2022

The Impact of derivatives trading on the liquidity of stocks at the Nairobi Securities Exchange.

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THE IMPACT OF DERIVATIVES TRADING ON THE LIQUIDITY OF STOCKS AT THE NAIROBI SECURITIES EXCHANGE.

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059750

A Thesis submitted in partial fulfilment of the requirements for the award of a Master of Commerce Degree in Finance of Strathmore Business School

Strathmore Business School

Strathmore University

2022

DECLARATION

I declare that this work has not been previously submitted and approved for the award of a degree by this or any other University. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made in the thesis itself.

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ABSTRACT

The introduction of derivatives to enhance liquidity of capital markets is an approach that has been adopted both globally and in Africa. In Kenya, CMA granted approval to the NSE to launch and operate NEXT Derivatives Exchange Market which was aimed at facilitating a deeper and more liquid capital market. One of the challenges experienced in the Kenyan financial market is low liquidity levels which has been a constraint towards product and service uptake by investors. This research focused on Single Stock Futures (SSF) for Safaricom Plc, Kenya Commercial Bank Group Plc, Equity Group Holdings Plc, East Africa Breweries Ltd, British American Tobacco Kenya Plc and Absa Bank Kenya PLC.The researcher collected daily share closing price and daily trading volume data for each of the six underlying company stocks from July 4th, 2018, to December 31st, 2021, which was used in the calculation of stock liquidity using the Amihud Price Impact measure considered the best price impact measure of liquidity. A bivariate VAR model containing the variables: liquidity of underlying stock (Ls) and derivatives trading (Ds) was used to test the short run and long run causality between derivatives trading and the liquidity of underlying stocks. This was used to answer the research objective which was to analyze the impact of derivatives trading (Single Stock Futures) on the liquidity of underlying stocks listed at the NSE. The findings of this study show that there was an increase in the liquidity for some of the underlying stocks as measured by the Amihud price impact measure and a decrease in liquidity for some of the underlying stocks six months and one year post derivatives listing. The increase in stock liquidity for Equity Group Holdings Plc can be explained by derivatives trading in the long run and the increase in stock liquidity for East African Breweries Ltd can be explained by derivatives trading in the short run. The increase in stock liquidity can be explained by the increased investment opportunity available to investors through the introduction of derivatives of the underlying stock. Therefore, market regulators like CMA, NSE and NEXT should encourage more companies to participate in the derivatives market increasing the investment opportunities available to investors. Findings of the research also revealed that the derivatives market was operating efficiently since its launch, the relationship between key participants was working effectively, the clearing process was efficient, and the rules and regulations of the derivatives market were sufficient. Finally, investors were keen on participating in the derivatives market which the CMA and NSE can leverage on to increase trading activity at the bourse through the implementation of aggressive campaigns.

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LIST OF TERMS

ABSA Absa Kenya

BAT British American Tobacco Kenya Plc

BSE Bombay Stock Exchange

CMA Capital Markets Authority

CDSC Central Depository and Settlement Corporation

CSI China Securities Index

EABL East African Breweries Ltd

EIF Equity Index Futures

EQUITY Equity Group Holdings Plc

FMA Fund Managers Association

GARCH Generalized Autoregressive Conditional Heteroskedasticity

JSE Johannesburg Stock Exchange

KCB Kenya Commercial Bank Group Plc

NASDAQ National Association of Securities Dealers Automated Quotation

NSE Nairobi Securities Exchange

NSE National Stock Exchange of India

SAFARICOM Safaricom Plc

SSF Equity Stock Futures

S&P CNX Nifty Index The Standard & Poor's CNX Nifty stock index

SSF Single Stock Futures

SEBI Securities and Exchange Board of India

VAR Vector Autoregressive Model

VECM Vector Error Correction Model

DEFINITION OF TERMS

Liquidity- Ease by which an asset can be sold immediately after purchase without lowering the price and without incurring transaction cost (Dalgaard, 2009).

Market Liquidity-The marketability of a security which is the ability to trade an asset at low cost, with little price impact at short notice and funding liquidity which refers to the ability of a company to raise either capital or cash (funding) in short notice (Nikolaou,2009).

Derivatives-Financial contract whose value is derived from the value of something else, such as a stock price, a commodity price, an exchange rate, an interest rate, or even an index of prices (Sakar,2006).

Single Stock Futures- Derivative instruments that give investors exposure to price movements on an underlying stock on selected counters at the NSE (NSE, 2019).

CHAPTER ONE:

INTRODUCTION

1.1 Background of Study

Emerging markets suffer from significantly low levels of trading volume liquidity, effectively placing a constraint on economic and market development which is not the case for developed markets where liquidity across many products remains high (Wyman, 2016). Emerging markets are typically characterized by low liquidity, unreliable information, and considerable volatility (Alam et al.,2007). In Africa, capital markets are denoted mainly by illiquidity with other characteristics being high transaction costs, poor settlement and delivery systems, lack of information, few investors and volatility this is despite the efforts implemented towards the development of African capital markets (Gakeri, 2011).

In Sub-Saharan Africa, most of the securities markets exhibit characteristics whereby only a few stocks which comprise a substantial amount of the total market capitalization are traded and for the other stocks informational and disclosure inadequacies are significant (Adjasi & Yartey, 2007).African securities markets generally exhibit low-turnover ratios whereby even the largest markets – South Africa, Nigeria and Egypt also exhibit low levels of liquidity when measured against global standards (McMillan & Thupayagale, 2009).

Illiquidity in African stock markets is attributed to the absence of an active and well-developed investor base (Magnusson & Wydick, 2002). Irving (2005) through his study concluded that low liquidity levels was a characteristic that was exhibited by African exchanges. Kibuthu (2005) noted that stock exchanges in Africa were small in nature, illiquid and underdeveloped. Piesse and Hearn (2006) also highlighted that, equity markets in Africa were small, characterized by a small number of listings, lacked highly developed infrastructure, had limited options in the range of financial instruments provided and were illiquid. Capital markets in Africa have exhibited low liquidity and capitalization (United Nations Development Programme ,2003).

The securities market in Kenya is one of the most highly developed in the East and Central African region though by international standards it is classified as young with a lot of potential to still develop (Nyasha & Odhiambo, 2013). The Nairobi Securities Exchanges (NSE) is the fifth largest in Africa after the Johannesburg, Egypt, Morocco, and Nigeria's Exchanges and the largest in East Africa with a market capitalization of around US$25 billion (Certificate, 2018). Several improvements targeting the NSE have been implemented over the years which include the formation of a regulatory body (the CMA) in 1989, replacement of the "Call-Over"

trading system with the floor-based "Open Outcry System" in 1991, reduction of listing costs in 1991, repeal of the Exchange Control Act and relaxation of the Exchange Control Act for firms that were locally controlled in 1995 and in 2000/2001 the introduction of tax concessions of 50% for newly listed companies for five years (Nairobi Stock Exchange, 1996). The reasons behind these reforms by the Kenyan Government was the need to foster sustainable economic development with an efficient and stable financial system enhancing the role of the private sector in the economy aimed at reducing the demands of public enterprises to rationalize their operations, broaden the base of ownership, and to enhance the capital-market development (Nairobi Stock Exchange, 2002).

CMA has in the past made efforts to engage relevant stakeholders, who include the NSE, National Treasury, Central Depository and Settlement Corporation (CDSC), and Fund Managers Association (FMA).The stakeholder engagements have been fruitful as the NSE introduced an incubator board designed to accelerate the growth and success of entrepreneurial companies geared towards developing a pipeline of successful businesses that could list on the bourse in future. This also saw the introduction of regulations of several Capital Markets instruments such as Real Estate Investment Trusts in 2013, Exchange Traded Funds in 2015, Asset Backed Securities in 2017, Derivatives Markets in 2015, Global Depositary Receipts and Notes in 2017 as well as Online forex trading in 2017, Securities Lending and Borrowing in 2017 adding onto already existing Capital Markets investment structures such as bonds, equities, and collective investment schemes (CMA, 2018).

These reforms have led to improvements in terms of total value of shares traded, turnover ratio and market capitalization. Some of the challenges experienced at the bourse include lack of investor awareness, low investor confidence, vulnerability to shocks, low level of liquidity and lack of competitive pressure in the local market (Nyasha & Odhiambo, 2014). While some of the external factors that challenge listed companies at the NSE include the tight monetary policy, poor interest rate policy, the taxation system, unclear legal and regulatory framework within which the stock exchange operates, lack of expertise and poor methods in the stock exchange system, lack of technological progress, political instability, lack of proper governance of the capital markets, information asymmetry, high market volatility and low level of liquidity in the stock exchange (Ogina, 2009).

1.1.1 Liquidity

A liquid market is one where there are many bids and offers and participants can easily enter and exit it with minimal transaction costs incurred (Capital Markets Authority, 2018). Liquidity

refers to the ease by which an asset can be sold immediately after purchase without lowering the price and without incurring transaction cost (Dalgaard, 2009). The ability to trade large volumes of stocks with least price impact, cost and postponement is termed as liquidity and it is very key in the stock market. It has implications for listed firms, regulators, stock exchanges and traders (Kumar & Misra, 2015).

Types of liquidity include market liquidity also referred to as the marketability of a security which this research paper will focus on is defined as the ability to trade an asset at low cost, with little price impact at short notice and funding liquidity which refers to the ability of a company to raise either capital or cash (funding) in short notice (Nikolaou,2009). In the financial markets the ease with which an asset is traded is referred to as the asset's market liquidity and the ease with which a trader can obtain funding to participate in the financial markets is referred to as the trader's funding liquidity. Traders provide market liquidity which is dependent on the availability of funding (Brunnermeier & Pedersen, 2009). Regulators, firms, and market participants consider a consistent level of market liquidity to be relevant as it regulates the cost of raising capital, ensures continuity in trades at desired prices which are important in ensuring the frictionless functioning of the equity market by enhancing the flow of information that is specific to market participants which promotes efficiency and stability in the stock markets. Finally, market liquidity plays an important role in accurate portfolio returns forecasting, trading strategies and portfolio formulation(Priyanka, B. G., and Y. V., 2020).

Low liquidity makes it harder to support a local market with its own trading system, because the business volume would simply be too low (Adjasi & Yartey, 2007). Liquidity is also defined as the ability to trade large quantities of a security easily and quickly at a low cost without movement in price (Pastor & Stambaugh, 2003; Wuyts,2007). It is also important to note that a large stock market is not necessarily a liquid market as it may possess a large capitalization but a small turnover and hence low liquidity (Levine & Zervos, 1998). In summary, liquidity is ability to convert stocks into cash and vice versa without affecting the price or with minimal impact on price (Bogdan, Bareša & Ivanović,2012). In liquid markets an investor is not uncertain about executing a large transaction which is not the case in illiquid markets as the investor is cautious with the aim of reducing financial loss. By increasing the liquidity of a firm's stocks, firms can reduce the cost of capital as some of the key considerations that investors make when investing in a company is stock liquidity, the stock return, and the risk profile of the stock.

Liquid markets exhibit five characteristics: tightness which refers to low transaction cost (tightness), immediacy which is the speed with which orders are executed, depth which is the

existence of abundant orders in the market or quantity of securities that are traded, breadth whereby orders are both numerous and large in volume and resiliency whereby new orders flow quickly to correct order imbalances (Sarr & Lybek, 2002).Liquidity plays an important role in strengthening and deepening financial markets which makes it a critical component of financial market development. This role has seen market and exchange regulators, investors, and issuers keen on implementing measures that are aimed at improving liquidity. Some of the measures that have been implemented by exchanges and regulators include promoting the development of a diverse investor base which is focused on enhancing retail engagement and attracting international and local institutional investors. Increasing the pool of associated financial products and securities offered by exchanges is another measure that has been adopted to enhance liquidity in stock markets and finally the improvement of trading technology to create an enabling market environment (Wyman, 2016).

The introduction of exchange traded derivatives by exchanges has encouraged trader and investor participation thus improving liquidity in the market enhancing greater market depth (Narasimhan & Kalra, 2014). Danthine (1978) observed that the increased volume in derivatives trading leads to greater depth in the cash markets largely associated with the liquidity. Benefits accrued to exchanges that have introduced derivatives include the increased interaction between the derivatives market and underlying stocks enhancing market liquidity, enhanced price discovery for the underlying assets and increased opportunities for risk transfer through hedging (Wyman, 2016). Howells & Bain (2002) also observed that the derivatives market contributes to the integration of global capital markets which improves the global allocation of savings and fosters higher investment levels in an economy. Kavussanos et al., (2008) noted that the introduction of a derivatives exchange provides an efficient and cheap system to speculate and hedge which facilitates increased transparency and overall functioning of capital markets improving overall efficiency. Increasing the available investment opportunities to encourage investor participation has seen markets concentrate on diversifying the range of financial securities such as Exchange Traded Funds (EFTs) and derivatives offered at the exchange to increase the quantity and quality of listings (Wyman, 2016).

1.1.2 Derivatives

A derivative security is a financial contract whose value is derived from the value of something else, such as a stock price, a commodity price, an exchange rate, an interest rate, or even an index of prices (Sakar,2006).It is a financial security, the value of which is derived from an underlying asset or group of assets, such as stocks, bonds, commodities, currencies, interest rates, and even market indexes (Gronow, 2020). The spot market price of the underlying asset drives prices in derivates that is a change in the price of the underlying asset results in a change

in the value of the derivative. The basic purpose of these instruments is to provide commitments to prices for future dates for giving protection against adverse movements in future prices, to reduce the extent of financial risks (Kalyan & Sirisha, 2019).

