank of South Africa, development banks and specialized banks are very limited in their capacity to raise enough external finance to fill the financing needs of businesses (PwC, 2020).

Although, "the number of stock markets in the sub region has grown from five in 1989 to 29 till date, with stock markets growing continuously in the area of shares listed and traded volume; and from 1992 to 2019, the capitalization of African stock markets increased tenfold from $113 billion to more than $1,130billion (Soumaré, Kanga, Tyson & Raga, 2021)". Despite these improvements in securities (bonds and stocks), "African capital markets remain underdeveloped; excluding South Africa (235 percent of the GDP), the highest stock market capitalization in Africa was in Mauritius (69 percent of GDP) in 2018: and the capitalization of Mauritius stock exchange was well below the average market capitalization in the East Asia and

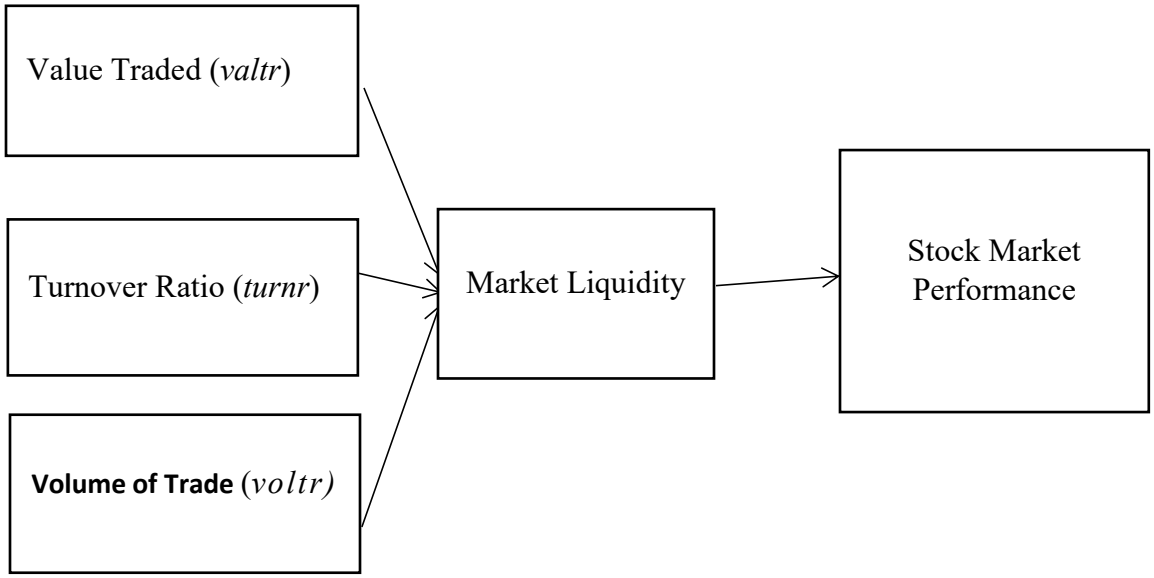
Pacific region (83 percent of GDP) and in high income countries (119 percent of GDP) (PwC, 2020; Soumaré, et.al, 2021:7)".

The underdevelopment of capital in this region might not be unconnected with inhibiting factors like smallness of the size of the domestic economies, quality of institutions, financial infrastructures as well as bureaucratic procedures for listing and issuance requirements, high transaction costs, the lack of training on the workings of capital markets, as well as the lack of transparency in some of these African stock markets (Soumaré, 2020).

As at 31 December 2020, Sub-Sahara African Stock Exchanges top four stock exchanges (in terms of nominal market capitalization) are South Africa, Morocco, Egypt and Nigeria. The market capitalization of each of these is greater than $30 billion. Where data is available, those of South Africa is above $100 billion, Morocco, Egypt and Nigeria are between $30-$100billion, while the capitalization of other stock exchanges in the sub region is less than $6 billion (Soumaré, Kanga, Tyson & Raga, 2021).

2.2.7 Conceptual Framework of Stock Market Liquidity and Performance

Figure 2.1: Schematic Diagram of Variables and Relationship



Source: Author's Design 2022.

2.3 Theoretical Review

2.3.1 Basic Model of Liquidity and Asset Prices

This model as advocated by Amihud and Mendelson (1986a), provides the basis for understanding liquidity and its effect on asset prices in the stock market. In this model, illiquid are caused by external trading costs which make investors to be neutral to risk within the investment period. The basic idea underlying this theory/model is that, neutrality to risk by investors usually acknowledge the value of securities at the same time. According to Amihud and Mendelson (1986a), "translating this into the required return on the security which is costly to trade, the required return is the return that would be required on a similar security which is perfectly liquid in addition to the expected trading cost per period (the product of the probability of trading by the transaction cost); thus, given a simple overlapping generations (OLG) economy in discrete time t {…, −2, −1, 0, 1, 2,…}". Therefore, dealers are able to transact on assets whose risk are minimal or completely risk free return (Rf = 1 + rf). "Stocks that are not liquid but traded such that i = 1, . . . , I with a total of Si shares of equities i. at time t, security i pays a dividend of di t, has an ex-dividend share price of P it, and has an illiquidity cost of Ci, t = Ci; thus, the illiquidity cost Ci is modeled simply as the per-share cost of selling security i, hence, agents can buy at Pi t but must sell at Pit – Ci".

2.3.2 Participation Costs Theory

The idea that participation in financial markets is costly and hence limited dates back to Demsetz (1968) on his studies on provision of immediate execution of trades. He argues that, "supplying immediacy is costly but there is a demand for it; and because of the costs of supplying immediacy, only a subset of agents will choose to supply it, and they will be compensated from the price concessions they will earn from the demanders of immediacy".

Demsetz (1968) identifies the suppliers of immediacy with market makers, and their compensation with the bid-ask spread.

In the extant literature, prices were analyzed along market makers who are often the sole provider immediacy and order flow in the market. The theory determines the bid-ask spreads chosen by market makers as a function of the process of order arrival, the degree of competition between market makers, and the inventory and risk aversion of market makers (Amihud & Mendelson, 1980; Cohen et al., 1981).

Due to the focus on market makers' inventory, it is now always referred to as the inventory theory, and most of the inventory literature takes the market structure as exogenous; however, Stoll (1978) with an exception, endogenizes the number of market makers in line with those of Demsetz (1968) by assuming the costs of supplying immediacy to be fixed costs of processing orders. However, Grossman and Miller (1988) re-emphasize that the bid-ask spread has drawbacks as a measure of liquidity, and suggest the use of price reversal instead. They show that price reversal increases in participation costs.

2.3.3 Market Based Asset Allocation Theory

This theory was adapted from the work of Ezenduka and Joseph (2020). Thus, the Market Based Asset Allocation Theory (MBAAT) was first propounded by Markowitz (1952; 1959). This theory is predicated on choosing a combination of investment that yield high returns at the end of the day. Modern theory on portfolio entails asset portfolio's construction and selection based on a certain level of risk, the investors expected returns on investments and risk. The idea of this model argues that portfolios is a function of risk and return as coupled with the covariance of return among investors pairs of asset choices. The portfolios are selected from those lying on a

profitable frontier which depicts the tradeoff between risk and return. The frontier is efficient due to the fact that the resultant portfolio choices provides the maximum expected return with a lower level of risk. The theory is associated to the work due to the fact that investment portfolio diversification encompasses taking of risk which in turn aligns with the submission of Steinbach (2001) investors choice of portfolio selection is primarily based on the assumption of expected streams of returns on assets over a given time horizon.

2.4 Empirical Literature

Chordia, Sarkar and Subrahmanyam (2003) empirically examine liquidity movements in stock and Treasury bond markets over a period of 1800 trading days. Using descriptive statistics, it was observed that a shock to quoted spreads in one market affects the spreads in both markets; while stock and bond volatility significantly influence market liquidity. It was also found that stock and government bond play significant role in forecasting stock and bond liquidity. Choi, and Cook (2005) examined the relationship between stock returns and liquid financial market for the period 1998 to 2003 in Japanese stock market; with a special focus on the ability of investors to sell large blocks of assets without substantially changing the price. Using the panel data regression method, the result showed a significant drop in the liquidity level during post-bubble period and a significant rise in liquidity risk.

Tetlock (2007) investigates the impact of liquidity on market efficiency for the period 1998 to 2005. Using the panel data analysis, it was found that, “the most liquid securities markets exhibit significant pricing anomalies, such as overpricing low probability events and underpricing high probability events, whereas less liquid markets do not exhibit these anomalies”. He again observed that prices of assets that are not liquid are more convergent “toward their terminal cash flows”. In another related study, Lee and Wong (2009) examine the impact of the

recent financial reforms on market liquidity in China for the period 1998 to 2007.Employing the panel data econometric technique, it was found that financial reforms measures significantly positively impact market liquidity in China's equity market.

Naes, Skjeltorp, Odegaard (2010) examine liquidity in the stock market during the global financial crisis for the period 2002 to 2009. Employing the multiple regression, the results showed a strong positive impact of business cycle on stock market liquidity; and that composition of investors' portfolio varies business cycle. Ujunwa and Salami (2010) examine the impact of liquidity on stock market returns and economic growth in Nigeria for the period 1986 to 2006. The OLS method as employed and the results revealed that market liquidity inversely impacted returns volatility and growth in Nigeria.

Ogunmuyiwa (2010) examines the impact of investors' sentiment and liquidity on economic growth in Nigeria for the period 1987 to 2003. Employing the granger causality test, the results showed that investors' sentiment and market liquidity granger-cause economic growth in Nigeria. Batten and Vo (2011) examined the relationship between liquidity and stock returns in the Vietnam stock market during financial crisis during the period 2006 to 2010. The used the panel data analysis and found that liquidity positively affects stock returns.

Beber, Brandt and Kavajecz (2011) empirically investigate the predictive power of financial markets liquidity level across equity sectors on economic cycles for a period of 13 years (1993 to 2005). Using panel data analysis, it was observed that (liquidity) an order flow portfolio constructed on cross-sector movements is able to forecast next quarter economic conditions. Alajekwu and Achugbu (2012) also examined the impact of market liquidity on returns and growth in Nigeria over the period 1994 t0 2008. They employed OLS method of

analysis and found that while value traded ratio is inversely related with the economic growth, turnover ratio has significant positive impact on growth.