1.1.3 Use of derivatives to enhance liquidity of capital markets

In the past derivatives markets have been successful in enhancing liquidity through the attraction of many types of agents from speculators, arbitrageurs to hedgers (Vo, Huynh, Vo, and Ha, 2019). The use of derivatives in both advanced economies and emerging markets over the last two decades has increased over the years as they are essential in the development of efficient capital markets (Sundaram, 2012). The Indian stock market which launched futures and contracts in the BSE Sensex and S&P CNX Nifty Index on the Bombay Stock Exchange (BSE) (Narasimhan & Kalra, 2014) has since experienced growth in the volume of activity in the market and the range of products traded which has had a positive impact on market liquidity due to new participants in the market and the attraction of international investors and JSE which established a derivatives market to further develop the financial system, manage risk, and meet the challenges of globalization has grown rapidly over the years supporting capital inflows and helping market participants to unbundle, price and transfer risk (Adelegan, 2009). The availability of derivative products also encourages investors and traders to invest in market and thereby improves the liquidity of the market. Derivatives on underlying stocks increase investment opportunities for investors and have been found to be useful when there are certain restrictions in the financial markets like short selling. Investors also use derivatives to hedge risk and speculate future prices (Karla,2014).

CMA guided by its Capital Markets Master Plan to position Kenya closer to becoming the Heart of Capital Markets Investment in Africa granted approval to the NSE to launch and operate the NEXT Derivatives Exchange Market on the 4th of July 2019 which was aimed at facilitating a deeper and more liquid capital market. NEXT offers Equity Index Futures on the NSE25 Share Index and Single Stock Futures on selected counters that meet the eligibility criteria whereby the security underlying the futures contract must be a listed on the NSE, must be a constituent of the NSE 25 Share Index, have a minimum average daily turnover of KES 7 million and have a market capitalization of at least KES 50 billion (NSE,2019). Single Stock Futures are derivative instruments that give investors exposure to price movements on an underlying stock. Parties agree to exchange a specified number of stocks in a company for a price agreed today (the futures price) in the future (NSE 2019). NEXT offers single futures on Safaricom Plc, Kenya Commercial Bank Group Plc, Equity Group Holdings Plc, East African Breweries Ltd, British American Tobacco Kenya Plc and Absa Bank Kenya Plc (CMA,2021).

The table below captures how derivative transactions have performed measured in terms of deals, volume, and turnover since their introduction at the NSE on the 4th of July 2019 when the derivatives market went live. (NSE,2019).

	Year 2019	Year 2020	Year 2021
Total Deals	298	703	2981
Total Volume (number of contracts traded)	572	1341	7947
Total Turnover (KES)	20,734,794	44,760,015	323,944,600

Source: NSE/CMA

Table 1: Derivative Transaction-Deals, Volume and Turnover July 2019-March 2021

The derivatives market registered an increase in number of deals from 298 in the year 2019 to 703 in the year 2020,number of contracts traded from 572 in 2019 to 1341 in 2020 and turnover from 20,734,794 million in 2019 to 44,760,015 million in 2020. The increase seen in the year 2020 in terms of total deals, total volume and total turnover was due to the fact that derivatives trading in the year 2019 started in July which was not a full year of operation of the derivative market like the year 2020. A significant increase in derivative transactions was also observed in the year 2021 when compared to the year 2020 where total deals increased by 324%, total volume by 493% and total turnover by 624%. The introduction of derivatives in exchanges is an approach that has been adopted by financial markets to enhance the liquidity of the underlying asset. In the context of this research, the NSE is characterized by low stock liquidity levels which has been one of the key constraints towards the uptake of capital market products and services by investors as high liquidity encourages participation in the stock market (CMA,2018). This has led to key stakeholders implementing measures like the introduction of derivatives to enhance liquidity of the financial markets. Derivatives transactions have experienced incremental growth since the launch of NEXT. The impact of derivatives trading on underlying stock liquidity and the equity market was further evaluated in this research.

1.2 Statement of the Problem

CMA guided by its Capital Markets Master Plan granted approval to the NSE to launch and operate the NEXT Derivatives Exchange Market which was aimed at facilitating deeper and more liquid capital markets. The fact that this approach has been adopted by exchange regulators both globally and locally with the aim of increasing available investment opportunities aimed at encouraging investor participation, it would therefore be important to establish whether the trading of single stock futures in the derivatives market has any impact on the liquidity of the underlying stocks. That is whether there exists a causal relationship between liquidity of underlying stocks and derivatives trading and what other impact derivatives trading has on the equity market in the Kenyan context. Mbithi (2011) and

Mugambi (2014) carried out research relating to the impact of the introduction of derivatives to the NSE and the benefits accrued from the introduction of derivatives however these studies were done before the launch of the derivatives market in Kenya in July 2019. This research will cover the period after the launch of NEXT. The introduction of a derivatives market was a measure adopted by CMA to deepen and increase liquidity of the capital market which has been experiencing low stock liquidity levels whereby only a few counters are traded at the NSE. This research will provide information on the impact that derivatives trading has had on the liquidity of underlying stocks by establishing whether a causal relationship exists between derivatives trading and liquidity of underlying stocks. Stakeholders keen on enhancing liquidity at the bourse can use this information to gauge how the derivatives market has performed so far in the Kenyan context and the measures that can be adopted to improve derivatives as a financial product so as to encourage investor participation.

1.3 Research Objectives

1.3.1 General Objective

The main objective of this study was to analyze the impact of derivatives trading (Single Stock Futures) on the liquidity of underlying stocks listed at the NSE.

1.3.2 Specific Objectives

1. To determine the short run impact of Single Stock Futures (SSF) trading on the liquidity of underlying stocks at the NSE.
2. To determine the long run impact of Single Stock Futures (SSF) trading on the liquidity of underlying stocks at the NSE.
3. To evaluate the views from derivatives market participants on the impact of derivatives trading on the equity market.

1.4 Research Questions

1. What is the short run impact of Single Stock Futures (SSF) trading on the liquidity of underlying stocks at the NSE?
2. What is the long run impact of Single Stock Futures (SSF) trading on the liquidity of underlying stocks at the NSE?
3. What are the views from derivatives market participants on the impact of derivatives trading on the equity market?

1.5 Scope of the Study

The researcher collected daily share closing price and daily trading volume data from July 4th, 2018, to December 31st, 2021,from listed stocks whose futures participate in the derivatives market to examine the impact of derivatives trading on their liquidity pre and post derivatives introduction. The companies included: Safaricom Plc, Kenya Commercial Bank Group Plc, Equity Group Holdings Plc, East Africa Breweries Ltd, British American Tobacco Kenya Plc and Absa Bank Kenya PLC. The long run and short run impact of derivative trading on liquidity of underlying stocks was examined. Data was collected from both secondary sources which are the Nairobi Securities Exchange database, Wall Street Journal and Capital Market Authority quarterly reports and primary sources through issuance of questionnaires to key derivative market participants.

1.6 Significance of the study

1.6.1 NEXT Derivatives Market

Findings of this study would be beneficial to the NEXT management as they would get to understand how the derivatives market has performed since its launch, which futures are most active and how they can enhance the performance of the others and the improvements that can be made to encourage other NSE listed companies to participate in the futures market.

1.6.2 Investors

The findings of the study would be beneficial to investors as who would get to know about the additional products which in this case is Single Stock Futures (SSF) and Equity Index Futures (EIF) that are available to them at the NSE.

1.6.3 Stock Market Regulators

CMA has been aggressive in their efforts to engage relevant stakeholders to come up with key reforms aimed at improving the performance of the bourse. These reforms successfully led the launch of NEXT Derivatives Exchange Market by the NSE aimed at facilitating deeper and more liquid capital markets. They would be keen to know how the derivatives market has performed so far which is information that this study hopes to provide.

For the NSE, who launched NEXT information from this study would be relevant as they can gauge performance of the derivatives markets and the impact the derivatives market has on the liquidity of the underlying stocks and overall impact on the equity market.

1.6.4 Researchers

The study will also be beneficial to researchers who have particular interest in this field of finance with specific focus on the Nairobi Securities Exchange. The information from the study will serve to add to existing knowledge relating to derivatives trading and its impact on liquidity of underlying stocks.

CHAPTER TWO:

LITERATURE REVIEW

2.0 Introduction

This section reviewed the various theories that have been advanced on stock market liquidity which will inform this study. In addition to the theories this chapter also analyzed the extensive work that has been done by several authors that relate to the field of liquidity in stock markets and the impact derivatives trading has on liquidity of underlying stocks. Measures of liquidity were discussed and eventually a conceptual framework drawn. This chapter is organized in the following sections: **2.1:**Theoretical Review; **2.2:**Empirical Review; **2.3:**Conceptual Framework; **2.4:**Chapter Summary.

2.1 Theoretical Review

A multi-theoretical approach was adapted in this research to explain market liquidity which exhibits five characteristics: tightness (width), immediacy, depth, breadth, and resiliency. This research focused on the width and depth aspect of market liquidity with the trading quantity theory and the transaction cost theory anchoring this research. The trading quantity theory provides further understanding on the depth aspect of liquidity measured in this research using the trading volume. The width aspect of liquidity was further elaborated by the transaction cost theory.

2.1.1. Trading Quantity Theory

Easley and O'Hara (1987) developed the trading quantity theory which looks at the size of a trade at a particular price arguing that informed investors preferred trading large stock amounts at a specific price. Market makers on the other hand develop pricing strategies which are dependent on the size of the trade whereby smaller trades are traded at favorable prices when compared to larger trades which is a disadvantage to the investors. Under the trading quantity theory price impact which is the demand pressure of an asset in the market is an important source of liquidity. The likelihood of buying or selling huge amounts of stocks in the quickest time possible by investors without a significant change in price in the market is described by demand pressure (Sloman and Kelvin, 2007).

The intensity of price impact is determined by the market liquidity level whereby markets with higher liquidity exhibit lower price impact. In markets where the liquidity is low the equilibrium of demand and supply is distorted when large market orders are placed by investors which leads to price changes. A scenario is observed where the prices increase for an investor in a long

position and prices decrease if an investor has a short position. Information can also influence price impact whereby if an investor buys or sells a significant number of stocks suddenly other investors may perceive that the investor has informational advantage, and this may cause pressure on the price of a stock. This type of price impact does not hold very long in efficient markets as prices readjust accordingly due to the existing demand and supply forces (Hubbard and Obrien, 2009).

Opportunity costs and financing costs are also incurred by a stock market investor because of demand pressure which is brought about by the intention to match his/her trades to a potential buyer in the market where the investor is selling and a potential seller where the investor is buying. The alternative to this is whereby the investor transacts with a dealer but at a cost due to fees charged and compensation for inventory risk (Sloman and Kelvin, 2007). A dealer is exposed to inventory risk when they take ownership of the stocks bearing the risk that there is a likelihood that changes in stock price might occur in the future, and they require compensation for this uncertainty which is reflected in the bid and ask prices quoted. The bid ask spread has a positive correlation with the risk of holding stocks. Low liquidity in the market is characterized by higher bid/ask spreads which is an indication of higher risk in holding stocks (Fama and MacBeth, 1973). Opportunity costs are brought about when an investor must wait for a counterpart in the market to complete a trade or when an investor is waiting for an opportunity to execute a trade.

Trading volume is a preferred measure of trading quantity which is number of traded shares at a particular time where the higher the volume the shorter the time required to trade a particular number of stocks. This measure was further developed to the turnover ratio which is a ratio of the volume of shares traded to the outstanding number of shares of that stock. Trading ratio can be used to compare liquidity between different stocks making it a more preferable measure than trading volume. A high turnover ratio is preferred as it demonstrates that stocks can be traded quicker with fewer cost implications and time delays characterized by lower bid ask spreads (Chordia, Subrahmanyam and Anshuman, 2011). The relevance of this theory to this study is that it explains depth aspect of the stock market a dimension of liquidity that will be measured by trading volume. The limitation of this theory is that it only explains one dimension of market liquidity depth, hence must be complemented with another theory that explains the breadth aspect of market liquidity which will be measured in this research. The impact of derivatives trading on the depth aspect of underlying stock liquidity will be assessed in this research.

2.1.2. Trading Cost Theory

Amihud and Mendelson (1986) came up with this theory that looks at trading costs that are

incurred because of trading stocks. Trade associated costs can either increase or decrease because of changes in the time of transactional costs. Frictions are expected in real markets that affect asset prices and hence their incorporation in dictating them is important. The larger the bid-ask spread of a stock the higher the return of the stock (Amihud and Mendelson, 1986). Short term investors prefer more liquid stocks than long term investors due to transaction costs resulting in segmentation of the market (Amihud and Mendelson, 1986).

Amihud and Mendelson (1986) found that a positive concave relationship exists between expected stock returns and transaction costs also confirmed by the fact that investors who hold stocks for longer periods can get a premium exceeding the transaction costs incurred from holding stocks with higher spreads. While investors who hold stocks for shorter periods are more vulnerable to costs incurred due to frequent transactions for these costs can be depreciated over the total holding period for their long-term counterparts.