Bogdan, Bareša and Ivanovic (2012) empirically examine the factors affecting market liquidity of 196 stocks traded in one year in the Croatian stock market. They employed the multiple regression technique and the results revealed that market capitalization, number of issued stocks and achieved volume significantly affects liquidity ratio. Kim and Murphy (2013) examined liquidity level in the highly traded S&P 500 exchange traded fund SPY for a period of 7 years (2005 to 2011). Using the descriptive statistics and regression analysis, it was found that over time, transaction size has been decreasing while the number of consecutive buy or sell transactions has been increasing due to the increased prevalence of high frequency trading and order splitting.

Capelle-Blancard and Havrylchyk (2014) assess the impact of the securities transaction tax introduced in France in 2012 on market liquidity and volatility for the period 2003 to 2012. In order to ascertain the nature of causality, they employed the unique design of the tax imposed only on large French firms listed on Euronext. The result from the empirical analysis reveal that the Securities Transaction Tax reduced trading volume, but they find no effect on theoretically based measures of liquidity, such as price impact, and no significant effect on volatility. Lorne, Switzer and Picard (2015) in a separate study re-examines the relationship between business cycles and market wide liquidity using a non-linear approach in order to capture the non-linear dynamics of macroeconomic series for the period 2008 to 2013. Applying both the Markov switching-regime for liquidity, it was found that liquidity does not affect future economic conditions.

Yameen, Farhan and Tabash (2019) examined the impact of liquidity on the profitability of 82 Pharmaceutical firms listed on Bombay Stock Exchange for the 2008 to 2017. Using a balanced panel data analysis technique, it was observed that current liquidity ratio and quick ratio have a positive and significant impact on the profitability of pharmaceutical firms. Eze (2019) investigates the effect of liquidity on stock market returns of Zenith Bank Plc in Nigeria for the period 2001 to 2017. The ordinary least square (OLS) method was used and the empirical findings indicat3 that market capitalization value ratio has a positive and significant impact on returns.

Abdullahi and Fakunmoju (2019) examined the effect of market liquidity, inflation, and exchange rates on stock return in Nigeria for the period 1998 to 2018. The study employed the Auto-regressive Distributive Lag (ARDL) bound test and found that in the short run, stock turnover, trading volume, exchange, and inflation rates significantly and positively impacted stock return; but in the long run, market turnover positively impacted returns.

Igbinosa and Uhunmwangho (2019) examined macro-economic aggregates (variables) and stock market liquidity in African stock markets for the period 2006 to 2016. The countries involved include Nigeria, South Africa, Egypt, Mauritius and Morocco. The panel data analysis technique was employed and the empirical results revealed that macroeconomic factors significantly influence stock market liquidity in Africa. Richard, Udom, John and Uche (2019) examine the effect of stock market liquidity on manufacturing sector performance in Nigeria for the period 1985 to 2017. The study employed the ordinary least square technique and the empirical findings revealed a significant positive relationship between stock market liquidity and performance; and that increases in stock market liquidity of manufacturing sector promotes economic growth in Nigeria overtime.

Obayagbona and Osayande (2020) empirically examined the pattern, extent and dimensions of liquidity in Sub-Sahara African Stock Markets for a period of 29 years (1990 to 2018). The study employs both statistical and econometric methodologies of descriptive statistics and the Partial Adjustment Mechanism on data from six Sub-Saharan African Countries for which stock market data were available (Nigeria, Egypt, Ghana, South Africa, Kenya and Cote d' Ivoire). The results from the empirical analysis show that market liquidity in African Stock Markets is largely driven by the size and development of the market.- Market turnover is more effective in measuring market liquidity than value traded in the African Markets; the South African Market (which is the largest and most developed) is the most liquid market in the region either in terms of value traded or turnover; and the speed of adjustment of assets holding from current level to desired level is higher in the South African market than in any other market in the region. Adjustment in the South African market takes within one period (approximately) to complete. On the other hand, the speed of adjustment is smallest for the Ivory Coast and Nigerian markets where it takes approximately 12.5 and 5 periods, respectively for asset holdings by investors to adjust to their desired level.

Ezenduka and Joseph (2020) examine the relationship between stock market performance and economic growth in Nigeria for the period 1985 to 2018. The study employed cointegration analysis and OLS and the empirical finding indicate that market capitalization ratio, number of securities listed and turnover ratio have significant impact on economic growth, while all share index (ASI) and monetary policy rate (MPR) did not. The results also revealed a strong positive impact of financial sector development and stock market performance indicators. Khang (2020) examines stock market liquidity in a frontier market of Vietnam after the financial crisis for the

period from 2011 to 2018. The results from the analysis indicates that the Vietnam market is highly liquid compared to those of the three other frontier markets.

Marozva (2020) investigates the deterministic relationship between monetary policy and stock market liquidity in South Africa for the period of 2002 to 2019. The OLS technique was employed and the results indicate that liquidity is a function of monetary policy adjustments; while effective spread was positively related to South African Benchmark overnight rate.

Boloupremo (2020) examined the relationship between liquidity and stock returns in Nigeria using trade volume and turnover against stock market returns for the period 1985 to 2015. The Vector auto-regression model was employed and the results indicate a strong positive relationship between market liquidity and stock returns. Bri`ere, Lehalle, Nefedova and Raboun (2020) investigate the liquidity and anomalies-based portfolio transaction costs in the US for the period 1996 to 2019. Employing the Fama-French model, it was observed that transaction costs is significantly and inversely related with returns.

Nguyen, Phan and Nguyen (2020) investigate the relationship between liquidity and stock returns in the Vietnam stock market during the COVID-19 outbreak. It was found that market liquidity positively and significantly impact stock returns during the COVID-19 outbreak. Ochenge, Ngugi and Muriu (2020) examined the impact of foreign equity inflows on liquidity in Kenya for the period 2011 to 2018. The employed the vector autoregression technique and the results indicate “a one-way causality link from inflows to liquidity and that foreign investors promote rather than impede local liquidity”.

Musneh, Karim and Baburaw (2021) investigate the impact of liquidity risk on stock returns of 149 firms in the industrial products and services sectors of Bursa Malaysia for the period 2000 to 2018. “This study employed the two-stage standard procedures and the empirical

findings indicate that the investors require liquidity premium for stocks whose illiquidity co-moves with market illiquidity and market return while shifting their investment to liquid stocks when the market becomes illiquid". Naik and Reddy (2021) examine stock market liquidity and performance for the period 2010-2018 using the panel data analysis. The findings indicate that market liquidity and expected return is positive and highly significant

Milos, Milos, Barna and Botoc (2021) examine the effect of MiFID and MiFID II regulation on stock market liquidity in Romania stock market for the period 2016 to 2019. Employing the panel data analysis, the empirical results showed significant reduction of liquidity due to MiFID II regulation but with a contrary result in the German stock market.

2.5 Summary Table of Reviewed Empirical Literature

Table 2.1: Summarized Table of Empirical Literature

SN	Author/Year	Countries	Period of Study	Methodology	Findings
1	Chordia, Sarkar and Subrahmanyam (2003)	Romania	1800 trading days	descriptive statistics	"a shock to quoted spreads in one market affects the spreads in both markets; while stock and bond volatility significantly influence market liquidity
2	Choi, and Cook (2005)	Japan	1998 to 2003	panel data regression	significant drop in the liquidity level during post-bubble period and a significant rise in liquidity risk
3	Tetlock (2007)	Vietnam	1998 to 2005	panel data regression	most liquid securities markets exhibit significant pricing anomalies, such as overpricing low probability events and underpricing high probability events, whereas less liquid markets do not exhibit these anomalies
4	Lee and Wong (2009)	China	1998 to 2007	panel data analysis	financial reforms measures significantly positively impact market liquidity in China's equity market
5	Naes, Skjeltorp, Odegaard (2010)	Vietnam	2002 to 2009	multiple regression	strong positive impact of business cycle on stock market liquidity; and that composition of investors' portfolio varies business cycle
6	Ujunwa and Salami (2010)	Nigeria	1986 to 2006	OLS	market liquidity inversely impacted returns volatility and growth in Nigeria
7	Ogunmuyiwa (2010)	Nigeria	1987 to 2003	granger causality test	investors' sentiment and market liquidity granger-cause economic growth in Nigeria
8	Beber, Brandt and Kavajecz (2011)	Croatian	1993 to 2005	panel data analysis	liquidity/an order flow portfolio constructed on cross-sector movements

					is able to forecast next quarter economic conditions
9	Alajekwu and Achugbu (2012)	Nigeria	1994 to 2008	OLS	while value traded ratio is inversely related with the economic growth, turnover ratio has significant positive impact on growth
10	Bogdan, Bareša and Ivanovic (2012)	Croatian	196 stocks	multiple regression	market capitalization, number of issued stocks and achieved volume significantly affects liquidity ratio
11	Kim and Murphy (2013)	US	2005 to 2011	OLS	transaction size has been decreasing while the number of consecutive buy or sell transactions has been increasing due to the increased prevalence of high frequency trading and order splitting
12	Capelle-Blancard and Havrylchyk (2014)	France	2003 to 2012	Granger causality test	Securities Transaction Tax reduced trading volume, but they find no effect on theoretically based measures of liquidity, such as price impact, and no significant effect on volatility
13	Lorne, Switzer and Picard (2015)	Bombay	2008 to 2013	Markov switching-regime	liquidity does not affect future economic conditions
14	Yameen, Farhan and Tabash (2019)	Bombay	2008 to 2017	balanced panel data analysis	current liquidity ratio and quick ratio have a positive and significant impact on the profitability of pharmaceutical firms
15	Eze (2019)	Nigeria	2001 to 2017	OLS	market capitalization value ratio has a positive and significant impact on returns"
16	Abdullahi and Fakunmoju (2019)	Nigeria	1998 to 2018	ARDL	"in the short run, stock turnover, trading volume, exchange, and inflation rates significantly and positively impacted stock return; but in the long run, market turnover positively impacted returns
17	Igbinosa and Uhunmwangho (2019)	Nigeria	2006 to 2016	panel data analysis	macroeconomic factors significantly influence stock market liquidity in Africa
18	Richard, Udom, John and Uche (2019)	Nigeria	1985 to 2017	OLS	a significant positive relationship between stock market liquidity and performance; and that increases in stock market liquidity of manufacturing sector promotes economic growth in Nigeria overtime
19	Obayagbona and Osayande (2020)	Nigeria	1990 to 2018	Partial Adjustment Mechanism	market liquidity in african stock markets is largely driven by the size and development of the market: market turnover is more effective in measuring market liquidity than value traded in the African markets; the South African Market (which is the largest and most developed) is the most liquid market in the region either in terms of value traded or turnover
20	Ezenduka and Joseph (2020)	Nigeria	1985 to 2018	cointegration and OLS	market capitalization ratio, number of securities listed and turnover ratio has