Transaction costs are recognized as a substantial determinant of investment performance as they affect net gains and are closely related to market liquidity (Kociński, 2014). There are three major sources of transaction costs in investment management that are considered commissions which is the amount of money paid to the brokerage firm (those incurred by market agents to monitor movements referred to participation costs and execution costs for each transaction), market impact costs which are dependent on how a transaction is carried out and bid ask spreads which is the difference between the quoted buy and sell order price (Kociński, 2014).

Breadth which is a market impact cost refers to the intensity of the trading volume impact on the price of a security (Kyle, 1985). It is the smooth functioning of a market that enables trading of a given volume of securities without the significant influence on share prices (Priyanka, B. G., and Y. V., 2020). Price impact measures are used to measure the aspect of breadth. Amihud's Illiquidity Ratio is regarded as the best price impact measure (Goyenko, Holden and Trzcinka, 2009).

Even though trading costs make up a small fraction of the value of a transaction, over the long term they can significantly lower the return attained by an investor. These costs cause a significant difference between the buying price and selling price of an asset which have a direct effect on a trader's profit. These costs contribute to the existence of frictions in the stock markets which affect the liquidity of a market as they affect the trading price. Markets that are less liquid are characterized with high transaction costs when compared to markets with lower transaction costs (Atkins & Dyl, 2007). Since transaction costs cannot be eliminated and form an integral component of market microstructure it is important that they are managed (Amihud & Mendelson, 2013). The relevance of this theory to this study is that it explains the breadth aspect of the stock market a dimension of liquidity measured by the Amihud price impact measure. This theory explains the width and breadth aspect of liquidity but does not explain the depth aspect of

liquidity which was explained using the trading quantity theory. The impact of derivatives trading on the breadth aspect of underlying stock liquidity will be assessed in this research.

2.2 Empirical Review

This section was structured according to the scope of studies done globally, regionally and in Kenya that relate to the field of liquidity in stock markets, the functioning of derivative markets and the impact derivatives trading has on liquidity of underlying stocks. There has been a considerable amount of debate regarding the impact derivatives have on the liquidity of the underlying asset. This has sparked interest among market regulators and investors to study the link between stock futures and underlying liquidity in the spot market. Important to note is that the findings with which researchers have come up with have been very conflicting. With the conclusion of whether the onset of derivatives has caused a decrease or increase in the liquidity levels of underlying stocks remaining inconclusive. This formed the basis for the study establishing whether derivatives trading has an impact on the liquidity of underlying stocks in the Kenyan context. The researcher investigated the concept of market liquidity, the measures used to measure liquidity and finally study research done previously on the impact that derivatives trading has on liquidity of underlying stocks.

Liquidity is a critical component of financial market development as it serves to deepen and strengthen financial markets (Wyman,2016). Black (1971) states that a liquid market is one that ensures the trading of securities of any quantity in a relatively short time at prices that are close to their market price. It plays a key role to market participants. For investors liquid markets are associated with lower trading costs, improved price formation and lower price volatility, liquid markets are also attractive for issuers as they reduce the cost of raising capital and provide share price valuations that are more accurate, for stock exchanges increased attractiveness to investors and issuers translates to greater utilization of the market. This increases the ability to attract new participants which drives revenues through trading fees and extension of their product offering (Wyman, 2016). This explains why improving liquidity in financial markets is a main objective for issuers, investors, exchanges, and market regulators. Liquidity is defined as the time and cost which are associated with the liquidation (or purchase) of a given quantity of financial securities (Narasimhan & Karla 2014). Wuyts (2007)) describes liquidity as the ability to trade large quantities of a security quickly at a low cost without moving the price.

2.2.1 Market Liquidity

Market liquidity which is also known as the marketability of a security refers to the ease with which a security can be exchanged at a given price and is an essential component of equity markets. Regulators, firms, and market participants consider a consistent level of market liquidity to be relevant as it regulates the cost of raising capital, ensures continuity in trades at desired prices which are important in ensuring the frictionless functioning of the equity market by enhancing the flow of information that is specific to market participants which promotes efficiency and stability in the stock markets (Priyanka, B. G., and Y. V., 2020).

Market liquidity has been described in multiple ways by existing literature and continues to be key research are in finance as it plays an important role in portfolio formulation, forecasting portfolio returns that are accurate and development of trading strategies(Priyanka, B. G., and Y. V., 2020). Liu (2005) describes market liquidity as the ability to execute trades in large quantities without any delay in time and major influence on the price whereas Hasbrouck and Schwarz (1988) define it as the immediacy with which a trade is executed. Panayides Panayides, Lambertides & Cullinane (2013) on the other hand define market liquidity with reference to the cost aspect which is trading a security at a lower cost in relation to its actual cost (worth). Finally, market liquidity can be easily understood in terms of five aspects namely: tightness which is the cost incurred in trading a security, breadth which is the intensity of trading volume impact on the price of a security, depth which is the quantity of traded securities, immediacy the time take to execute a trade and resiliency which is the ability of security prices to recover after a shock in the liquidity (Kyle,1985). Market liquidity has in the past been examined using numerous measures due to its multidimensional nature which is captured in terms of depth, breadth, tightness, immediacy, and resiliency. Each of these dimensions capture aspects of market liquidity that are distinct in different market conditions and systems (Chai, Faff, and Gharghori, 2010).

2.2.2 Dimensions of Market Liquidity

Depth refers to the availability of many orders in the market which aids in maintaining an equilibrium in the market price of a security and is a prerequisite for the existence of a deep market (Priyanka, B. G., and Y. V., 2020).It is assessed by the turnover rate (turnover ratio) which is calculated by dividing the total number of shares traded with the total number of outstanding shares (Lo& Wang 2000). The trading volume defined as the quantity of shares per given time is also used to assess the depth aspect. The higher the share turnover the more liquid the shares of a company are. Breadth is the intensity of the trading volume impact on the price of a security (Kyle, 1985). It is the smooth functioning of a market that enables trading of a given volume of securities without the significant influence on share prices (Priyanka, B. G., and Y.

V., 2020). Price impact measures are used to measure the aspect of breadth. Amihud's Illiquidity Ratio is regarded as the best price impact measure (Goyenko, Holden and Trzcinka, 2009). This price impact measure is given by the average daily ratio of absolute return of stock to the daily volume over a period of time. This measure is based on the observed price changes associated with trades. (Narasimhan & Kalra, 2014).Amihud's illiquidity ratio exhibits the movement in the security prices due to changes in in the volume. Its main advantage over other measures is that its construction is simple, as it uses absolute value of the daily return-to-volume ratio to capture price impact Lou & Shu (2016) and it has a positive relation that is strong with expected stock return (Amihud 2002;Chordia, Huh, and Subrahmanyam, 2009).

Tightness also referred to as the width aspect of market liquidity is assessed by the cost of trading incurred by a trader while executing a trade measured by the bid-ask spread whereby a minimal bid-ask spread is preferred which is an indicator of higher stock liquidity. The bid ask spread is the common transaction cost measure used. It is the cost of executing a small trade and is also known as the immediacy cost as it is incurred when investors want to execute a trade immediately. It is the difference between ask price at which an investor is willing to sell a security and bid price at which the investor is willing to purchase a security (Narasimhan and Karla, 2014). One of the factors that influence the difference between the ask and bid prices is liquidity measured by the volume of stocks traded daily. The spread is usually less than 1% of the price per share for large stocks that are traded actively which is inversely related to the trading activity amount in the stock whereby stocks that tend to have a greater spread have less trading volume (Kociński, 2014). In markets where trades are not executed at quoted bid-ask prices the Relative Quoted spread is used as a measure of tightness where daily spread is expressed as a percentage of the bid and ask prices midpoint (Yilmaz, Erdem and Eraslan,2015).

Immediacy is the time taken to execute a trade (Kyle,1985). The execution time required for a transaction is dependent on the willingness of both parties to transact the stated quantity of a security without any time delay in time at the price quoted (Priyanka, B. G., and Y. V., 2020).The Coefficient of Elasticity of Trading is an immediacy measure that depicts the execution speed of a trade that is represented using percentage change in trading quantity for a percentage change in share price (Wanzala, 2018).

The Hui-Heubel (Lhh) liquidity ratio attempts to capture the resiliency aspect of market liquidity that relates to the volume of trades to their impact on prices. Resiliency is the ability of security prices to recover after a shock in the liquidity (Kyle,1985). This ratio uses the turnover ratio (traded volume to the outstanding volume) in the denominator. The lower the Liquidity ratio the higher the liquidity of the asset (Sarr and Lybek, 2002). For this research two aspects of liquidity were measured that is the depth aspect (trading volume) and the breadth aspect (Amihud price impact measure).

2.2.3 Derivatives

A derivative security is a financial contract whose value is derived from the value of an underlying asset (Chui,2012). It gives the holder the obligation or choice to buy or sell underlying assets at a certain future time. Underlying assets can be any commodity or financial asset like fixed-income instruments, commodities, equities, equity index, foreign currencies (Kamrul & Shabyashachi, 2011). The underlying asset determines the value of the derivative contracts which can be derived from interest rates, commodity prices, equity prices and exchange rates (Chui, 2012). They are a powerful tool for limiting risks that individuals and companies are facing in their ordinary course of business (Haiss & Sammer, 2010).

Derivatives play a valuable role in financial markets as they help markets move closer to completeness (Kolb,2003). This is because they can be used to hedge market exposure in the case of forwards and futures, to transform the nature of an exposure in the case of swaps, to retain upside potential while obtaining downside protection to an exposure in the case of options and in case of events like default they can be used to obtain insurance against such events which is the case for credit derivatives (Sundaram,2012). There are two categories of participants in the derivatives market: Hedgers who enter a derivative contract to protect the value of their assets or liabilities against adverse changes and speculators who enter a derivative contract to profit from anticipating changes in market rates or prices (Chui,2012). A derivatives market that is well-functioning can offer a variety of benefits such as improved liquidity. This could be due to increased interaction between the derivative market and underlying stocks, improved opportunities for hedging and risk transfer, and potentially enhanced price discovery for the underlying assets(Wyman,2016).

There are four main types of derivatives contracts: options, swaps, forwards, and futures. Investors can buy or sell derivative contracts on exchange or over the counter (OTC) market (Kamrul & Shabyashachi, 2011). A futures or forward contract is an agreement to buy or sell a specified quantity of an asset at a specified price with delivery at a specified date in the future (Chui,2012). There are key differences between futures and forwards which include: Futures traders can realize their gains and losses daily while trading in forwards requires cash settlement at delivery, forwards are customized to meet the needs of the counterparties which is mostly done over-the counter while futures contracts are standardized, regulated, and settled through a clearing house (exchange-traded) (Chui,2012).

Options are financial derivatives that give the holder the right to realize the same option over a specific time period and are categorized as either put option which gives the right to sell the underlying asset or call option which gives the right to buy the underlying asset at a specified price within a specified time in the future (Dejanovski, 2014). In the case of European type

options, the conversion must be done on the specified day of delivery (expiration date) upon signing of the contract while for American type options the conversion can be done before the contract expiry date (Dejanoski, 2014).

Swaps are agreements to exchange a series of cash payments either charged on fixed or floating interest rates determined by the contract terms for a stated period between two counter parties (Chui,2012). They are over-the-counter contracts like forwards but differ in that the counterparties in a swap commit to multiple cash flow exchanges over several dates in the future which is not the case for forwards which involves a single trade or single exchange of cash flows (Sundaram, 2012).

2.2.4 Impact of derivatives trading on the liquidity of equity markets

The introduction of derivatives to enhance liquidity is an approach that has been adopted in both global exchanges like the Indian stock market which launched futures and contracts in the BSE Sensex and S&P CNX Nifty Index on the Bombay Stock Exchange (BSE) Narasimhan & Kalra (2014) and African exchanges like JSE which established a derivatives market to further develop the financial system, manage risk, and meet the challenges of globalization (Adelegan, 2009).

Previous research on the impact of derivatives trading on the underlying asset has yielded mixed results with some concluding through their analysis that liquidity and volatility of underlying stocks declined like Narashiman & Karl (2012) who through their study on stocks in India examined the impact of changes in aggregate market liquidity on stocks in which derivative trading was allowed by studying the impact of derivative trading on the liquidity beta of underlying stocks. They observed that even though the liquidity of the market declined after the introduction of derivatives trading, the impact of changes in the market liquidity of stocks was crucial in asset pricing. They found that the negative value of liquidity beta had increased after derivative trading introduction which resulted in an increase in the sensitivity of liquidity shocks on asset prices.

Han (2014) also through his study on the Hong Kong Stock Market observed that the futures market reduced spot market volatility by providing new information to the market revealing that the impact on volatility was dependent on the quality of new information generated by trading of derivatives. His research investigated the impact of futures and options markets on the volatility of the underlying spot market focusing on their persistence over time. He also noted that the futures market reduces spot market volatility by providing new, material information, but options market generates noisy information which results in increase in volatility and decrease in its sensitivity to price change.

Singh and Kansal (2010) studied the impact derivatives trading has on the volatility of the Indian

stock market using the NSE S&P CNX Nifty index. From their findings they observed that the impact that trading of derivatives had on the volatility of the stock market return was significant and had declined post derivative introduction. They noted however that the decline in the volatility in the S&P CNX Nifty index was not because of derivative trading only but also attributed to the futures markets having lower transaction costs, attraction of new traders, new information was transmitted faster to the spot market and the existence of a favorable financial market environment.

In addition, researchers Thenmozhi (2002) and Raju & Karande (2003) observed that derivatives trading decreased volatility of underlying stocks in India after the introduction of derivatives which contrasts with Antoniou & Holmes (1995) who observed increase in volatility associated with increase in sensitivity, which they attribute to increased information flow in their study of the FTSE-100 Stock Index Futures contract using GARCH.

Gygax, Liu and Long (2006) analyzed the liquidity effects on the underlying stocks following the introduction of the single stock futures (SSF) contracts on the One Chicago exchange. Their study revealed that after controlling determinants that caused changes in spread average proportional spreads increased significantly supporting the hypothesis that stock spreads may widen because of the migration of uninformed traders to the futures market with the aim of reducing their adverse selection costs. A reduction in the liquidity of SSF stocks permanently was documented because of the significant increase in the spreads of the stock three moths post the introduction period.

In contrast, some researchers have also found that trading volume which is a measure of liquidity increased after the introduction of derivatives. Bhaumik and Bose (2007) studied the impact of derivatives trading on emerging capital markets using India as a representative by analyzing the impact that the expiration of futures contracts had on the cash market at the Indian bourse. Their findings revealed that on expiration weeks and specific expiration days the trading volumes were significantly higher when compared to weeks where futures expiration did not occur.

Fang and Xu (2007) discovered that the introduction of stock index futures increased the trading volumes in stock markets by carrying out a comparative study in Korea, India, and China's Taiwan region. They noted however that there was no notable change both in the short term and long term in trading volume growth rate before and after stock index futures were listed.

In support of this, Fedenia and Grammatikos (1992) found that the bid-ask spreads in stock markets narrowed after derivative listing which reduced the bid-ask bounce in stock prices and stock return variance. Market makers could hedge their risks more efficiently which allowed them to narrow the spreads they charged in the market.

Mixed results have also been observed by researchers like Narasimhan and Karla (2014) who by

studying sixty listed stocks at the National Stock Exchange of India (NSE) for which futures and options were allowed during the period 2001 to 2003 were considered for the analysis. They were able to examine the short-term (one month pre- and post-listing) and long-term impact (one year pre- and post-listing). Their findings revealed a shift in the volume from the cash market to the derivative market, decline in the number of traded, increase in illiquidity of stocks in the short run and lower volatility after the introduction of derivative trading. They also observed that the impact of derivative trading on long-term liquidity depended on the level of liquidity prior to derivative trading introduction whereby liquidity of illiquid stocks was significantly improved after derivative listing.

Kamrul and Shabyashachi (2011) examined the volatility and liquidity effect of the underlying stock after the introduction of index options by collecting data from the stock markets of India, Korea, Taiwan, Hong Kong, Japan, Thailand, Malaysia, and Singapore. To examine the conditional volatility of intraday returns they applied the GARCH model and examined the liquidity effect through the t-test and Wilcoxon Signed Rank Test. They observed that the persistence of conditional volatility for all the selected stock markets increased dramatically with derivatives trading. As for liquidity effects, mixed results were observed with Hong Kong, Japan, Korea, Taiwan and Thailand markets becoming more liquid with increased trading volume in the post options period while India, Malaysia and Singapore stock markets exhibited no liquidity effects in the post-option period.

Martin T. Bohl, Diesteldorf & Siklos (2014) using GARCH models in their study examined whether an impact on the underlying spot market volatility in mainland China, Singapore and Hong Kong had been observed upon the introduction of Chinese stock index futures. Their findings revealed that spot market volatility in the three spot markets decreased upon the introduction of Chinese index futures. They went further to compare their findings for mainland China with Chinese index futures traded in Singapore and Hong Kong. An interesting observation was that the companion index futures markets in Hong Kong and Singapore did not exhibit decreased spot market volatility which could be attributed to the fact that China's stock market was relatively young and largely dominated by private retail investors compared to that of both Singapore and Hong Kong.

Chen and Zhang (2015) using the CSI 300 index as their proxy and Shanghai and Shenzhen 300 stock index futures as subjects examined the impact the Chinese stock index futures had in the Chinese stock market. Their study revealed that the index futures did not have a significant effect on the spot market volatility. They noted however that a co-integration relationship existed in the short term and long term. In short term the reaction of the market to information was quicker in the spot market following the introduction of stock index futures due to low transaction costs, good leverage, and market liquidity. In the long-term spot market pricing still dominated.

In South Africa, Beer (2008) through his event study evaluated thirty-eight South African companies in terms of a possible price, volume, and volatility effect due to the initial trading of their respective single stock futures contracts. The study revealed that SSF trading had little impact on the underlying share prices and a reduction in the level and changes in the structure of spot market volatility. A normalized volume comparison pre to post SSF trading showed a general increase in spot market trading volumes using a GARCH(1,1) model establishing a volatility structure (pattern of behavior) per company.

Research has also been done in Kenya on the impact that derivatives trading has on the stock markets. Mbithi (2011) examined the impact of introduction of financial derivatives trading on the volatility of Nairobi Stock Exchange using the NSE 20 index as the proxy of stock market return using the ARCH/GARCH technique. The findings suggested that derivatives trading would result in reduced volatility having a positive impact on the economy of Kenya. Mugambi (2014) carried out a study to establish the perceived benefits derived from the equity derivative market. The researcher went further to investigate the measures that could be adopted and the critical success factors that would affect the adoption of an efficient and successful equity derivatives market in Kenya. The study concluded that equity derivatives would create efficiency in the capital markets which was because of increased market scrutiny and price discovery mechanisms. The instruments would also reduce transaction costs, investor risks and market volatility offering a variety of investment opportunities to local and international investors as increasing stability and liquidity in the capital markets. With reference to previous research done on the impact derivatives trading has on the liquidity and volatility of the underlying asset the following null hypothesis will be tested.

H_{o1}= Derivative Trading does not impact the liquidity of the underlying stock in the short run.

H_{o2}= Derivative Trading does not impact the liquidity of the underlying stock in the long run.

2.2.4 Research Gap Matrix

Authors & Year of Study	Objective of the study	Model Applied	Main Findings and Conclusions	Knowledge Gaps
Narasimhan and Karla (2014)	Examine the short-term and long-term impact of derivative trading on the liquidity of underlying stocks using the price measure impact of liquidity in India for the period 2001-2003	Price Impact	Findings revealed a shift in the volume from the cash market to the derivative market, decline in the number of traded, increase in illiquidity of stocks in the short run and lower volatility after the introduction of derivative trading.	Characteristics of the derivatives market in India and Firms in India defer from Kenya. This presents a geographical gap which will be covered by this research as it is based on the exchange in Kenya.
Narasimhan and Kalra (2012)	Examined the Impact of derivative trading on the liquidity beta of underlying stocks in India.	Liquidity Beta	They found that the negative value of liquidity beta had increased after derivative trading introduction which resulted in an increase in the sensitivity of liquidity shocks on asset prices.	Characteristics of the derivatives market in India and Firms in India defer from Kenya. This presents a geographical gap which will be covered by this research as it is based on the exchange in Kenya.
Bhaumik and Bose (2007)	Studied the impact of derivatives trading on emerging capital markets using India as a representative by analyzing the impact that the expiration of futures contracts had on the cash market	Trading Volume	Their findings revealed that on expiration weeks and specific expiration days the trading volumes were significantly higher when compared to weeks where futures	Characteristics of the derivatives market in India and Firms in India defer from Kenya. This presents a geographical gap which will be covered by this research as it is based on the

	at the Indian bourse		expiration did not occur.	exchange in Kenya.
Fang and Xu (2007)	Carried out a comparative study in Korea, India, and China's Taiwan region.	Trading Volume	Discovered that the introduction of stock index futures increased the trading volumes in stock markets	Characteristics of the derivatives market in India and China and Firms in India defer from Kenya. This presents a geographical gap which will be covered by this research as it is based on the exchange in Kenya.
Gygax, Liu and Long (2006)	Analyzed the liquidity effects on the underlying stocks following the introduction of the single stock futures (SSF) contracts on the OneChicago exchange.	Bid-Ask Spread	Their study revealed that after controlling determinants that caused changes in spread average proportional spreads increased significantly supporting the hypothesis that stock spreads may widen because of the migration of uninformed traders to the futures market with the aim of reducing their adverse selection costs	Characteristics of the derivatives market in the OneChicago Exchange. This presents a geographical gap which will be covered by this research as it is based on the exchange in Kenya.
Fedenia and Grammatikos (1992)	Identified a trade-off between the benefits of increased liquidity and the cost of informational externalities.	Bid-Ask Spread	Found that the bid-ask spreads in stock markets narrowed after derivative listing which reduced the bid-ask bounce in stock.prices and stock return variance.	Geographical Gap and the study focused on Options listing. The geographical gap will be covered by this research as it is based on the exchange in

			Highly liquid stocks tend to have spread increases, while illiquid stocks experience spread decreases	Kenya and study will focus on the SSF trading.
Beer (2008)	Evaluated thirty-eight South African companies in terms of a possible price, volume, and volatility effect due to the initial trading of their respective single stock futures contracts.	GARCH Model	The study revealed that SSF trading had little impact on the underlying share prices and a reduction in the level and changes in the structure of spot market volatility. A normalized volume comparison pre to post SSF trading showed a general increase in spot market trading volumes using a GARCH(1,1) model establishing a volatility structure (pattern of behavior) per company.	The study focused on accessing the impact that SSF trading had on Volatility while this study will focus on the impact SSF trading has on Liquidity of underlying stocks.
Kamrul and Shabyashachi (2011)	Examined the volatility and liquidity effect of the underlying stock after the introduction of index options by collecting data from the stock markets of India, Korea, Taiwan, Hong Kong, Japan, Thailand,	GARCH Model t-test Wilcoxon Signed Rank Test	They observed that the persistence of conditional volatility for all the selected stock markets increased dramatically with derivatives trading. As for liquidity effects, mixed results were observed with Hong Kong, Japan,	Characteristics of the derivatives market in India, Korea, Taiwan, Hong Kong, Japan, Thailand, Malaysia, and Singapore defer from that of Kenya. This presents a geographical gap which will be covered by this research as

	Malaysia, and Singapore.		Korea, Taiwan and Thailand markets becoming more liquid with increased trading volume in the post options period while India, Malaysia and Singapore stock markets exhibited no liquidity effects in the post-option period	it is based on the exchange in Kenya.
Chen and Zhang (2015) Martin T. Bohl, Diesteldorf and Siklos (2014) Han (2014) Singh and Kansal (2010)	Studied the impact of derivatives trading on volatility of spot markets	Volatility Measures		Studies focused on the aspect of Volatility and not liquidity in different jurisdictions which will be covered by this research as it is based on the exchange in Kenya.
Mbithi (2011)	Examined the impact of introduction of financial derivatives trading on the volatility of Nairobi Stock Exchange using the NSE 20 index as the proxy of stock market return.	ARCH/GARCH	The findings suggested that derivatives trading would result in reduced volatility having a positive impact on the economy of Kenya. Study focused on the impact that derivatives trading would have on volatility.	Study done before the introduction of derivatives at the NSE. The research period for this study covers post launch of a derivatives market in Kenya.
Mugambi (2014)	Carried out a study to establish the perceived benefits derived from the equity derivative market.		The study concluded that equity derivatives would create efficiency in the capital markets, reduce	Study done before the introduction of derivatives at the NSE. The research period for this study covers post

			transaction costs, investor risks and market volatility. Study focused on the impact that equity derivatives would have on the capital markets	launch of a derivatives market in Kenya.
Kahihu (2016)	Carried out a study to assess stock market liquidity and asset returns: The case of the NSE 20 share index.	Amihud's Illiquidity Ratio	The results show that there is a positive relationship between market illiquidity and returns which suggests that the excess returns contain a compensation for illiquidity.	The focus of the study was not the impact of derivatives trading on the liquidity of underlying stocks. The Amihud illiquity ratio will be used in this research to measure liquidity.