					significant impact on economic growth
21	Khang (2020)	Vietnam	2011 to 2018	Multiple regression	Vietnam market is highly liquid compared to those of the three other frontier markets
22	Marozva (2020)	South Africa	2002 to 2019	OLS	liquidity is a function of monetary policy adjustments; while effective spread was positively related to South African Benchmark overnight rate
23	Boloupremo (2020)	Nigeria	1985 to 2015	Vector auto-regression model	a strong positive relationship between market liquidity and stock returns
24	Bri`ere, Lehalle, Nefedova and Raboun (2020)	US	1996 to 2019	Fama-French model	transaction costs is significantly and inversely related with returns
25	Nguyen, Phan and Nguyen (2020)	Vietnam	COVID-19 outbreak	panel-data regression	market liquidity positively and significantly impact stock returns during the COVID-19 outbreak
26	Ochenge, Ngugi and Muriu (2020)	Kenya	2011 to 2018	vector autoregressive technique	a one-way causality link from inflows to liquidity and that foreign investors promote rather than impede local liquidity
27	Musneh, Karim and Baburaw (2021)	Malaysia	2000 to 2018	two-stage standard procedures	investors require liquidity premium for stocks whose illiquidity co-moves with market illiquidity and market return while shifting their investment to liquid stocks when the market becomes illiquid"
28	Naik and Reddy (2021)	Malaysia	2010-2018	panel data analysis	market liquidity and expected return is positive and highly significant
29	Milos, Milos, Barna and Botoc (2021)	Romania	2016 to 2019	panel data analysis	significant reduction of liquidity due to MiFID II regulation but with a contrary result in the German stock market
30	Batte and Vo (2011)	Vietnam	2006 to 2010	panel data analysis	liquidity positively affects stock returns

Source: Author's Compilations 2021

2.6 Gaps in the Empirical Literature

From the reviewed empirical literature, it was observed that despite these promising prospects and the role played by the African Stock Exchange Association (ASEA) in enhancing capital market development in the sub region, the SSA market has continued to experience low level of liquidity and political interference among others (Oten, 2010). Given the relevance of market liquidity in ascertaining an efficient capital market, coupled with the above observed weaknesses, one cannot clearly ascertain the current level of market liquidity and performance in

the SSA markets, hence, it became imperative to empirically re-investigate this situation within the context of Sub-Saharan African Capital Markets with a view to ascertaining the nature and level of liquidity in relation to market performance.

Again, to the best of the researcher's knowledge, apart from the study of Obayagbona and Osayande (2020) who examined the level of liquidity and their impact on market performance, no other studies within the SSA countries did. Other earlier studies either examined the impact of liquidity on stock market returns, economic growth and profitability (Ujunwa & Salami, 2010); Eze, 2019; Yameen, Farhan & Tabash, 2019; Ezenduka & Joseph, 2020); or macro-economic aggregates (variables) and stock market liquidity (Igbinosa & Uhunmwangho, 2019); or liquidity, inflation and stock returns volatility (Nguyen, Phan & Nguyen, 2020). Thus, this study does not intend to examine the relationship between market liquidity and economic growth and returns, but examine the level of liquidity (as measured by value traded, turnover ratio and volume of trade) in the SSA markets and how this liquidity is impacted by performance.

In terms of method of data analysis, it was observed in the reviewed empirical literature that most of the studies such as Kim and Murphy (2013), Eze (2019), Capelle-Blancard and Havrylchyk (2014), Abdullahi and Fakunmoju (2019), Igbinosa and Uhunmwangho (2019), Ezenduka and Joseph (2020), Boloupremo (2020), and Bri`ere, Lehalle, Nefedova and Raboun (2020) either employed OLS, Granger causality test, ARDL, panel data analysis, cointegration and OLS, Vector auto-regression model or Fama-French model in their empirical analysis. It was obvious that, apart from those of Obayagbona and Osayande (2020) who employed the partial adjustment model, not other studies did. Hence, this study defers from previous ones in that it will employed the partial adjustment model technique in the analysis of its data to ascertain the level of liquidity, market performance and the speed of adjustment in the SSA capital markets.

Lastly, it was also observed in the empirical literature that some studies like Batten and Vo (2011) used only one measure of liquidity (turnover ratio) in relation to stock returns; while Tran (2018) used four measures for liquidity (relative spread, turnover ratio, Amihud's (2002) measure, and the zero-return). However, this study differs from the above because, it employed three different standard measures of market liquidity (volume of trade, value traded and turnover ratio) which are "real time" measures of stock markets liquidity.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter examines the research design, the population and sample of the study, sources of data, theoretical framework, model specification and method of data analyses.

3.2 Research Design

The ex-post-facto research was used in the study. This is to enable the researcher to ascertain the impact of explanatory variables on the dependent variable from historical data. Besides, the data has already occurred and hence, the researcher cannot manipulate them.

3.3 The Population and Sample Size of the Study

The study focuses on market liquidity and performance of Sub-Saharan African(SSA) capital markets. According to the World Bank, there are 46 Sub-Saharan African countries (World Bank, 2022). The sample size covers six Sub-Sahara Africa capital markets of Nigeria, Côte d'Ivoire, Guinea, Ghana, Kenya and South Africa for a period of 33 years (1988 to 2020). The period is long enough to provide a comprehensive analysis and a reliable result. The reason for the choice of these countries is that they are the first set of countries among the Sub-Saharan African countries to attain some level of market liquidity. Also, the choice of the six SSA markets is based on two reasons. First, they represent some of the most active capital markets in the sub-region and second, for reason of data availability.

3.4 Sources of Data

This study used solely secondary data. This was necessitated by the fact that such data are readily available and easily accessible with less probability of inaccuracy. The secondary data

were obtained from the African Stock Exchange Association (ASEA), and the Nigerian Stock Exchange Facts Book covering a period of 33 years (1988 to 2020).

3.5 Theoretical Framework

The theoretical framework for the study hinges on information asymmetry theory propounded by Akerlof (1970) and further expounded by Krishnawami and Subrahmanian (1999) and Bharath et al., (2009). Thus, the measure for market liquidity comprises regularity of transactions, prices impact and being influenced by market information discrepancies. However, when emerging markets are compared to the developed ones, information disclosure conditions seem to be very low. Therefore, information asymmetry is more of an issue in liquidity markets and this leads to low trading frequency or activity. In order to test the hypotheses, both the developed and frontier market are included. Usually, three proxies are used to measure a country's information environment: accounting standard index from La Porta (1998), financial transparency factor from Bushman, Piotroski and Smith (2004), and disclosure requirement index from La Porta et al, (2006). Thus, while these proxies are highly correlated, they have their own focus in capturing the information environment in each market; and to construct a composite measure, the market is based on each of the three proxies, which were ranked and then obtain the average of the three ranks, $TRANS_C$. The trading (in) frequency, *NT%*, is measured by the proportion of zero-volume days in a month".

3.6 Model Specification and Method of Data Analysis

Therefore, following the works and contribution to the model as developed by Roll (1984), which is trade-based liquidity measures and Amihud (2002) that was focused on the price impact of trades. In this kind of analysis, the liquidity of the market is taken as the speed to which prices or assets adjust to a desired level. Thus, the investor has an initial inventory of

assets that needed to be disposed of as quickly as possible (i.e., moving from a present level to a desired level). In this study, we assume that a highly liquid market will have fast speed to reaching the desired level while a less liquid market will have slow speed.

The degree to which prices adjust, as inventory of assets held by investors is accumulated or dissipated respectively, depends on security and dealer characteristics of which dealer risk aversion and the variance are the major features. Thus, considering the model that explains price adjustment in the market can help to explain the pattern of liquidity in the market. A basic price adjustment model is the partial adjustment model presented by Nerlove (1968) to explain the process of a factor moving from a given level to a desired level and also the speed at which the movement occurs.

The partial adjustment model is presented as follows. given that Y_t^* is the desired level, consider an asset demand function:

$$Y_t^* = b_0 + b_1 X_t + u_t \text{----------} \quad (3.1)$$

Where X_t is total market performance.

Now assume that due to market imperfections or adjustment costs agents cannot realize their desired holdings immediately instead, the observed level of assets demand (Y_t) is determined as:

$$Y_t - Y_{t-1} = \delta(Y_t^* - Y_{t-1}) \qquad 0<\delta\leq 1 \text{----------} \quad (3.2)$$

Equation (3.2) is the partial adjustment hypothesis.

$\delta = 1$ means observed changes are equal to desired changes in money demand: full adjustment.

$\delta < 1$ agents are able to fulfill their desired change only partially. δ is usually called the adjustment coefficient.