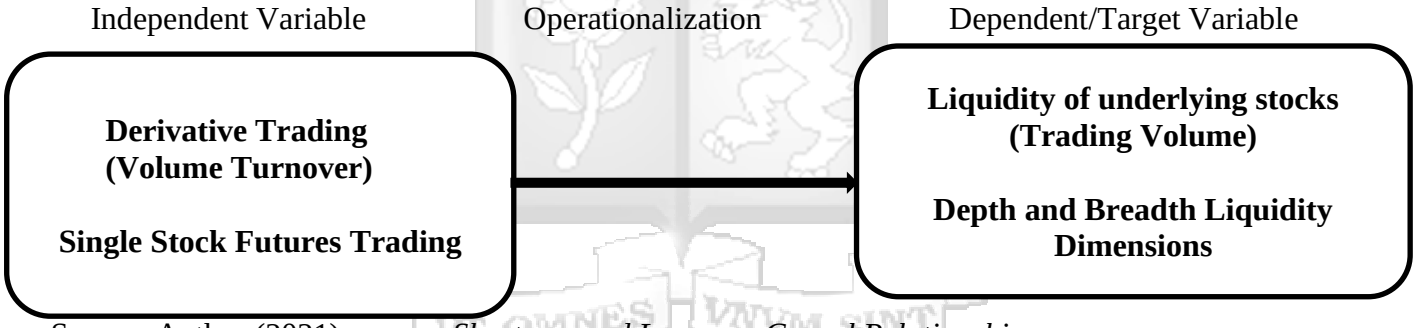
Table 2: Summary of empirical review and gaps

There has been a considerable amount of debate regarding the impact derivatives have on the liquidity of the underlying asset. Several researchers have come up with very conflicting findings which are quite inconclusive as to whether derivative trading has an impact on underlying stocks with some arguing that it decreases liquidity and volatility like Narashiman & Karla (2012); Han (2014); Singh & Kansal (2010); Thenmozhi, 2002; Raju & Karande, (2003). This contrasts with Bhaumik &Bose (2007); Fang & Xu (2007); Fedenia & Grammatikos (1992) whose research results indicate an increase in liquidity of the underlying stocks. Mixed results have also been observed by researchers Narasimhan & Karla (2014); Kamrul & Shabyashachi (2011); Martin T. Bohl, Diesteldorf & Siklos (2014); with some arguing that derivatives trading has no impact on the underlying asset Chen & Zhang (2015) and Beer (2008).The existence of an inconclusive debate regarding whether derivatives trading increases or decreases the liquidity of underlying stocks and the fact that research that relates to derivatives trading in frontier markets is still very narrow formed the basis of this research study. Mbithi (2011) and Mugambi (2014) carried out research relating to the impact of the introduction of derivatives to the NSE and the benefits accrued from the introduction of derivatives however these studies were done before the launch of the derivatives market in Kenya in July 2019. Liquidity was measured using Amihud's Illiquidity Ratio which is regarded as the best price impact measure (Goyenko, Holden and Trzcinka, 2009). Hasbrouck (2009) also showed that the price-impact measure is the best available liquidity

measure when using daily data which this study intends to use complemented by trading volume as a measure of liquidity. The study also evaluated the existence of short run and long run causality between derivatives trading and liquidity of underlying stocks using a Vector Autoregressive Model. Finally, the research further evaluated the views from derivatives market participants on the impact derivatives trading has on the equity market. This study aims to add to and complement the extensive research that has been done globally that has primarily focused on developed markets and emerging markets.

2.3 Conceptual Framework

The conceptual framework displayed the expected relationship between the variables derivatives trading, and liquidity of underlying stocks identified for this research. This was used to study whether there exists a causal relationship between the independent variable and dependent/target variable. Derivative trading measured by volume turnover (number of contracts traded) is the independent variable used and liquidity of underlying stocks measured by trading volume is the dependent variable used to answer the research objectives.



Source: Author (2021)

Figure 1: Conceptual Framework

2.3.1 Operationalization of Variables

Involves the process of defining the identified variables as factors that are measurable. The dependent variable identified for this research was liquidity of underlying stocks measured by trading volume (depth aspect) and the Amihud Illiquidity Ratio (breadth aspect). The independent variable identified for this research was derivatives trading (single stock futures trading) measured by volume turnover.

2.3.1.1. Dependent Variable

Liquidity refers to the ease with which an asset can be sold immediately after purchase without lowering the price and without incurring transaction costs (Dalgaard, 2009). Several authors have measured liquidity of underlying stocks using different methods: Narasimhan &Karla (2012) used liquidity beta t; Narasimhan & Karla (2014) used price impact; Bhaumik & Bose (2007) and Fang & Xu (2007) used trading volume and Gygax, Liu & Long (2006) used the bid-ask spread. This research used Amihud's Illiquidity Ratio (breadth aspect) to measure liquidity which is regarded as the best price impact measure when using daily data (Goyenko, Holden and Trzcinka, 2009). Complemented by trading volume (depth aspect) which is a measure of liquidity.

2.3.1.2 Independent Variable

Derivative Trading which is the number of contracts that are exchanged at the derivatives market. This was measured by the volume turnover extracted from CMA Quarterly reports.

Variable	**Type of Variable**	**Indicators**	**Measure**	**Supporting Literature**
Liquidity	Dependent	Liquidity of underlying stocks	a. Amihud (2002) price impact measure $=\frac{1}{N}\sum_{i=1}^{N}\frac{\mathrm{R}\,i,d}{\mathrm{V}\,i,d}$ b. Trading Volume	a. Narasimhan and Karla (2014) b. Goyenko, Holden and Trzcinka (2009) c. Hasbrouck (2009) d. Kahihu (2016) e. Fang & Xu (2007)
Derivatives Trading (Single Stock Futures trading)	Independent	Derivative Transactions	Volume Turnover	a. CMA /NSE

Table 3: Operationalization of variables

CHAPTER THREE:

RESEARCH METHODOLOGY

3.0 Introduction

The purpose of this study was to determine the impact of derivative trading on the liquidity of underlying stocks listed at the Nairobi Securities Exchange (NSE). To answer the research questions and achieve the objective of the study, this chapter details the research methodology as follows: the research design, population, and sample; data collection tools that was used and the statistical techniques that were applied. This chapter was organized in the following sections: **3.1:** Research Philosophy; **3.2:** Research Design; **3.3:** Population of the Study; **3.4:** Sample Design and Technique; **3.5:** Data Collection Methods; **3.6:** Data Quality; **3.7:** Data Analysis; **3.8:** Ethical Considerations.

3.1 Research Philosophy

This research study adopted a positivism approach that utilized measurable quantitative data to answer the research problem objectively. Positivism relates to the philosophical stance of the natural scientist and entails working with an observable social reality to produce law-like generalizations (Saunders, 2009).When a positivism approach is used functional relationships can be derived between causal and explanatory variables by relying on the hypotheticodeductive method used to verify a priori hypotheses stated quantitatively (Park, Konge, and Artino 2020).The aim of this research is to evaluate the relationship between the independent variable (derivatives trading) and dependent variable (liquidity of underlying stock) to generate findings objectively that will be beneficial to derivative market stakeholders without influence from the researcher using secondary and primary data ensuring there is no bias to the subject of the research (Saunders, Lewis, & Thornhill, 2009). The research used quantitative data collection and analysis methods to study the impact of derivative trading on liquidity of underlying stocks at the NSE. This was also supplemented with quantitative data collected from derivative market participants to evaluate the impact of derivatives trading on the equity market.

3.2 Research Design

The strategy for collecting, deducing, and interpreting data adopted by the researcher is the research design (Creswell & Creswell, 2017). This study used a descriptive correlational research design to guide the analysis and collection of data. Descriptive research is defined as a process of data collection to test the hypothesis or answer questions concerning the current

status of the study (Mugenda & Mugenda, 2003). A quantitative approach was adopted based on the research objectives where both secondary data and primary data collected using likert scale was presented quantitatively. The objective of the descriptive correlational design approach is to describe the features of a phenomenon, or the way things are at a particular time (Kothari, 2008). This research design was helpful in obtaining data on the liquidity of underlying stocks at the NSE pre and post derivatives trading as well as determine the relationship between the two variables that is whether either one variable can be used to predict the other.

3.3 Population of the study

Kothari (2004) defines a population as the researcher's 'universe'. The target population of the study was 6 listed stocks that participate in derivatives trading whose stock futures were traded from 4th July 2019 to 31st December 2021 at the derivatives market (NEXT).

Number	Name of Company	First Time Listed on NEXT and Available to Trade	First Time Actually Traded on NEXT
1.	Safaricom Plc	4th July 2019	4th July 2019
2.	Kenya Commercial Bank Group Plc	4th July 2019	8th July 2019
3.	Equity Group Holdings Plc	4th July 2019	5th July 2019
4.	East African Breweries Ltd	4th July 2019	4th July 2019
5.	British American Tobacco Kenya Plc	4th July 2019	11th July 2019
6.	Absa Kenya (formerly Barclays Bank of Kenya)	20th December 2019	7th January 2020

Table 4: NSE Listed companies participating in derivatives trading

Source: NEXT 2021

3.4 Sample Design and Technique

The study population and sample were the same for this research which comprised of all six listed companies that participate in derivatives trading (unit of analysis). Companies whose stocks futures were traded from 4th July 2019 to 31st December 2021 at the NSE.

3.5 Data Collection Methods

Data collected for this study was from both primary sources and secondary sources with the nature of data collected being quantitative in nature. Secondary data constituting daily share closing price and daily trading volume for the stocks from July 4th, 2018, to December 31st, 2021, was collected from the Nairobi Securities Exchange database, Wall Street Journal and CMA Quarterly reports. The period for selected for the study was sufficient to cover one-year pre and post derivatives listing for each of the stocks whose futures participate in derivatives trading as derivatives trading started on the 4th of July 2019. Primary data was collected using questionnaires issued to derivative market participants representatives who for this research were NEXT trading accredited members as listed in the table below. Questionnaires were sent to the departments that deal in equities and derivatives trading from all the twelve accredited members. Information sought using the questionnaire was based on the individual experience that each of the accredited trading members had by participating in the derivatives market which was not information that could be collected from secondary sources. This information sought would provide further insight on the general working of the NEXT platform and Investor participation at the derivatives market.

Accredited Members	
1.	AIB-AXYS Africa
2.	EGM Securities
3.	Faida Investment Bank Ltd
4.	NCBA Capital
5.	Genghis Capital Ltd
6.	Dyer & Blair Investment Bank Ltd
7.	Kingdom Securities Ltd
8.	Kestrel Capital (EA) Limited
9.	African Alliance Securities
10.	SBG Securities Ltd CfC Stanbic
11.	Standard Investment Bank Ltd
12	Sterling Capital Ltd

Table 5: List of Next Accredited Trading Members

Source: NSE 2021

3.6 Data Quality: Validity and Reliability

Cooper and Schindler (2011) suggest that a good measurement tool is one which passes tests on validity, reliability, and practicability. Joppe (2000) defines validity as the ability of a test to measure what it intends to measure and reliability the extent to which results are consistent over time. The questions raised by this research study were designed to answer the main objective of this study which are also intended to produce consistent results with previous studies done investigating the impact of derivative trading on the liquidity of underlying stocks. The researcher carried out a pre-test before actual data collection is done using the primary data collection instrument (questionnaire) to test for relevance, interpretation of questions, proper wording, and clarity of the questions. Data was then analyzed using the Cronbach's Alpha Coefficient method where a correlation coefficient of 0.8 is desirable for reliability. The Cronbach's Alpha (α) Coefficient was interpreted as below:

1. Complete internal consistency: $\alpha = 1$
2. No internal consistency: $\alpha = 0$
3. The closer it is to 1: the higher the reliability

3.7 Data Analysis

According to Miles & Huberman (1994), data analysis consists of three concurrent flows of activity, namely data reduction, data display and conclusion drawing. The methods employed in data analysis mainly depend on the purpose of the study and the type of data collected (Cooper and Schindler, 2003).

The daily share prices and trading volume data collected were be prepared using Microsoft Excel and further analyzed using STATA. Liquidity was measured using Amihud's Price Impact measure and trading volume and derivatives trading was measured using the volume turnover. The Vector Auto Regression (VAR) model was employed to test the short run and long run causality between derivatives trading and the liquidity of underlying stocks. The diagnostic tests that were used were the unit- root test (Augmented Dickey-Fuller Test), Granger Causality test, the Johansen Test for cointegration and diagnostic tests to test for autocorrelation, normality, and stability of the VAR or VECM model.

The qualitative data collected using the issuance of questionnaires to the 12 NEXT accredited trading members was analyzed in the following steps: organization of the data using MS Excel. Processing of the data using STATA software and analysis of the data. The Likert scale was coded as shown in table 6.

1	Strongly disagree
2	Disagree
3	Unsure /Neutral
4	Agree
5	Strongly agree

Table 6: Likert Scale

3.7.1 Amihud (2002) Price Impact Measure

Amihud's illiquidity ratio was used to show the movement in the prices of securities which is because of changes in volume(Priyanka, B. G., and Y. V., 2020).The lower the Illiquidity ratio the higher the liquidity. The price impact measure of liquidity is given by the average daily ratio of absolute return of the stock to the daily volume over a period of time (Narasimhan & Kalra, 2014). Illiquidity Ratio is regarded as the best price impact measure when using daily data Goyenko, Holden and Trzcink (2009) as in this research daily trading volume and daily share closing price data was used. The computation is as shown:

Amihud (2002) Price Impact Measure

$$Illiq_{\,i,d} = \left| \frac{\mathrm{R}\,i,d}{\mathrm{V}\,i,d} \right|$$

$$Illiq_{\,i,d} = \frac{1}{N}\sum_{i=1}^{N} \frac{\mathrm{R}\,i,d}{\mathrm{V}\,i,d}$$

Where,

R $_{i,\,d}$ is the return for stock i on day d.

V $_{i,\,d}$ is the R volume for stock i on day d

N is the number of trading days in a month or a period

For this study the inverse relationship between liquidity and illiquidity was used in the analysis whereby the higher the illiquidity levels the lower the liquidity of the stocks and the lower the illiquidity the higher the liquidity of the underlying stock. This model was adopted from Narasimhan & Karla (2014) used Amihud's price impact to measure liquidity of underlying stocks. This measure of liquidity has been regarded as the best price impact measure when using daily data by several authors (Goyenko, Holden and Trzcinka, 2009).

3.7.2 Trading Volume

The trading volume defined as the quantity of shares per given time that are exchanged of a particular stock during a single day. It is used as technical indicator in accessing stock markets. This model was adopted from Bhaumik & Bose (2007) and Fang & Xu (2007) who used trading volume as a measure of liquidity in their studies. The computation is as below:

V= $\sum$ **Q** X **N** where V is volume traded.

Where,

V is volume traded

Q is quantity of shares

N is number of trading days in a month or a period

The higher the trading volume the more liquid the stock of a particular stock is.

3.7.3 The Vector Auto Regression (VAR) model

The Vector Auto Regression Model (VAR) was introduced by Sims (1980). A VAR system contains a set of variables that are expressed as a linear function of m lags of itself and of all the other variables in the system, plus an error term. VAR models have been used in past research to examine the existence of a short run and long run relationship between variables. This model was adopted from Obi, Anarfo & Obi (2019) who used the VAR and VECM model to study the short run and long run relationship between oil price and exchange rates. Farooq, Fabiha & Hasibul (2021) also used the VAR and VECM model to study the short-run and long-run dynamics of GDP and trade. VAR models have also been used in market liquidity studies like Chordia, Asani & Avanidhar (2003) carried out an empirical analysis of stock and bond market liquidity using a VAR model and Priyanka, B. G., & Y. V. (2020) used a VAR model i to establish the simultaneous relationships between liquidity dimensions. A bivariate VAR model containing the variables: liquidity of underlying stock (Ls) and derivatives trading (Ds) was used to test the short run and long run causality between derivatives trading and the liquidity of underlying stocks. Each variable was expressed as a linear function of m-lags of itself and of the other variable and an error term. The VAR model was as follows (assuming the variables are stationary and ergodic).

$$y_t = \beta_{y0} + \beta_{yy1}y_{t-1} + \cdots + \beta_{yym}y_{t-m} + \beta_{yx1}x_{t-1} + \cdots + \beta_{yxm}x_{t-m} + v_t^y$$

(Equation 1)

$$x_t = \beta_{x0} + \beta_{xy1}y_{t-1} + \cdots + \beta_{xym}y_{t-m} + \beta_{xx1}x_{t-1} + \cdots + \beta_{xxm}x_{t-m} + v_t^x$$

(Equation 2)

Where:

y_t - represents the monthly trading volume for each underlying stock Ls,

x_t - represents the monthly turnover of the underlying stock derivative Ds,

β_{xym}- represents the coefficient of y in the equation for x at lag m,

$v_t{}^y$ *and* $v_t{}^x$ - are the error terms that represent parts of y_t and x_t that are not related to past values of the two variables (the innovation or impulse term).

Equation (1 &2) could only allow us to make inferences on the short run relationship between the two variables. To examine the long run relationship between the variables a restricted VAR model known as the vector error correction model (VECM) was defined as below:

$$\Delta y_t = \beta_{y0} + \beta y_1 \Delta y_{t-1} + \cdots + \beta_{ym}\Delta y_{t-m} + \gamma_{y1}\Delta x_{t-1} + \cdots + \gamma_{yp}\Delta x_{t-m} - \lambda_y\,(y_{t-1} - \alpha_0 - \alpha_1 x_{t-1}) + v_t{}^y$$

(Equation 3)

$$\Delta x_t = \beta_{x0} + \beta_{x1}\Delta y_{t-1} + \cdots + \beta_{xm}\Delta y_{t-m} + \gamma_{x1}\Delta x_{t-1} + \cdots + \gamma_{xp}\Delta x_{t-m} - \lambda_x\,(y_{t-1} - \alpha_0 - \alpha_1 x_{t-1}) + v_t{}^x$$

(Equation 4)

Where:

$y_t = \alpha_0 + \alpha_1 x_t$ - is the long run cointegration relationship between the two variables

λx *and* λy – are the error-correction parameters that measure how y and x react to deviations from long run equilibrium.

3.7.4 Diagnostic Tests

3.7.4.1 Augmented Dickey-Fuller Test

A unit root test on each of the variables was performed to ensure they are all integrated of the same order. The Augmented Dickey-Fuller Test (ADF) was used to test hypothesis below:

H_o= Series has a unit root (not stationary)

3.7.4.2 Granger Causality Test

The causality test was carried to identify causal linkages between the variables. The hypothesis that was tested:

H_o= The independent variable does not granger cause on the dependent variable

The null hypothesis would be rejected based on the f-statistic and p-values.

3.7.4.3 Johansen Test for cointegration

The Johansen cointegration test was carried out to determine if the variables exhibit a long-run equilibrium relationship. The hypothesis that was tested:

H_o= There is no cointegration between the variables

3.7.4.4. Autocorrelation, Normality, and Stability tests

To assess the validity of the VAR and VECM model diagnostic tests were carried out to test for autocorrelation , stability, and normality of the residuals. The hypotheses tested:

H_o= There is no autocorrelation in the residuals.

H_o= The errors are normally distributed.

H_o= The VAR/VECM system is not stable.

3.7.4.5 Paired T-test

A paired t-test was carried out to determine whether the pre and post derivatives listing liquidity mean was the same. The hypothesis that was tested:

H_o= The mean of the paired differences equals zero.

3.8 Ethical Considerations

The researcher sought authorization to carry the research as required by the institution. The purpose for this research was strictly for academic purposes and to add to existing knowledge in this field.

CHAPTER FOUR:

DATA ANALYSIS AND INTERPRETATION

This chapter presents the sought data, the analysis done and the research findings. Data analysis was done with reference to the specific objectives and the selected variables for the study. The specific objectives for the study were **i.** To determine the short-run impact of Single Stock Futures (SSF) trading on the liquidity of underlying stocks at the NSE. **ii.** To determine the long-run impact of Single Stock Futures (SSF) trading on the liquidity of underlying stocks at the NSE. **iii.** To evaluate the views from key market participants on the impact of derivatives trading on the equity market. This chapter is organized in the following sections: **4.1:** Background Information ; **4.2:** Amihud Price Impact Measure of liquidity; **4.3**: Impact of Derivatives Trading on liquidity in short and long run ; **4.4**: The impact of derivatives trading on the equity market **4.5:** Chapter Summary.

4.1 Background Information

To meet the objective of the study, the research focused on listed companies whose stock futures were traded from 4th July 2019 to 31st January 2021 at the NSE. Daily share closing price and daily trading volume for the stocks from July 1st, 2018, to December 31st, 2021, was collected from the Nairobi Securities Exchange database, Wall Street Journal and CMA Quarterly reports. Primary data was collected through the issuance of a questionnaire with a 5-point Likert scale (Appendix 1) to NEXT trading accredited members who were the derivatives market participants selected for the study. NEXT accredited members were selected for the research as they interact with NEXT investors, clearing members, market regulators and have been participating in the equity market. Eight questionnaires covering eight representatives (person responsible for derivatives trading as a product in the firm) from each accredited trading member were duly filled and received out of the twelve questionnaires that were issued translating to a response rate of 66%. This was considered sufficient to enable the researcher to analyze the collected data whereby a 60% response rate is the goal of most researchers (Fincham,2008). After several follow-up attempts with the four unresponsive companies it became apparent that despite being approved by NEXT as accredited trading members, they had not started actively participating in the derivatives market which was a hindrance to answering the questionnaire as it would not reflect an accurate representation.

Description	Totals
Questionnaires Received	8
Questionnaires Issued	12
Response Rate	66%

Table 7: Questionnaire Response Rate

4.2 Amihud (2002) Price Impact Measure of liquidity

To answer the first and second research question the Amihud's price impact measure was used to measure the liquidity of stocks pre and post derivatives listing at the Kenyan derivatives market. The price impact measure of liquidity is constructed from daily data. It is given by the average daily ratio of absolute return of the stock to the daily volume over a period of time (Narasimhan & Kalra, 2014). The computation is as shown below:

Amihud (2002) Price Impact Measure

$$Illiq_{i,d} = \left| \frac{R_{i,d}}{V_{i,d}} \right|$$

$$Illiq_{i,d} = \frac{1}{N} \sum_{i=1}^{N} \frac{R_{i,d}}{V_{i,d}}$$

Where,

R i, d is the return for stock i on day d.

V i, d is the R volume for stock i on day d

N is the number of trading days in a month or a period

This measure captures the extent to which trading volume moves prices in the market (price impact of trading).The existence of lower price changes with high trading volume results in decrease in the ratio (illiquidity of stock decreases). The higher the illiquidity ratio the lower the liquidity of a stock. i.e., A stock with an illiquidity ratio of 0.8 has lower liquidity than a stock with an illiquidity ratio of 0.4 because its price will change by 0.8% for every 1 Ksh. turnover. Daily share closing price and daily trading volume data from July 1st, 2018, to January 31st, 2021, was collected from the Nairobi Securities Exchange database and Wall Street Journal. The stocks selected for the study were Safaricom Plc, Kenya Commercial Bank Group Plc, Equity Group Holdings Plc, East African Breweries Ltd, British American Tobacco Kenya Plc and Absa Kenya (formerly Barclays Bank of Kenya). Daily returns were calculated for each of the stocks which was used in computation of the Amihud price impact measure.

4.2.1.1 Liquidity of Listed Stocks Pre and Post Derivative Listing

The liquidity of stocks pre and post derivatives listing was computed for each of the listed stocks using the Amihud Price Impact Measure as shown in the table 8:

		Pre-Derivative Listing	Post Derivative Listing	Paired T-test P-Value *(One year pre and post derivatives listing)*
Safaricom Plc	**Average Returns**			
	One Year	0.00%	0.01%	
	Six Months	0.20%	0.11%	
	Amihud Illiquidity Measure			
	One Year	0.000000000077	0.000000000086	0.6264
	Six Months	0.000000000066	0.000000000080	
Kenya Commercial Bank Group Plc	**Average Returns**			
	One Year	-0.04%	-0.04%	
	Six Months	0.06%	0.26%	
	Amihud Illiquidity Measure			
	One Year	0.000000000335	0.000000000344	0.8933
	Six Months	0.000000000253	0.000000000373	
Equity Group Holdings Plc	**Average Returns**			
	One Year	-0.04%	-0.07%	
	Six Months	-0.01%	0.26%	
	Amihud Illiquidity Measure			
	One Year	0.000000005499	0.000000000398	0.2681
	Six Months	0.000000011436	0.000000000541	
East African Breweries Ltd	**Average Returns**			
	One Year	-0.02%	-0.07%	
	Six Months	0.11%	0.02%	
	Amihud Illiquidity Measure			
	One Year	0.000000015040	0.000000004116	0.0919
	Six Months	0.000000006554	0.000000002921	
British American Tobacco Kenya Plc	**Average Returns**			
	One Year	-0.06%	-0.24%	
	Six Months	-0.32%	0.01%	
	Amihud Illiquidity Measure			
	One Year	0.000000061000	0.000000043500	0.2714
	Six Months	0.000000054691	0.000000032972	
ABSA Kenya	**Average Returns**			
	One Year	0.09%	-0.12%	
	Six Months	0.22%	-0.26%	
	Amihud Illiquidity Measure			
	One Year	0.000000005100	0.000000011400	0.3153
	Six Months	0.000000006700	0.000000008600	

Table 8: Underlying Stock Liquidity and Returns Pre and Post Derivatives Listing

Safaricom Plc was listed at the derivatives market on the 4th of July 2019 which is the day it also started trading on NEXT. Daily share closing price and daily trading volume data was collected from the 3rd of July 2018 to 9th of July 2020 which covers one-year pre and post derivatives listing. The average returns increased one year post derivatives listing to 0.01% when compared to 0.00% pre derivatives listing. However, the average returns decreased to 0.11% from 0.20% when six months period pre and post derivatives listing was used. For the illiquidity measure, the illiquidity ratio increased both in the one year and six months period post derivative listing which shows a decrease in liquidity of Safaricom stocks.

Kenya Commercial Bank Group Plc was listed at the derivatives market on the 4th of July 2019 but started trading on NEXT on the 8th of July 2019. Daily share closing price and daily trading volume data was collected from the 6th of July 2018 to 10th of July 2020 which covers one-year pre and post derivatives listing. There was no change in the average returns one-year pre derivatives listing and one year post derivatives listing. However, the average returns increased to 0.26% from 0.06% when six months pre and post derivatives listing was used. For the illiquidity measure, the illiquidity ratio increased both in the one year and six months period post derivative listing which shows a decrease in liquidity of KCB stocks. .

Equity Group Holdings Plc was listed at the derivatives market on the 4th of July 2019 but started trading on NEXT on the 5th of July 2019. Daily share closing price and daily trading volume data was collected from the 4th of July 2018 to 10th of July 2020 which covers one-year pre and post derivatives listing. The average returns decreased one year post derivatives listing to -0.07% when compared to -0.04% pre derivatives listing. However, the average returns increased to 0.26% from -0.01% when six months pre and post derivatives listing was used. For the illiquidity measure, the illiquidity ratio decreased both in the one year and six months period post derivative listing period which shows an increase in liquidity of Equity stocks.

East African Breweries Ltd was listed at the derivatives market on the 4th of July 2019 which is the day it also started trading on NEXT. Daily share closing price and daily trading volume data was collected from the 3rd of July 2018 to 9th of July 2020 which covers one-year pre and post derivatives listing. The average returns decreased one year post derivatives listing to -0.07% when compared to -0.02% pre derivatives listing. The average returns also decreased to 0.02% from 0.11% when six months pre and post derivatives listing was used. For the illiquidity measure, the illiquidity ratio decreased both in the one year and six months post derivative listing period which shows an increase in liquidity of EABL stocks.

British American Tobacco Kenya Plc was listed at the derivatives market on the 4th of July 2019 but started trading on NEXT on the 11th of July 2019. Daily share closing price and daily trading volume data was collected from the 9th of July 2018 to 5th June 2020 which covers one-year pre and post derivatives listing. The average returns decreased one year post derivatives listing to -

0.24% when compared to -0.06% pre derivatives listing. However, the average returns increased to 0.01% from -0.32% when six months pre and post derivatives listing was used. For the illiquidity measure, the illiquidity ratio decreased both in the one year and six months period post derivative listing period which shows an increase in liquidity of BAT stocks.