In estimating the partial adjustment model, the desired asset inventory level cannot be estimated directly because Y^* is not observable. In the usual procedure, Y_t^* is replaced by Y_t to get the following model:

$$Y_t = \delta b_0 + \delta b_1 X_t + (1-\delta) Y_{t-1} + \delta u_t \text{ ----------(3.3)}$$

$$= \alpha + \beta X_t + \gamma Y_{t-1} + \varepsilon_t$$

Where $\alpha \equiv \delta b_0$, $\beta \equiv \delta b_1$, $\gamma \equiv (1-\delta)$, $\varepsilon_t \equiv \delta u_t$. the model in equation (3.3) above can then be estimated using OLS. From equation (3.3), speed of adjustment is computed as the inverse of $(1-\delta)$. That is:

$$\text{Speed of adjustment} = 1/(1-\delta) \text{----------(3.4)}$$

For the model discussed above, the liquidity in Sub-Sahara African capital markets can be demonstrated. In this study, asset levels are proxied by value traded (*valtr*), turnover (*turnr*) ratio and volume of trade (*voltr)*, while market performance is proxied by market capitalization rate (*mcapr*). The Partial Adjustment Model is therefore specified as:

$$\alpha + \beta valtr_t + \gamma mcapr_{t-1} + \varepsilon_t \text{----------(3.5)}$$

$$\alpha + \beta turnr_t + \gamma mcapr_{t-1} + \varepsilon_t \text{----------(3.6)}$$

and $\alpha + \beta voltr_t + \gamma mcapr_{t-1} + \varepsilon_t$ ----------(3.7)

The three models were estimated for each of the countries used in the analysis. The countries for which data is available are Nigeria, Côte d'Ivoire, Guinea, Ghana, Kenya and South Africa.

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3.7 Measurement of Variables

Table 3.1 Variables Measurements

Table 3.1: Variables Description, Proxies, Definition and Apriori Expectation

Variable	Proxy	Definition	Apriori Expectation	Previous Author(s)
"Stock Market Capitalization	MCAPr (Market Performance)	The number of outstanding shares multiplied by the price	(+), $\beta > 0$	Onao, Mohd, Ahmad and Ojoma (2013)
Stock market total value traded	VALTr	The value of shares traded is the total number of shares traded, domestic and foreign, multiplied by their respective matching prices	(+), $\beta > 0$	Osho (2014)
Stock market turnover ratio	TURNr	Total number of shares traded over a given period divided by the average number of shares outstanding for the period	(+), $\beta > 0$	Osho (2014)
Stock market total volume traded	VOLTr	The total quantity of shares, bonds, options contracts, futures traded for a specified trading" period	(+), $\beta > 0$	Osho (2014)

Source: Author's Compilations (2020).

CHAPTER FOUR

EMPIRICAL ANALYSIS

4.1 Introduction

This chapter is on the estimation of the objectives of the study using the method of analysis earlier stated in previous chapter (chapter 3). Descriptive statistics and correlation were applied for preliminary analysis. The single-equation estimation for the determination of market liquidity in each market is performed based on the Pooled Mean Group (PMG) procedure, which is based on the Panel Autoregressive Distributed Lags (ARDL) technique.

4.1 Descriptive Statistics

The summary of the dataset used in the empirical analysis is presented in this section. The descriptives are reported in Table 4.1. Average ratio of market capitalization (MCAP) to GDP is 43.28 percent for the countries, with a standard deviation of 64.91. This result shows that on average, the stock market has represented a relatively moderate segment of the economies included in the empirical analysis. Given that the share of MCAP in GDP reveals the level of development of the stock market in an economy, the mean value for the African markets indicates that the stock market as a whole has had less than appreciable penetration into the economy and there is still room for more expansion. This also shows that the stock market is not fully developed in the African economies. The high standard deviation of the MCAP ratio however indicates that there is high level of variations in the dataset for the countries.

Table 4.1: Descriptive Statistics

Variable	Mean	Max.	Min.	Std. Dev.	Skew.	Kurt.	J-B	Prob.	Obs.
MCAPR	43.28	328.36	0.39	64.91	2.20	7.11	299.4	0	198
TURNR	11.7	82.9	0.4	13.9	2.1	8.5	399.1	0.0	198
VALTR	8.64	123.25	0.02	19.67	3.04	12.79	1097.3	0	198
VOLTR	432.30	2148.09	78.36	501.22	1.71	4.83	123.6	0	198

Source: Author' Compilations 2020

Average market turnover ratio is 11.7 percent for the selected stock markets, indicating that these markets have high turnovers for the period of the analysis. The maximum value of 82.9 is also high although the minimum of 0.4 percent indicates that there also periods of weak turnover for some of the countries. There is therefore evidence that the flow of resources in the stock markets vary significantly across the different markets in the study. The average ratio of value traded to GDP (overall market liquidity) is 8.64 percent, which is also relatively low for the countries. Maximum value is however up to 123.25 percent and indicates that some of the countries performed very well in terms of value traded. Average volume traded is 432.30 with a standard deviation of 501.22 (which is higher than the mean value). This shows that volume traded also varied significantly among the stock markets included in the study. The J-B statistic for each of the variables passed the significance test and shows that individual market heterogeneity plays a significant role in identifying the stock market indicators and characteristics among the countries. This suggests that an estimation technique that takes heterogeneity into consideration needs to be adopted in the study.

Given the high level of cross-sectional variations in the dataset (noted from the standard deviations), we also report the summary statistics for each of the respective countries in the study.

The result shown in Table 4.2 indicates that average MCAP to GDP ratio is highest for South Africa at 174.14 percent, while is smallest for Ghana at 8.08 percent. This reveals that South Africa is clearly in the lead in terms of market depth and development among the African countries. None of the markets comes close to South Africa in this regard: note that the next market in terms of the market depth indicator is Egypt at 26.78 percent. Thus, the South African market stands out in terms of the size, depth and development of the stock market. On the other hand, Ghana has a stock market depth of less than 10 percent. In general, it is seen that the stock market in African economies is largely not well-developed when compared to other economies of the world. Egypt (27.85 percent) however has the highest turnover ratio a among the countries, with SA coming close behind at 20.9 percent. Average value traded ratio is highest for South Africa, indicating that the market appears to be more liquid than all the other markets, with Ghana having the least ratio. The same is the case for volume traded among the countries.

Table 4.2: Descriptive Statistics for Individual Countries

COUNTRY	MCAPR		TURNR		VALTR		VOLTR	
	Mean	*Std. Dev.*	*Mean*	*Std. Dev.*	*Mean*	*Std. Dev.*	*Mean*	*Std. Dev.*
Côte d'Ivoire	18.08	13.37	4.49	7.23	0.48	0.40	201.3	22.8
Egypt	26.78	22.48	27.85	19.54	10.28	14.25	810.7	476.5
Ghana	8.08	6.07	4.25	3.37	0.33	0.20	111.5	14.1
Kenya	21.58	10.75	5.46	3.00	1.22	1.05	162.6	38.7
Nigeria	11.01	5.40	7.54	6.31	0.95	1.12	136.0	24.9
South Africa	174.14	60.37	20.90	12.78	35.88	26.20	1171.8	527.5

Source: Author' Compilations 2020

4.2 Correlation Analysis

In Table 4.3, the initial pattern of relationship among the variables estimated. The correlation between MCAP ratio and value traded ratio is highest among the variables. This shows that economies with strong market development also have the most liquid markets. Thus, it is seen

that market development and market liquidity move in the same direction. More appropriately, larger markets appear to be more efficient among the African stock markets. The correlations among all the stock market indicators are however positive and show that the variables move in the same direction. Market turnover and value traded ratio also have a high correlation coefficient at 0.695. This indicates that markets with high liquidity also have higher turnover.

Table 4.3: Correlation Matrix

	MCAPR	TURNR	VALTR	VOLTR
MCAPR	1			
TURNR	0.471 (0.00)	1		
VALTR	0.885 (0.00)	0.6957 (0.00)	1	
VOLTR	0.506 (0.00)	0.2612 (0.00)	0.305 (0.00)	1

Source: Author' Compilations 2023

4.3 Unit Root and Cointegration Tests

Given that the data used in the study exhibit both country-specific characteristics (cross-sectional) and common (homogenous) characteristics (time series), there is need for the use of panel unit root tests to check for the stationarity of the data. In this study, the tests developed by Levin, Lin and Chu (LLC), the Im, Pesaran and Shin (IPS, 2003) and the Augmented Dickey-Fuller tests were all employed in order to enhance the reliability of the tests. The tests results are presented in Table 4.4. Note that only the levels tests are conducted because of the nature of the dataset (they are all ratios that are expected to converge easily). In the unit root results in Table 4.4, "it can be seen that the coefficient of the test for each of the variables (except for VOLTR) in levels are all significant at the 5 percent level (since each coefficient is larger than the respective critical value at the 95 percent confidence level); this indicates that all the variables are stationary in their levels and are I[0]". Based on this outcome, there is evidence that the variables

are stable in their levels for any form of estimation in terms of the relationships among the variables. On the other hand, the coefficient of the test for VOLTR fails the significance test in levels, suggesting that it is stationary at first difference. This makes the variable to be integrated in the first order (I[1]). This implies that some of the variables will converge simultaneous in the same pattern, while others will not. This integration of different orders poses an econometric issue for the panel estimation framework, which was addressed by employing the ARDL-based Pooled Mean Group (PMG) estimation framework.

Table 4.4: Panel Data Unit Root Tests Results *in levels)

Variable	Homogenous Unit Root Process	Heterogeneous Unit Root Process		Remarks
	Intercept and Trend			
	LLC	IPS	ADF-Fisher	
	I(0)	*I*(0)	*I*(0)	
MCAPR	-1.901*	-1.901*	21.47*	I[0]
TURNR	-2.115*	-1.485	24.74*	I[0]
VALTR	-3.095**	-3.250**	33.23**	I[0]
VOLTR	-0.532	0.115	11.84	I[1]

Source: Estimated by the Author. *Note: ** and * indicate significant at 1% and 5 % levels respectively; IPS = Im, Pesaran & Shin; LLC = Levin, Lin & Chu*

Source: Author' Compilations 2023

Thus, as a follow up to the unit root test, the results of the Bounds test for cointegration are shown in Table 4.5 and the evaluations are based on the critical F-statistic values for the lower and upper bounds.

Table 4.5: Results of Bounds Approach to Cointegration Test

Specified model	*Critical bound F-statistic values*		*Computed F-statistics*
	5% level		
	I(0)	I(1)	
F_{MCAPR}(MCAPR|TUNR)	2.39	3.28	6.034 (k = 1)
F_{MCAPR}(MCAPR|VALTR)	2.39	3.38	4.56 (k = 1)
F_{MCAPR}(MCAPR|VOLTR)	2.39	3.38	2.842 (k = 1)

Note: k represents the total number of explanatory variables. Source: Authors' Compilation (2020).

Source: Author' Compilations 2023

In the Bounds test result in Table 4.5, the evaluation of the tests is based on the size of the computed F-statistic, which is expected to be greater than both lower (I0 Bounds) and the upper (I1 Bounds) critical values for cointegration to be established. Each of the rows represent the Bounds test with the different variables set as dependent variable. From the result in the Table, the F-statistic values for each of the tests are greater than the respective I(0) and I(1) values. Based on this empirical output of the F-values, it can be seen that the null hypothesis of no cointegration (or long-run relationship) of variable combinations is rejected at the 5 percent level.

4.4 Regression Analysis of Market Liquidity

The models specified in the previous section are presented and analysed in this section. The focus is on observing the pattern of liquidity of the markets with focus on the speed of adjustment of the markets to equilibrium following any initial shock or deviation. The initial result of the pooled mean group estimates for the panel of countries is presented in Table 4.4. The estimates indicate both the short run and the long run results, including the error correction term that seeks to identify the liquidity characteristics of the markets in the analysis. Note that the estimations are performed in recursive form with each of the explanatory variables included successively. This is in order to avoid multicollinearity in the models and also to clearly identify the liquidity characteristics of each stock market indicator.

Table 4.4: PMG estimates for panel data

Variable	Turnover ratio			Value traded			Volume traded		
	Coeff.	**t-Stat.**	**Prob.**	**Coeff.**	**t-Stat.**	**Prob.**	**Coeff.**	**t-Stat.**	**Prob.**
			Long Run Equation						
TURNR	2.584	3.99	0.00						
VALTR				7.054	4.41	0.00			
VOLTR							0.010	0.66	0.51
ECM_{t-1}	-0.109	-2.20	0.04	-0.277	-2.48	0.01	-0.204	-3.39	0.00
			Short Run Equation						
$MCAPR_{t-1}$	0.304	4.19	0.00						
TURNR	0.196	1.44	0.15						
$MCAPR_{t-1}$				0.278	2.99	0.00			
VALTR				3.722	2.64	0.01			
$MCAPR_{t-1}$							0.297	3.06	0.00
VOLTR							-0.001	-0.04	0.97
Constant	5.164	1.33	0.19	4.703	1.91	0.06	5.248	2.38	0.02
Log likelihood	-577.3			-565.0			-582.5		

Source: Author' Compilations 2023

In the result with turnover ratio, the short run estimates show that the coefficient of lagged MCAPR is significant at the 1 percent level, while that of TURNR fails the significance test at the 5 percent level. This shows that market capitalization has a more than one round of effect on itself among the African economies. In the value traded result, the coefficient of value traded passes the significance test in the short run estimates. This implies that value traded has a significant positive impact in short run changes in market capitalization ratio for the economies. In the volume traded model, the coefficient of volume traded (VOLTR) failed the significance test at the 1 percent level for the short run estimates. This result also shows that volume traded does not influence short run movements in stock market depth among the selected countries in the study.

For the long run estimates, the results in the PMG estimates in Table 4.4 reveals that both turnover ratio and value traded had significant positive impacts on market capitalization rate in the long run. Thus, it shows that after all adjustments have been completed, an increase in turnover ratio or the value traded ratio in the market will aid in the development or depth of the market. On the other hand, the coefficient of volume traded in the long run results failed the significance test at the 5 percent level. This reveals that volume traded is not a strong component for boosting market development among the African stock markets in the long run. The results therefore indicate that the two variables that show market liquidity (value traded ratio and turnover ratio) are the critical factors that drive stock market depth among Sub- Sharan African stock markets.

The coefficient of the error correction terms serve two purposes in these estimations. First, they measure the disposition of the relationship in terms of long run adjustments to equilibrium. Second, it measures the actual speed of adjustment for the stock markets which can then be used to identify the level of liquidity in the market. The coefficients of each of the error correction terms are negative for each of the equations, which shows that there is adjustment to equilibrium in the market for the Sub-Sharan African countries. Moreover, all the coefficients pass the significance test at the 5 percent level, indicating that after any short-term shocks the market tend to return to equilibrium. In terms of speed of adjustment, the results show that the model with value traded ratio has the largest error correction term (in absolute values). This implies that value traded is the most important factor that drives market liquidity among the African stock markets. The second largest coefficient is for the model with volume traded, while market turnover has the smallest liquidity capacity amongst the markets in the study.

The particular patters of liquidity in the individual markets among the selected stock exchanges are also examined. This provides a more nuanced evaluation for the levels of liquidity generated by the different market fundamentals in the study. In Table 4.5, the results for the estimates using market turnover as the market fundamental component is presented. It should be noted that the results were obtained from the Pooled Mean Group (PMG) estimates for the panel data and the reported outputs are the short run results for individual countries. In the estimates, the coefficient of market turnover is significant at least at the 5 percent level for Cote d'Ivoire (CIV), Ghana, and Nigeria, while the coefficient is insignificant for the other three countries. While the coefficient is positive for Ghana and Nigeria, it is negative for CIV. This indicates that market turnover drive market development in Nigeria and Ghana, but it fails to deliver significantly positive effects in CIV and the other African economies.

The particular coefficient of interest is that of the lagged ECM term (the speed of adjustment). In the result, the coefficient of the speed of adjustment is significant and has the expected negative sign for each of the countries (except for Ghana). This implies a mean-reverting capacity of market turnover in relation to stock market development among five of the six African countries. Essentially, the result shows that turnover in the market can help to fine-tune long run adjustment in the stock markets for each of the countries following an initial shock or disequilibrium in the system. In particular, it can be seen that the biggest speed of adjustment (in absolute value) is that of Kenya (with a value of 0.347). This indicates that movement in market turnover can help to stabilize the sock market at a rate of 34.7 percent in the first period. CIV has the smallest speed of adjustment and it is seen that only 2 percent of the adjustment to long run equilibrium in the stock market is completed within the first period. In general, none of the speed of adjustment is up to 50 percent, therefore suggesting that although market turnover

generates liquidity in the respective stock markets for five countries, such liquidity is generally moderate at best. For Ghana, the coefficient of the adjustment speed is positive, which indicates an explosive convergence procedure. Hence, the result shows that turnover ratio does not contribute in attaining liquidity in the stock market in Ghana, neither does it ensure long run stability.

Table 4.5: Liquidity Result for stock market indicators – market turnover (PMG Estimates)

Variable	*Cote d'Ivoire*		*Egypt*		*Ghana*	
	Coeff.	**Pr.**	**Coeff.**	**Pr.**	**Coeff.**	**Pr.**
Adj. speed	-0.020	0.00	-0.149	0.00	0.078	0.00
$MCAPR_{t-1}$	0.093	0.06	0.433	0.00	0.525	0.00
TURNR	-0.212	0.00	-0.095	0.07	0.116	0.00
Constant	0.942	0.25	-0.427	0.43	3.647	0.60
Variable	*Kenya*		*Nigeria*		*South Africa*	
	Coeff.	**Pr.**	**Coeff.**	**Pr.**	**Coeff.**	**Pr.**
Adj. speed	-0.347	0.00	-0.038	0.00	-0.179	0.00
$MCAPR_{t-1}$	0.421	0.00	0.174	0.00	0.174	0.02
TURNR	0.206	0.26	0.600	0.00	0.562	0.18
C	2.809	0.37	-0.316	0.60	24.329	0.89

Source: Author' Compilations 2023

The liquidity test results for value traded among the markets is presented in Table 4.6. The coefficient of VALTR is significant for three of the markets, suggesting that value traded has strong impacts on market depth for Ghana and South Africa but does not have the same type of impact for the other four countries. In terms of the adjustment processes, the results show that the coefficient of the speed of adjustment has the expected negative sign for all the countries. This indicates that value traded is an important factor in driving liquidity and long run stability in each of the markets. In particular, the results show that the coefficient of the speed of adjustment is significant for all the countries at the 1 percent significance level. This also shows that

liquidity capacity of value traded is significant and that this market fundamental can help to achieve long run equilibrium in the markets.

Table 4.6: Liquidity Result for stock market indicators – value traded (PMG Estimates)

Variable	*Cote d'Ivoire*		*Egypt*		*Ghana*	
	Coeff.	**Pr.**	**Coeff.**	**Pr.**	**Coeff.**	**Pr.**
Adj. speed	-0.066	0.001	-0.218	0.000	-0.274	0.003
$MCAPR_{t-1}$	-0.056	0.233	0.500	0.000	0.219	0.041
VALTR	9.352	0.697	8.538	0.107	0.709	0.009
Constant	1.828	0.343	1.663	0.049	-0.775	0.891
Variable	*Kenya*		*Nigeria*		*South Africa*	
	Coeff.	**Pr.**	**Coeff.**	**Pr.**	**Coeff.**	**Pr.**
Adj. speed	-0.261	0.000	-0.431	0.000	-0.154	0.003
$MCAPR_{t-1}$	0.358	0.001	-0.020	0.527	-0.031	0.380
VALTR	2.045	0.382	2.269	0.084	1.217	0.018
Constant	5.195	0.265	4.029	0.171	16.279	0.929

Source: Author' Compilations 2023

In terms of the size of the speed of adjustment, the coefficient is largest for the Nigerian market and smallest for the CIV market. In particular, the result shows that values traded ratio can help to attain 43 percent of adjustment to equilibrium in the first period in Nigeria while the rate of adjustment is just 6 percent for CIV. Thus, there is evidence that the two liquidity variables generate low levels of liquidity in the CIV market. Considering that the CIV market is the smallest market among those in the study, the result reveals that fundamentals in the market that relate to liquidity do not promote liquidity effectively in the smaller markets. In essence, these factors improve market liquidity more efficiently the larger the market under consideration.