Absa Kenya (formerly Barclays Bank of Kenya) was listed at the derivatives market on the 20th of December 2019 but started trading on NEXT on the 7th of January 2019. Daily share closing price and daily trading volume data was collected from the 4th of January 2019 to 8th January 2021 which covers one-year pre and post derivatives listing. The average returns decreased one year post derivatives listing to -0.12% when compared to 0.09% pre derivatives listing. The average returns also decreased to -0.26% from 0.22% when six months pre and post derivatives listing was used. For the illiquidity measure, the illiquidity ratio increased both in the one year and six months period post derivative listing period which shows a decrease in liquidity of ABSA stocks.

4.2.2 Summary of Liquidity of Listed Stocks Pre and Post Derivative Listing

In summary, the Amihud illiquidity ratio increased in the six months and one year period post derivatives listing for Safaricom, KCB and ABSA which shows a decrease in liquidity in their individual stocks. For Equity, EABL and BAT the illiquidity ratio decreased in the six months and one year period post derivatives listing which shows an increase in liquidity of their individual stocks. The decrease or increase in the liquidity of stocks indicated that a change was observed in the stock liquidity post derivatives listing . The change in liquidity post derivatives listing was further evaluated to answer the first and second objectives of the study which was determining the short run and long run impact of single stock futures (SSF) trading on the liquidity of underlying stocks at the NSE. That is whether the decrease or increase of liquidity of stocks post derivatives listing for Safaricom, KCB, ABSA, Equity, EABL and BAT can be explained by derivatives trading. A paired t-test was carried out to compare the mean of the underlying stock liquidity pre and post derivatives listing. For the six stocks the P-values were not less than 0.05 at 95% confidence interval which means that the null hypothesis was not rejected. That is the difference between the two variables (liquidity pre and post derivatives listing) for the one-year period was not statistically significant.

H_o= The mean of the paired differences equals zero.
H_a= The mean of the paired differences does not equal zero

4.3 Impact of derivatives trading on the liquidity of underlying stocks in the short run and long run

To answer the first and second research objective a bivariate vector autoregressive model containing the variables: liquidity of underlying stock (Ls) measured by trading volume and

derivatives trading (Ds) measured by turnover was used to test the short run and long run impact of derivatives trading on the liquidity of underlying stocks. That is whether there exists a causal relationship between derivatives trading and liquidity of underlying stocks in the short run and long run. The importance of evaluating the short run and long run dynamics is that liquidity of underlying stocks may not react instantaneously to a change in derivatives trading and vice versa. A lag may be experienced due to the availability of information affecting the reaction of the target variable hence the need to examine the long run relationship dynamics. The VAR system contained a set of the two variables each expressed as a linear function of p lags of itself and of the other variable, plus an error term. The Augmented Dickey Fuller test was used to examine the stationarity of the series before construction of the VAR model.

4.3.1. Unit root test: Augmented Dickey Fuller test

The research applied the Augmented Dickey Fuller test to examine the stationarity of the series. Each series was found to be stationary after first differencing using the Augmented Dickey Fuller test. The table below shows the results obtained from the Augmented Dickey Fuller test.

					1st Difference ***dstocks & dderivatives***		
		t-statistic	***5% critical value***	***p-value***	***t-statistic***	***5% critical value***	***p-value***
Safaricom	Volume stocks	-1.304	-3.000	0.6275	-5.274	-3.000	0.0000
	Volume derivatives	-2.715	-3.000	0.0714	-8.810	-3.000	0.0000
KCB	Volume stocks	-2.992	-3.000	0.0357	-5.895	-3.000	0.0000
	Volume derivatives	-3.717	-3.000	0.0039	-9.624	-3.000	0.0000
Equity	Volume stocks	-4.324	-3.000	0.0004	-7.304	-3.000	0.0000
	Volume derivatives	-2.335	-3.000	0.1608	-8.910	-3.000	0.0000
EABL	Volume stocks	-3.177	-3.000	0.0214	-6.658	-3.000	0.0000
	Volume derivatives	-2.482	-3.000	0.1198	-8.107	-3.000	0.0000
ABSA	Volume stocks	-2.866	-3.000	0.0495	-6.022	-3.000	0.0000
	Volume derivatives	-2.147	-3.000	0.2260	-3.251	-3.000	0.0172
BAT	Volume stocks	-3.641	-3.000	0.0050	-5.685	-3.000	0.0000
	Volume derivatives	-2.824	-3.000	0.0550	-8.329	-3.000	0.0000

Table 9: Augmented Dickey Fuller Test Results

The construction of a VAR model requires that the series is stationary at first difference. If the p-values are greater than 0.05 (P> 0.05), the series is nonstationary and if the p-values are less than 0.05 (P<0.05) the series is stationary. Also, if the absolute values of the t-statistic are greater than the 5% critical absolute values the series is stationary. In the table above the p-values of all variables shown in the second column before differencing are greater than 0.05 but at first difference the p-values shown in the fourth column are less than 0.05 (P < 0.05) which means

the series is stationary at first difference and hence we reject the null hypothesis also confirmed by the absolute values of the t-statistic that are greater than the 5% critical absolute values.

H_o= Series has a unit root (is not stationary)

H_a= Series has no unit root (stationary)

4.3.2 Vector Autoregression Model Results

The Akaike Information Criterion (AIC) and Schwartz-Bayesian Information Criterion (SBIC) was used to choose the optimal lag length using the command VARSOC in STATA. The optimal lag is indicated by an asterisk in the table that summarizes the results. After which the Vector Autoregression was run to examine the impact of derivatives trading on the liquidity of underlying stocks. The Granger causality test was carried to identify causal linkages between the variables followed by diagnostic tests to test for autocorrelation, normality, and stability of the model. Finally, the Johansen cointegration test was conducted to determine whether the variables liquidity of underlying stock (Ls) and derivatives trading (Ds) exhibit a long-run equilibrium relationship which determines if a Vector Error Correction Model (VECM) will be run to observe the long run impact of derivatives trading on the liquidity of underlying stocks.

4.3.2.1 Safaricom Plc Vector Autoregression Model Results and Diagnostic Tests

The optimal lag length was four as determined by the Akaike Information Criterion (AIC) and Schwartz-Bayesian Information Criterion (SBIC). The output of the VAR model shown in table 10 below was evaluated using the Granger causality test output shown in table 11 below to determine the short run causal effects. Based on the causality test output, derivatives trading does not granger cause liquidity of underlying stocks in the short run since its lags are not jointly significant in the liquidity of stocks equation. The liquidity of underlying stocks does not also granger cause derivatives trading in the short run since its lags are not jointly significant in the derivatives trading equation. The p-values of 0.963 and 0.952 do not fall below the test significance threshold of 0.05 which means that the null hypothesis cannot be rejected.

H_o= Derivatives trading does not granger cause on the liquidity of underlying stocks.

H_a= Derivatives trading has a granger cause on the liquidity of underlying stocks.

var dstocks dderivatives, lags (1/4)						
Vector autoregression						
Sample: 2019m12-2021m8						
No. of obs= 21						
Log likelihood= -821.6733						
FPE= 2.07e+32						
Det (Sigma_m1) = 3.32e+31						
AIC=89						
HQIC=19						
SBIC=19						
Equation	**Parms**	**RMSE**	**R-sq**	**chi2**	**P>chi2**	
dstocks	9	1.80e+09	0.3454	11.08176	0.1971	
dderivatives	9	5.60e+06	0.772	71.112	0.0000	
	Coef.	**Std. Err.**	**z**	**P>|z|**	**95% Conf. Interval**	
dstocks						
dstocks						
L1.	.0674357	.2171593	0.31	0.756	-.3581886	.49306
>01						
L2.	-.404149	.1941402	-2.08	0.037	-.7846572	-.02364
>16						
L3.	.3901163	.1948537	2.00	0.045	.0082100	.77202
>26						
L4.	-.079119	.2107072	-0.38	0.707	-.4920972	.333
>86						
dderivatives						
L1.	11.37789	54.59266	0.21	0.835	-95.62177	118.37
>75						
L2.	63.09284	105.3831	0.60	0.549	-143.4542	269.62
>98						
L3.	53.67591	99.97713	0.54	0.591	-142.2757	249.62
>75						
L4.	-155.6799	236.248	-0.66	0.510	-618.7174	307.35
>77						
_cons	-2.08e+08	3.44e+08	-0.81	0.415	-9.54e+08	3.94e+
>08						
dderivatives						
dstocks						
L1.	.0004933	.0006749	0.73	0.465	-.0008294	.00181
>61						
L2.	-.000148	.0006033	-0.25	0.806	-.0013308	.00103
>42						
L3.	.0001423	.0006056	0.23	0.814	-.0010446	.00132
>92						
L4.	-.000069	.0006548	-0.11	0.916	-.0013524	.00121
>44						
dderivatives						
L1.	-.8130985	.1696599	-4.79	0.000	-1.145626	-.48057
>12						
L2.	.407219	.3275034	1.24	0.214	-.234676	1.0491
>14						
L3.	.7772175	.3107031	2.50	0.012	.1682506	1.3861
>84						
L4.	-2.908408	.7341978	-3.96	0.000	-4.347409	-1.4694
>07						
_cons	1136669	1068707	1.06	0.288	-957957.5	32312
>96						

Table 10: Safaricom VAR results

vargranger Granger Causality Wald tests				
Equation	Excluded	chi2	df Prob >	chi2
dstocks	dderiavtives	.59682	4	0.963
dstocks	ALL	.59682	4	0.963
dderiavtives	dstocks	.69854	4	0.952
dderiavtives	ALL	.69854	4	0.952

Table 11: Safaricom Granger Causality Results

To assess the validity of the VAR model diagnostic tests were carried out to test for autocorrelation , stability, and normality of the residuals. Based on the output in table 12 below, there was no autocorrelation in the residuals at the lag order and the errors were normally distributed for the VAR model. However, the system was not stable as some of the eigenvalues were at least one.

varlmar, mlag (4)				
Lagrange-multiplier test				
lag	chi2	df	Prob > chi2	
1	0.5368	4		0.96982
2	2.7458	4		0.60122
3	7.2761	4		0.122
4	9.7337	4		0.04516
H0: no autocorrelation at lag order				
varnorm, jbera				
Jarque-Bera test				
Equation	chi2	df	Prob>chi2	
dstocks	1.214	2		0.54487
dderivatives	2.922	2		0.232
ALL	4.136	4		0.38785
varstable				
Eigenvalue stability condition				
Eigenvalue			Modulus	
-1.216059	+	.9197841i		1.52473
-1.216059	-	.9197841i		1.52473
0.8223709	+	.7562256i		1.11722
0.8223709	-	.7562256i		1.11722
-0.3064006	+	.7706117i		0.829291
-0.3064006	-	.7706117i		0.829291
0.3272573	+	.05318393i		0.331551
0.3272573	-	.05318393i		0.331551
At least one eigenvalue is at least 1.0				
VAR does not satisfy stability condition				

Table 12: Saf VAR Model Autocorrelation, Normality and Stability Diagnostic Test

The output from the Johansen cointegration test (table 13) indicated that there was no cointegration in the model therefore the null hypothesis was not rejected. This was indicated by trace statistic value which was higher than the 5% critical value (21.0286>15.41, 4.6604>3.76).

H_o= There is no cointegration between the variables

H_a= There is cointegration between the variables

Since there was no cointegration between the two variables, the VECM model was not constructed which was to be used to examine the long run causal relationship between derivatives trading and the liquidity of underlying stocks.

Based on the VAR model output and Granger Causality test output the conclusion is that the trading of Safaricom derivatives does not impact the liquidity of Safaricom stock in the short run. The null hypothesis below was therefore not rejected.

H_{o1}= Derivative Trading does not impact the liquidity of the underlying stock in the short run.

H_{a1}= Derivative Trading impacts the liquidity of the underlying stock in the short run.

vecrank dstocks dderivatives, trend (constant) lags (4)					
Johansen tests for cointegration					
Trend: constant					
Number of obs= 21					
Sample: 2019m12-2021m8					
Lags=4					5%
maximum				trace	critical
rank	parms	LL	eigenvalue	statistic	value
0	14	-832.1876	-	21.0286	15.41
1	17	-824.0035	0.54134	4.6604	3.76
2	18	-821.6733	0.19902		

Table 13: Safaricom Johansen Test for Cointegration Results

4.3.2.2 Kenya Commercial Bank Group Plc Vector Autoregression Model Results and Diagnostic Tests

The optimal lag length was one as determined by the Akaike Information Criterion (AIC) and Schwartz-Bayesian Information Criterion (SBIC). The output of the VAR model shown in table 14 below was evaluated using the Granger causality test output shown in table 15 below to determine the short run causal effects. Based on the causality test output, derivatives trading does not granger cause liquidity of underlying stocks in the short run since its lags are not jointly significant in the liquidity of stocks equation. The liquidity of underlying stocks does not also granger cause derivatives trading in the short run since its lags are not jointly significant in the derivatives trading equation. The p-values of 0.381 and 0.526 do not fall below the test

significance threshold of 0.05 which means that the null hypothesis cannot be rejected.

H_o= Derivatives trading does not granger cause on the liquidity of underlying stocks.