Finally, the results for the volume traded factor is presented in Table 4.7. The coefficient of VOLTR is significant in five of the markets (except for Nigeria), therefore indicating that volume traded is an important factor that drives short run market depth and development among the African stock markets. For the speed of adjustment, the results show that the coefficient is

also significant at the 1 percent level for five of the countries and at the 5 percent level for Ghana. Again, the coefficients are all negative, indicating capacity of volume traded to aid affective adjustment to long run equilibrium and overall liquidity. The coefficient is also highest for Nigeria at 45.8 percent and smallest for South Africa at 5.9 percent. This result shows that volume-based liquidity prompts are lesser in the largest market in the sample. This shows that volume traded is not size sensitive in terms of stimulating or enhancing liquidity in the African stock markets.

Table 4.7: Liquidity Result for stock market indicators – volume traded (PMG Estimates)

Variable	*Cote d'Ivoire*		*Egypt*		*Ghana*	
	Coeff.	**Pr.**	**Coeff.**	**Pr.**	**Coeff.**	**Pr.**
Adj. speed	-0.072	0.000	-0.274	0.000	-0.002	0.040
$MCAPR_{t-1}$	0.115	0.042	0.412	0.001	0.278	0.000
VOLTR	-0.080	0.002	0.127	0.000	-0.425	0.000
Constant	1.887	0.319	1.931	0.134	1.273	0.753
Variable	*Kenya*		*Nigeria*		*South Africa*	
	Coeff.	**Pr.**	**Coeff.**	**Pr.**	**Coeff.**	**Pr.**
Adj. speed	-0.176	0.000	-0.458	0.000	-0.059	0.001
$MCAPR_{t-1}$	0.443	0.000	0.239	0.004	-0.037	0.339
VOLTR	-0.052	0.000	-0.011	0.298	0.028	0.000
Constant	3.668	0.485	4.699	0.264	16.071	0.907

Source: Author' Compilations 2023

4.5 Discussion of Findings

The results obtained from the empirical analysis are far-reaching and generally apt for policy as well as empirical directions. It is on the basis of this that the discussion of this results is conducted. First, it is established that the two market liquidity factors used in the study are capable of driving stock market depth and overall development both in the long run and in the

short run. Thus, the result clearly demonstrates the role of market liquidity in stock market performance among African economies. More liquid markets are often considered as more efficient in resource allocation and transfer (Holmström & Tirole, 1993; Hayatudeen & Adamu, 2017; Saliya, 2020). From another perspective, market liquidity also entails tradability of stock shares in the stock market. This plays a critical role in the overall governance and valuation of these markets which eventually imply enhanced performance especially in the long run (Saliya, 2020; Qiu & To, 2022). The results obtained from this study are in line with previous studies from both developed and developing economies (e.g., Osamwonyi & Ikponmwosa; 2016; Newton & O'Connor, 2017; Sri Artini & Sandhi, 2021).

The results from this study also emphasise the role of market fundamentals in driving market liquidity as well as the patterns of moderate liquidity among African stock markets. It is found that although liquidity is clearly evident among the markets, such liquidity are not too strong since each of the market fundamental components considered in the study was found to be capable of generating less than half of the needed liquidity adjustment required for long run stability in the market. Thus, the study finds liquidity a major issue for African stock markets just like Qui and To (2022) and Nwaolisa and Chijindu (2016) also noted that information asymmetry was a key determinant of stock liquidity, which was noted to be prevalent among African markets. This is a major hitch that may require strong policy and operational activities to correct in order to ensure that the size of the stock market can be leveraged on to ensure long term economic growth for the West African countries.

Test of Hypotheses

The hypotheses in the study are tested based on the results from the study.

Hypothesis One: *There is low level of market liquidity measured by turnover ratio in the Sub-Saharan Capital Markets.*

This hypothesis is tested from the results in Table 4.5. The coefficients of the speed of adjustment was significant and negative for most of the countries, implying that there are basis levels of liquidity among the markets. However, the coefficients were small (less than 50 percent in each case). Thus, the null hypotheses cannot therefore be rejected, which implies that there is actually is low level of market liquidity measured by turnover ratio in the Sub-Saharan Capital Markets.

Hypothesis Two: *There is low level of market liquidity measured by value traded in the Sub-Saharan Capital Markets.*

The test of this hypothesis is based on the VALTR result in Table 4.6. The coefficient of the speed of adjustment is significant and negative for all the markets. The coefficients are however low (less than 50 percent). Thus, the null hypothesis accepted in this case and it is shown that there is low level of market liquidity (as measured by value traded) in the Sub-Saharan Capital Markets.

Hypothesis Three: *There is low level of market liquidity (as measured by volume of trade) in the Sub-Saharan Capital Markets.*

For this hypothesis the result in Table 4.7 for VOLTR is applied. In the result, the coefficient of speed of adjustment is also low, although significant. In this case also, the null hypothesis is rejected. This means that there is low level of market liquidity (as measured by volume of trade) in the Sub-Saharan Capital Markets.

The test of this hypothesis is based on the result in 4.4 withfocus on the coefficient of TURNR and VALTR. In both cases for the long run estimates, the coefficients pass the significance tests at the 5 percent level. The null hypothesis is therefore rejected. Thus, there a significant relationship between stock market performance and market liquidity in the Sub-Saharan Capital Markets.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 Summary of Findings

In the study, the relationship between stock market liquidity and performance of Sub-Saharan African Capital Markets was examined. This is in line with the drive for allocative efficiency and competitiveness of stock markets in the African region which has become a major policy component of economies in the sub-region. The study used data from the leading six stock markets in the continent for the period 1988 to 2020. Given that the focus is on liquidity of the markets, a dynamic structure was formulated for the analysis using the Pooled Mean Group (PMG) estimation for the panel data used for the study. Liquidity was measured both in terms of the market and the economy, while the volume of trade in the markets was also considered in the overall market performance analysis. The performance of the market as well as the basis for market depth were considered in terms of the capitalization of the stock markets. Based on the empirical analysis, the following findings were made in the study:

a. That there is significant level of market liquidity in the Sub-Saharan Capital Markets generated from market turnover, but this liquidity is low for the markets.
b. That value traded also generates significant levels of liquidity in the Sub-Saharan C capital Markets. The liquidity was also found to be low.
c. That the level of market liquidity generated by volume of trade in the Sub-Saharan Capital Markets is significant but low.
d. That market liquidity has significant positive impact on stock market performance in the Sub-Saharan Capital Markets.

5.3 Recommendations

Based on the empirical findings of the study, the following recommendations are made:

i. There is the need for African stock markets to improve on the level of liquidity. This is because, the study has shown that liquidity generates both long run and short run positive outcomes for overall market performance in these economies. The liquidity can be further enhanced by promoting activities that enhance market participation as well as ease of trading and other forms of transfers. In this case more automated stock market activities can facilitate liquidity.

ii. The study has shown that market turnover has only a moderate role in ensuring market liquidity among African stock markets. Improving turnover rates will also involve sound macroeconomic policies, good legal systems, and effective shareholder protection through better institutional networks in the countries. Also, modern ICT application and enhanced or financial integration can improve turnover of markets.

iii. Value traded in the markets also need to be improved in order to generate larger liquidity outcomes. This will help to facilitate speedy entry and exit in the market without price loses and with low transaction costs. These are elements of the stock market that can also ensure better value traded and flows.

iv. The volume of trade also needs to be improved in the African markets through more listing, especially from investors outside of the individual economies.

v. There is need to investors to be more focused on the market fundamentals in individual markets for making decisions instead of purely focusing on information from outside the markets. When market fundamentals are allowed to drive individual markets, contagions and severe global financial crises can be mitigated.

5.3 Conclusion

The contribution of the stock market to resource mobilization and investment directions in modern economies have become essential since they are required for diversification of emerging economies. This has led to quite a lot of analysis with regard to fostering improvement in the stability, growth and development of the market, especially the emerging ones like those of the West African sub-region. Clearly, the stock market is a complex and long-term process which requires a lot of work and policy discipline in order to ensure its stability and overall capacity to deliver gains. Interestingly, the result from this study shows that although liquidity of the markets is important for driving the performance of the markets, there is low level of liquidity from different counts in the markets. This therefore calls for more investment, institutional and policy improvements in the stock market in order to ensure proper capacity to enhance investor experiences among African countries

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5.4 Suggestions for Further Studies

In the study, selected Sub-Saharan African capital markets only were the focus. Therefore, it is suggested that attention should be focused on other regions outside African continent like Asia, Europe and America. This will enable us to have a clearer view of the different level of market liquidity in these countries and can also provide a platform for information gathering to investors and potential investors to know where to direct/channel their investment to those areas.

Lastly, it is also suggested that other methods of analysis can be used to estimate stock market liquidity in conjunction with either autoregressive distributed lags (ARDL), panel data analysis and the generalized method of moment (GMM).

5.5 Contributions to Knowledge

The study contributed to knowledge in the following ways:

a. Investors should be more focused on capital market fundamentals in individual markets in making investment decisions instead of focusing purely on information from outside the markets. When market fundamentals are allowed to drive individual markets, contagions and severe global financial crises can be mitigated.

b. It further that the current level of Sub-Saharan African stock markets liquidity can be improved upon by promoting activities that enhance market participation as well as ease of trading and other forms of transfers; and in this case, more automated stock market activities can facilitate liquidity.

c. The study utilizes recent sub-Saharan African stock market-liquidity data for its empirical analysis; hence, the currency of the data used makes this study unique from previous studies in this area

d. It clearly established that sub-Saharan African Stock Markets are very complex, coupled with long-term process which requires a lot of work and policy discipline in order to ensure its stability and overall capacity to deliver gains.

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APPENDICES

Panel unit root test: Summary
Series: MCAPR
Date: 11/02/22 Time: 13:35
Sample: 1988 2020
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-1.90189	0.0365	6	186
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-1.90144	0.0366	6	186
ADF - Fisher Chi-square	21.4757	0.0438	6	186
PP - Fisher Chi-square	11.8924	0.4544	6	192

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: TURNR
Date: 11/02/22 Time: 13:36
Sample: 1988 2020
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-2.11571	0.0172	6	186
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-1.48520	0.0687	6	186
ADF - Fisher Chi-square	24.7436	0.0161	6	186
PP - Fisher Chi-square	19.3824	0.0797	6	192

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: VALTR
Date: 11/02/22 Time: 13:40
Sample: 1988 2020
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-3.09570	0.0010	6	186
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-3.25025	0.0006	6	186
ADF - Fisher Chi-square	33.2268	0.0009	6	186
PP - Fisher Chi-square	16.5860	0.1658	6	192

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: VOLTR
Date: 11/02/22 Time: 13:41
Sample: 1988 2020
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-0.53285	0.2971	6	186
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	0.11593	0.5461	6	186
ADF - Fisher Chi-square	11.8407	0.4586	6	186
PP - Fisher Chi-square	9.98594	0.6172	6	192

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: D(VOLTR)
Date: 11/02/22 Time: 13:41
Sample: 1988 2020
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-7.79414	0.0000	6	180
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-8.43551	0.0000	6	180
ADF - Fisher Chi-square	85.2134	0.0000	6	180
PP - Fisher Chi-square	90.9962	0.0000	6	186

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Kao Residual Cointegration Test
Series: MCAPR TURNR VALTR VOLTR
Date: 11/02/22 Time: 13:43
Sample: 1988 2020
Included observations: 198
Null Hypothesis: No cointegration
Trend assumption: No deterministic trend
User-specified lag length: 1
Newey-West automatic bandwidth selection and Bartlett kernel

	t-Statistic	Prob.
ADF	-3.938371	0.0000
Residual variance	82.83421	
HAC variance	78.36551	

Dependent Variable: D(MCAPR)
Method: ARDL
Date: 11/02/22 Time: 13:47
Sample: 1990 2020
Included observations: 186
Maximum dependent lags: 2 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (1 lag, automatic): TURNR
Fixed regressors: C
Number of models evalulated: 2
Selected Model: ARDL(2, 1)
Note: final equation sample is larger than selection sample

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
Long Run Equation				
TURNR	2.583865	0.647992	3.987496	0.0001
Short Run Equation				
COINTEQ01	-0.109179	0.060790	-1.795999	0.0742
D(MCAPR(-1))	0.303528	0.072414	4.191550	0.0000
D(TURNR)	0.196261	0.136041	1.442658	0.1509
C	5.164132	3.891250	1.327114	0.1862

Mean dependent var	1.208099	S.D. dependent var	10.12773
S.E. of regression	9.239894	Akaike info criterion	6.084134
Sum squared resid	14769.98	Schwarz criterion	6.499319
Log likelihood	-577.3293	Hannan-Quinn criter.	6.252187

*Note: p-values and any subsequent tests do not account for model selection.

Cote d'Ivoire

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
COINTEQ01	-0.020460	0.001042	-19.63237	0.0003
D(MCAPR(-1))	0.093464	0.032430	2.882056	0.0634
D(TURNR)	-0.212321	0.014211	-14.94116	0.0007
C	0.942460	0.654942	1.438998	0.2457

Guinea

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
COINTEQ01	-0.149033	0.003386	-44.01403	0.0000
D(MCAPR(-1))	0.433278	0.024786	17.48069	0.0004
D(TURNR)	-0.095009	0.033534	-2.833213	0.0660
C	-0.426567	0.465596	-0.916175	0.4271

Ghana

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
COINTEQ01	0.078138	0.002806	27.85049	0.0001
D(MCAPR(-1))	0.524843	0.026053	20.14498	0.0003
D(TURNR)	0.116337	0.013902	8.368078	0.0036
C	3.646643	6.150979	0.592856	0.5950

Kenya

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
COINTEQ01	-0.346736	0.008709	-39.81173	0.0000
D(MCAPR(-1))	0.421344	0.017538	24.02456	0.0002
D(TURNR)	0.206340	0.147469	1.399209	0.2562
C	2.808982	2.657950	1.056823	0.3682

Nigeria

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
COINTEQ01	-0.038200	0.002095	-18.23529	0.0004
D(MCAPR(-1))	0.174098	0.020227	8.607247	0.0033
D(TURNR)	0.600237	0.026347	22.78195	0.0002
C	-0.315846	0.545022	-0.579511	0.6029

South Africa

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
COINTEQ01	-0.178782	0.011606	-15.40479	0.0006
D(MCAPR(-1))	0.174144	0.037522	4.641111	0.0189
D(TURNR)	0.561983	0.320089	1.755706	0.1774
C	24.32912	159.7645	0.152281	0.8886

Dependent Variable: D(MCAPR)
Method: ARDL
Date: 01/19/23 Time: 14:18
Sample: 1990 2020
Included observations: 186
Maximum dependent lags: 2 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (3 lags, automatic): TURNR
Fixed regressors: C
Number of models evalulated: 6
Selected Model: ARDL(2, 1)
Note: final equation sample is larger than selection sample

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
Long Run Equation				
TURNR	2.583865	0.647992	3.987496	0.0001
Short Run Equation				
COINTEQ01	-0.109179	0.042790	-2.195999	0.0442
D(MCAPR(-1))	0.303528	0.072414	4.191550	0.0000
D(TURNR)	0.196261	0.136041	1.442658	0.1509
C	5.164132	3.891250	1.327114	0.1862

Mean dependent var	1.208099	S.D. dependent var	10.12773
S.E. of regression	9.239894	Akaike info criterion	6.084134
Sum squared resid	14769.98	Schwarz criterion	6.499319
Log likelihood	-577.3293	Hannan-Quinn criter.	6.252187

*Note: p-values and any subsequent tests do not account for model selection.

Dependent Variable: D(MCAPR)
Method: ARDL
Date: 01/19/23 Time: 14:15
Sample: 1990 2020
Included observations: 186
Maximum dependent lags: 2 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (3 lags, automatic): VALTR
Fixed regressors: C
Number of models evalulated: 6
Selected Model: ARDL(2, 2)
Note: final equation sample is larger than selection sample

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
		Long Run Equation		
VALTR	7.054275	1.598844	4.412111	0.0000
		Short Run Equation		
COINTEQ01	-0.276807	0.111603	-2.480290	0.0142
D(MCAPR(-1))	0.277564	0.092820	2.990345	0.0032
D(VALTR)	3.721996	1.412321	2.635376	0.0092
D(VALTR(-1))	-2.889310	1.389340	-2.079628	0.0391
C	3.950134	1.942726	2.033294	0.0437
@TREND	-0.028784	0.193568	-0.148702	0.8820

Mean dependent var	1.208099	S.D. dependent var	10.12773
S.E. of regression	7.323612	Akaike info criterion	5.862988
Sum squared resid	8635.282	Schwarz criterion	6.477462
Log likelihood	-543.4358	Hannan-Quinn criter.	6.111707

*Note: p-values and any subsequent tests do not account for model selection.

Dependent Variable: D(MCAPR)
Method: ARDL
Date: 11/02/22 Time: 14:08
Sample: 1990 2020
Included observations: 186
Maximum dependent lags: 2 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (1 lag, automatic): VOLTR
Fixed regressors: C

Number of models evalulated: 2
Selected Model: ARDL(2, 1)
Note: final equation sample is larger than selection sample

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
		Long Run Equation		
VOLTR	0.009667	0.014694	0.657903	0.5115
		Short Run Equation		
COINTEQ01	-0.203959	0.060197	-3.388164	0.0009
D(MCAPR(-1))	0.297412	0.097090	3.063268	0.0025
D(VOLTR)	-0.001212	0.029833	-0.040623	0.9676
C	5.247811	2.208325	2.376376	0.0186

Mean dependent var	1.208099	S.D. dependent var	10.12773
S.E. of regression	9.479977	Akaike info criterion	6.136363
Sum squared resid	15547.50	Schwarz criterion	6.551549
Log likelihood	-582.5000	Hannan-Quinn criter.	6.304417

*Note: p-values and any subsequent tests do not account for model selection.

DATA

Country	Year	MCAPR	VALTR	TURNR	VOLTR
Côte d'Ivoire	1988	3.85	0.08	1.13	212.08
Côte d'Ivoire	1989	4.83	0.07	1.06	196.39
Côte d'Ivoire	1990	5.40	0.11	3.09	189.83
Côte d'Ivoire	1991	5.12	0.12	1.30	199.52
Côte d'Ivoire	1992	4.85	0.05	0.74	208.48
Côte d'Ivoire	1993	2.99	0.05	1.57	222.23
Côte d'Ivoire	1994	1.39	0.09	9.95	215.00
Côte d'Ivoire	1995	0.39	0.13	32.89	215.21
Côte d'Ivoire	1996	0.51	0.14	30.57	208.72
Côte d'Ivoire	1997	8.94	0.18	2.29	232.68
Côte d'Ivoire	1998	14.69	0.15	1.03	222.53
Côte d'Ivoire	1999	12.48	0.38	4.88	235.47
Côte d'Ivoire	2000	7.41	0.47	4.15	248.21
Côte d'Ivoire	2001	6.33	0.19	1.21	225.31
Côte d'Ivoire	2002	9.50	0.11	1.49	221.12
Côte d'Ivoire	2003	10.67	0.15	1.49	222.97
Côte d'Ivoire	2004	11.82	0.23	2.56	219.07
Côte d'Ivoire	2005	13.04	0.25	1.57	215.08
Côte d'Ivoire	2006	18.44	0.40	3.26	216.38
Côte d'Ivoire	2007	31.88	0.70	2.53	201.46
Côte d'Ivoire	2008	33.95	0.98	3.55	197.28
Côte d'Ivoire	2009	26.42	1.06	3.75	193.04
Côte d'Ivoire	2010	25.94	0.91	3.52	193.72
Côte d'Ivoire	2011	27.48	0.71	1.67	189.28
Côte d'Ivoire	2012	25.01	0.52	2.41	175.33
Côte d'Ivoire	2013	37.83	0.88	3.11	171.12
Côte d'Ivoire	2014	34.43	1.12	3.39	171.50
Côte d'Ivoire	2015	35.10	1.35	4.68	171.79
Côte d'Ivoire	2016	32.36	0.91	3.52	173.72
Côte d'Ivoire	2017	34.94	0.71	1.67	169.28
Côte d'Ivoire	2018	37.47	0.70	2.53	171.46
Côte d'Ivoire	2019	37.84	0.98	3.55	167.28
Côte d'Ivoire	2020	33.26	0.96	2.19	170.36
Ghana	1988	0.93	0.04	1.28	78.36
Ghana	1989	1.18	0.07	2.04	79.48
Ghana	1990	1.17	0.08	1.55	88.35
Ghana	1991	1.04	0.25	1.23	86.42
Ghana	1992	1.17	0.04	1.26	96.95
Ghana	1993	1.92	0.06	3.58	93.13

Ghana	1994	16.10	0.58	7.87	102.65
Ghana	1995	26.78	0.71	1.09	111.67
Ghana	1996	21.27	0.22	1.09	120.26
Ghana	1997	18.87	0.40	3.18	117.26
Ghana	1998	16.68	0.65	4.59	114.40
Ghana	1999	14.36	0.48	1.79	116.94
Ghana	2000	9.81	0.18	1.42	114.11
Ghana	2001	6.59	0.17	3.57	111.35
Ghana	2002	4.90	0.18	3.31	113.60
Ghana	2003	6.55	0.35	8.79	120.48
Ghana	2004	6.41	0.66	12.80	131.63
Ghana	2005	5.26	0.61	9.03	123.77
Ghana	2006	3.40	0.26	7.43	129.59
Ghana	2007	6.23	0.39	9.43	126.28
Ghana	2008	8.81	0.72	11.42	131.56
Ghana	2009	9.11	0.56	2.19	128.25
Ghana	2010	8.48	0.24	3.73	125.10
Ghana	2011	7.63	0.45	8.41	114.23
Ghana	2012	7.46	0.33	1.72	111.55
Ghana	2013	6.36	0.19	3.18	108.99
Ghana	2014	8.48	0.24	3.73	125.10
Ghana	2015	7.63	0.45	8.41	114.23
Ghana	2016	7.46	0.33	1.72	111.55
Ghana	2017	7.28	0.19	2.94	108.99
Ghana	2018	6.28	0.26	2.38	108.37
Ghana	2019	6.73	0.42	2.38	109.37
Ghana	2020	4.29	0.12	1.75	104.24
Guinea	1988	3.47	0.25	4.28	894.26
Guinea	1989	4.20	0.18	5.46	923.79
Guinea	1990	3.74	0.24	7.80	1017.10
Guinea	1991	5.32	0.32	7.06	1092.57
Guinea	1992	6.70	0.38	6.95	1123.85
Guinea	1993	7.71	0.40	4.73	1136.45
Guinea	1994	7.68	0.86	18.99	1162.18
Guinea	1995	10.30	1.22	10.92	1219.58
Guinea	1996	16.42	2.30	22.17	1044.69
Guinea	1997	22.31	5.28	33.47	1007.82
Guinea	1998	26.76	6.46	22.15	1312.68
Guinea	1999	31.53	7.73	31.61	1528.54
Guinea	2000	30.84	10.08	36.11	1561.78
Guinea	2001	26.15	7.32	15.26	1580.84
Guinea	2002	26.64	3.36	10.93	1608.73
Guinea	2003	29.72	3.28	13.30	1341.55

Guinea	2004	38.80	5.28	18.33	1071.83
Guinea	2005	66.10	17.20	42.83	985.12
Guinea	2006	82.01	42.42	54.86	774.00
Guinea	2007	88.73	42.00	53.13	556.04
Guinea	2008	76.23	50.83	77.21	468.38
Guinea	2009	47.48	46.05	82.88	384.55
Guinea	2010	40.48	26.12	42.00	274.28
Guinea	2011	27.83	11.13	24.20	273.28
Guinea	2012	19.18	5.86	31.90	270.76
Guinea	2013	20.59	5.10	21.43	265.82
Guinea	2014	21.00	6.23	41.22	272.05
Guinea	2015	18.62	6.15	23.83	270.44
Guinea	2016	12.61	3.53	24.02	265.76
Guinea	2017	13.79	4.24	44.45	261.30
Guinea	2018	21.00	6.23	41.22	272.05
Guinea	2019	18.62	6.15	23.83	270.44
Guinea	2020	11.28	4.93	33.00	261.24
Kenya	1988	5.15	0.12	2.19	251.18
Kenya	1989	5.49	0.08	1.94	251.47
Kenya	1990	5.30	0.10	2.20	230.31
Kenya	1991	5.15	0.12	2.62	218.67
Kenya	1992	6.35	0.14	2.30	227.66
Kenya	1993	15.75	0.18	1.34	145.39
Kenya	1994	30.39	0.59	3.16	148.42
Kenya	1995	30.10	0.76	2.20	201.67
Kenya	1996	15.22	0.52	3.88	199.37
Kenya	1997	13.79	0.64	5.39	193.77
Kenya	1998	13.97	0.61	3.77	188.43
Kenya	1999	12.59	0.45	4.56	187.02
Kenya	2000	9.49	0.33	3.14	175.19
Kenya	2001	8.78	0.29	3.45	173.52
Kenya	2002	9.36	0.29	3.04	145.18
Kenya	2003	19.24	0.80	6.97	135.53
Kenya	2004	25.27	1.50	6.98	134.70
Kenya	2005	28.03	2.14	9.60	131.06
Kenya	2006	35.73	3.69	14.78	138.12
Kenya	2007	39.96	4.09	8.83	142.10
Kenya	2008	35.84	2.80	5.77	138.22
Kenya	2009	27.95	1.18	1.92	134.47
Kenya	2010	31.15	1.21	6.37	130.86
Kenya	2011	28.36	1.95	7.71	134.33
Kenya	2012	25.35	1.96	7.90	135.31
Kenya	2013	25.27	2.53	6.97	134.01

Kenya	2014	28.03	2.30	6.98	139.19
Kenya	2015	35.73	1.26	9.60	133.67
Kenya	2016	32.37	1.06	7.39	132.51
Kenya	2017	31.15	1.21	6.37	130.86
Kenya	2018	28.36	1.95	7.71	134.33
Kenya	2019	25.35	1.96	7.90	135.31
Kenya	2020	22.17	1.49	5.39	133.28
Nigeria	1988	2.94	0.03	0.39	112.37
Nigeria	1989	3.84	0.02	0.43	119.12
Nigeria	1990	3.95	0.02	0.91	137.00
Nigeria	1991	5.26	0.03	0.62	144.77
Nigeria	1992	4.52	0.03	1.06	152.10
Nigeria	1993	6.66	0.09	1.63	169.42
Nigeria	1994	7.09	0.10	1.87	168.10
Nigeria	1995	11.04	0.13	1.72	167.67
Nigeria	1996	19.87	0.39	3.10	165.36
Nigeria	1997	23.57	0.75	3.89	160.41
Nigeria	1998	20.39	0.99	5.47	159.90
Nigeria	1999	10.97	0.60	1.73	162.67
Nigeria	2000	7.47	0.42	7.58	158.70
Nigeria	2001	10.89	0.22	10.32	153.96
Nigeria	2002	2.43	0.82	8.60	150.90
Nigeria	2003	10.71	0.93	11.85	150.89
Nigeria	2004	10.93	1.16	11.28	152.23
Nigeria	2005	11.32	1.09	9.80	154.83
Nigeria	2006	12.04	1.21	12.65	141.01
Nigeria	2007	21.42	3.78	29.40	144.18
Nigeria	2008	21.36	5.34	23.22	141.08
Nigeria	2009	12.11	3.13	12.71	138.67
Nigeria	2010	11.32	1.32	12.42	135.64
Nigeria	2011	10.92	1.09	8.64	120.39
Nigeria	2012	10.34	0.87	8.62	113.02
Nigeria	2013	13.24	1.00	9.13	109.45
Nigeria	2014	12.67	1.00	7.13	106.57
Nigeria	2015	10.36	0.85	7.97	101.03
Nigeria	2016	8.66	0.60	4.31	90.88
Nigeria	2017	8.28	0.46	7.09	86.97
Nigeria	2018	13.24	1.00	9.13	109.45
Nigeria	2019	12.67	1.00	7.13	106.57
Nigeria	2020	10.84	0.83	7.04	101.26
South Africa	1988	66.21	2.63	5.30	1413.76
South Africa	1989	95.95	4.59	6.58	1600.19
South Africa	1990	118.88	7.27	7.75	2140.08

South Africa	1991	107.76	5.85	3.45	2148.09
South Africa	1992	101.24	4.38	5.67	2048.43
South Africa	1993	108.27	6.03	6.59	2010.84
South Africa	1994	125.37	6.41	5.20	1850.53
South Africa	1995	129.42	5.69	4.16	1660.09
South Africa	1996	134.93	5.35	4.37	1551.71
South Africa	1997	164.74	7.35	5.80	1479.14
South Africa	1998	172.56	9.41	5.94	1476.99
South Africa	1999	161.69	13.44	11.17	1418.05
South Africa	2000	150.96	22.02	18.26	1430.65
South Africa	2001	131.90	32.32	29.87	1488.02
South Africa	2002	150.68	44.60	35.37	1470.50
South Africa	2003	160.55	49.74	32.20	1343.19
South Africa	2004	129.63	38.44	22.43	1119.13
South Africa	2005	131.17	33.12	31.48	929.56
South Africa	2006	148.69	33.35	18.83	834.77
South Africa	2007	163.84	30.94	22.37	780.27
South Africa	2008	194.19	38.17	22.25	726.81
South Africa	2009	225.46	51.02	28.37	740.37
South Africa	2010	252.09	70.52	34.14	761.40
South Africa	2011	212.68	75.07	33.23	737.25
South Africa	2012	215.51	70.90	34.11	699.33
South Africa	2013	247.80	70.81	29.81	687.27
South Africa	2014	208.89	61.35	25.96	667.25
South Africa	2015	202.72	53.97	28.24	639.74
South Africa	2016	234.83	58.24	26.97	599.75
South Africa	2017	256.20	65.32	27.35	590.33
South Africa	2018	243.06	70.19	30.32	570.54
South Africa	2019	270.28	102.46	50.35	539.11
South Africa	2020	328.36	123.25	35.77	515.79

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