H_a= Derivatives trading has a granger cause on the liquidity of underlying stocks.

var dstocks dderivatives, lags (1/1)						
Vector autoregression						
Sample: 2019m9-2021m8						
No. of obs= 24						
Log likelihood= -800.2031						
FPE= 5,17e+26						
Det (Sigma_m1) = 3.13e+26						
AIC=67.18359						
HQIC=67.26172						
SBIC=67.4781						
Equation	**Parms**	**RMSE**	**R-sq**	**chi2**	**P>chi2**	
dstocks	3	1.5e+07	0.0732	1.894413	0.3878	
dderivatives	3	1.4e+06	0.3864	15.11249	0.0005	
	Coef.	**Std. Err.**	**z**	**P>Izl**	**95% Conf. Interval**	
dstocks						
dstocks						
L1.	-.1683353	.1969591	-0.85	0.393	-.5543681	.2176975
dderivatives						
L1.	-1.579934	1.804542	-0.88	0.381	-5.116771	1.956904
_cons	1143908	2870680	0.40	0.690	-4482521	6770336
dderivatives						
dstocks						
L1.	.0112304	.0177199	0.63	0.526	-.0235	.0459608
dderivatives						
L1.	-.630417	.1623501	-3.88	0.000	-.9486173	-.3122166
_cons	129365	258267.8	0.50	0.616	-376830.6	635560.5

Table 14: KCB VAR results

vargranger Granger Causality Wald tests				
Equation	Excluded	chi2	df Prob >	chi2
dstocks	dderiavtives	.76656	1	0.381
dstocks	ALL	.76656	1	0.381
dderiavtives	dstocks	.40167	1	0.526
dderiavtives	ALL	.40167	1	0.526

Table 15: KCB Granger Causality Results

To assess the validity of the VAR model diagnostic tests were carried out to test for autocorrelation , stability, and normality of the residuals. Based on the output below shown in table 16 , there was no autocorrelation at lag order in the residuals and the errors were normally distributed for the VAR model. The VAR system was also stable as none of the eigenvalues were at least one (All the eigenvalues lie inside the unit circle).

varlmar, mlag (1)			
Lagrange-multiplier test			
lag	chi2	df	Prob > chi2
1	2.1699	4	0.70454
H0: no autocorrelation at lag order			
varnorm, jbera			
Jarque-Bera test			
Equation	chi2	df	Prob>chi2
dstocks	1.503	2	0.47157
dderivatives	5.594	2	0.06099
ALL	7.098	4	0.13082
varstable			
Eigenvalue stability condition			
Eigenvalue	Modulus		
-0.5881525	0.588153		
-0.2105997	0.2106		
All the eigenvalues lie inside the unit circle.			
VAR satisfies stability condition.			

Table 16: KCB VAR Model Autocorrelation, Normality and Stability Diagnostic Tests

The output from the Johansen cointegration test (table 17) indicated that there was no cointegration in the model therefore the null hypothesis was not rejected. This was indicated by trace statistic value which was higher than the 5% critical value (62.4460>15.41, 22.2136>3.76).

H_o= There is no cointegration between the variables
H_a= There is cointegration between the variables

Since there was no cointegration between the two variables, the VECM model was not constructed which was to be used to examine the long run causal relationship between derivatives trading and the liquidity of underlying stocks.

Based on the VAR and Granger Causality test output the conclusion is that the trading of KCB derivatives does not impact the liquidity of KCB stock in the short run. The null hypothesis was therefore not rejected.

H_{o1}= Derivative Trading does not impact the liquidity of the underlying stock in the short run.

H_{a1}= Derivative Trading impacts the liquidity of the underlying stock in the short run.

vecrank dstocks dderivatives, trend (constant) lags (1)					
Johansen tests for cointegration					
Trend: constant					
Number of obs= 24					
Sample: 2019m9-2021m8					
Lags=1					5%
maximum				trace	critical
rank	parms	LL	eigenvalue	statistic	value
0	2	-831.42606	-	62.4460	15.41
1	5	-811.30985	0.81294	22.2136	3.76
2	6	-800.20307	0.60369		

Table 17: KCB Johansen Test for Cointegration Results

4.3.2.3 Equity Group Holdings Plc Vector Autoregression Model Results and Diagnostic Tests

The optimal lag length was four as determined by the Akaike Information Criterion (AIC) and Schwartz-Bayesian Information Criterion (SBIC). The output of the VAR model shown in table 18 below was evaluated using the Granger causality test output shown in table 19 below to determine the short run causal effects. Based on the causality test output, derivatives trading does not granger cause liquidity of underlying stocks in the short run since its lags are not jointly significant in the liquidity of stocks equation. The liquidity of underlying stocks does not also granger cause derivatives trading in the short run since its lags are not jointly significant in the derivatives trading equation. The p-values of 0.933 and 0.885 do not fall below the test significance threshold of 0.05 which means that the null hypothesis cannot be rejected.

H_o= Derivatives trading does not granger cause on the liquidity of underlying stocks.

H_a= Derivatives trading has a granger cause on the liquidity of underlying stocks.

var dstocks dderivatives, lags (1/4)						
Vector autoregression						
Sample: 2019m12-2021m8						
No. of obs= 21						
Log likelihood= -725.5609						
FPE= 2.19e+28						
Det (Sigma_m1) = 3.51e+27						
AIC=70.81532						
HQIC=71.00963						
SBIC=71.71063						
Equation	**Parms**	**RMSE**	**R-sq**	**chi2**	**P>chi2**	
dstocks	9	9.5e+07	0.8326	104.4389	0.0000	
dderivatives	9	1.1e+06	0.4703	18.64709	0.0169	
	Coef.	**Std. Err.**	**z**	**P>|z|**	**95% Conf. Interval**	
dstocks						
dstocks						
L1.	-.7746489	.0808152	-9.59	0.000	-.9330239	.6162339
L2.	-.5886402	.0904731	-6.51	0.000	-.7659642	-.4113163
L3.	-.4269267	.0899245	-4.75	0.000	-.6031755	-.250678
L4.	-.2346	.0786027	-2.98	0.003	-.3886585	-.0805415
dderivatives						
L1.	-4.543303	19.2451	-0.24	0.813	-42.26301	33.17641
L2.	6.464732	24.168	0.27	0.789	-40.90367	53.83313
L3.	7.969624	24.07964	0.33	0.741	-39.22561	55.16486
L4.	-15.05824	19.24831	0.78	0.434	-22.66775	52.78423
_cons	-4.86e+07	1.80e+07	-2.70	0.007	-8.38e+07	-1.33e+07
dderivatives						
dstocks						
L1.	.0003784	.0009339	0.41	0.685	-.001452	.0022088
L2.	.0007783	.0010455	0.74	0.457	-.0012709	.0028274
L3.	.0003142	.0010391	0.30	0.762	-.0017225	.0023509
L4.	.0007807	.0009083	0.86	0.390	-.0009996	.002561
dderivatives						
L1.	-.7922218	.2223926	-3.56	0.000	-1.228103	-.3563403
L2.	-.2338423	.2792806	-0.84	0.402	-.781221	.3135376
L3.	.2182504	.2782596	0.78	0.433	-.3271284	.7636292
L4.	.2653708	.2224296	1.19	0.233	-.1705833	.7013248
_cons	159333.9	207731.2	0.77	0.443	-247811.8	566479.5

Table 18: Equity VAR results

vargranger Granger Causality Wald tests				
Equation	Excluded	chi2	df Prob >	chi2
dstocks	dderiavtives	.84323	4	0.933
dstocks	ALL	.84323	4	0.933
dderiavtives	dstocks	1.1559	4	0.885
dderiavtives	ALL	1.1559	4	0.885

Table 19: Equity Granger Causality Results

To assess the validity of the VAR model diagnostic tests were carried out to test for autocorrelation , stability, and normality of the residuals. Based on the output below in table 20, there was no autocorrelation at lag order in the residuals and the errors were normally distributed for the VAR model. The VAR system was also stable as none of the eigenvalues were at least one (All the eigenvalues lie inside the unit circle).

varlmar, mlag (4)				
Lagrange-multiplier test				
lag	chi2	df	Prob > chi2	
1	13.2303	4		0.0102
2	4.5682	4		0.33454
3	2.3487	4		0.67192
4	2.9677	4		0.56324
H0: no autocorrelation at lag order				
varnorm, jbera				
Jarque-Bera test				
Equation	chi2	df	Prob>chi2	
dstocks	4.475	2		0.10674
dderivatives	36.791	2		0
ALL	41.266	4		0
varstable				
Eigenvalue stability condition				
Eigenvalue			Modulus	
-0.7850112				0.785011
-0.319552	+	.6985518i		0.768172
-0.319552	-	.6985518i		0.768172
0.1779157	+	.7046264i		0.726741
0.1779157	-	.7046264i		0.726741
-0.5597485	+	.4169895i		0.697996
-0.5597485	-	.4169895i		0.697996
0.6209302				0.62093
All the eigenvalues lie inside the unit circle.				
VAR satisfies stability condition.				

Table 20: Equity VAR Model Autocorrelation, Normality & Stability Diagnostic Tests

The output from the Johansen cointegration test (table 21) indicated that there was cointegration in the model therefore the null hypothesis was rejected. This was indicated by trace statistic value which was lower than the 5% critical value (3.7157<3.76).

H_o= There is no cointegration between the variables

H_a= There is cointegration between the variables

Since there was cointegration between the two variables, the VECM model was constructed to examine the long run causal relationship between derivatives trading and the liquidity of underlying stocks.

Based on the VAR output and Granger Causality test the conclusion is that the trading of Equity derivatives does not impact the liquidity of Equity stock in the short run. The null hypothesis was therefore rejected.

H_{o1}= Derivative Trading does not impact the liquidity of the underlying stock in the short run.

H_{a1}= Derivative Trading impacts the liquidity of the underlying stock in the short run.

vecrank dstocks dderivatives, trend (constant) lags (1)					
Johansen tests for cointegration					
Trend: constant					
Number of obs= 21					
Sample: 2019m12-2021m8					
Lags=4					5%
maximum				trace	critical
rank	parms	LL	eigenvalue	statistic	value
0	14	-748.84888	-	46.5760	15.41
1	17	-727.41875	0.87010	3.7157_*	3.76
2	18	-725.56091	0.16217		

Table 21: Equity Johansen Test for Cointegration Results

In the long run derivatives trading of equity derivatives had an impact on the liquidity of equity stocks with a statistically significant coefficient at the 1% level based on the p-value 0.000 which means the null hypothesis (*H_{o2})*was rejected. This was based on the VECM output shown in table 22.

H_{o2}= Derivative Trading does not impact the liquidity of the underlying stock in the long run.
H_{a2}= Derivative Trading impacts the liquidity of the underlying stock in the long run.

var dstocks dderivatives, trend(constant) lags (1)						
Vector error-correction model						
Sample: 2019m9-2021m8						
No. of obs= 24						
Log likelihood= -870.3063						
Det (Sigma_m1) = 1.08e+29						
AIC=72.94219						
HQIC=73.0073						
SBIC=73.18762						
Equation	**Parms**	**RMSE**	**R-sq**	**chi2**	**P>chi2**	
D_dstocks	2	3.9e+08	0.0363	.8284862	0.6608	
D_dderivatives	2	921915	0.7779	77.05063	0.0000	
	Coef.	**Std. Err.**	**z**	**P>|z|**	**95% Conf. Interval**	
D_dstocks						
_cel						
L1.	-.0328125	.0360494	-0.91	0.363	-.103468	.0378429
_cons	731.1591	7.96e+07	0.00	1.000	-.1.56e+08	1.56e+08
D_dderivatives						
_cel						
L1.	-.0007481	.0000852	-8.78	0.000	-.0009151	-.000581
_cons	-32073.01	1.88185.	-0.17	1.000	-1.56e+08	-1.56e+08
Cointegrating equations						
Equation	**Parms**	**Chi2**	**p>chi2**			
_cel	1	77.15815	0.0000			
Identification: beta is exactly identified						
Johansen normalization restriction imposed						
beta	Coef.	Std. Err.	z	P>|z|	95% Conf.	Interval
_cel						
dstocks	1					
dderivatives	2099.865	239.0564	8.78	0.000	1631.323	2568.407
_cons	-2.38e+08					

Table 22: Equity VECM results

The validity of the VECM model was assessed using diagnostic tests carried out to test for autocorrelation , stability, and normality of the residuals. Based on the output below in table 23 there was no autocorrelation in the residuals and the errors were normally distributed for the VECM model. However, the system was not stable as some of the eigenvalues were at least one (VECM specification imposes a unit modulus).

veclmar, mlag (1)			
Lagrange-multiplier test			
lag	chi2	df	Prob>chi2
1	5.1719	4	0.27011
H0: no autocorrelation at lag order.			
vecmorm, jbera			
Jarque-Bera test			
Equation	chi2	df	Prob>2
D_dstocks	23.052	2	0.00001
D_dderivatives	36.743	2	0
ALL	59.796	4	0
vecstable			
Eigenvalue stability condition			
Eigenvalue	Modulus		
1	1		
-0.60366	0.603661		
The VECM specification imposes a unit modulus			

Table 23: Equity VECM Model Autocorrelation, Normality and Stability Diagnostic Tests

4.3.2.4 British American Tobacco Kenya Plc Vector Autoregression Model Results and Diagnostic Tests

The optimal lag length was one as determined by the Akaike Information Criterion (AIC) and Schwartz-Bayesian Information Criterion (SBIC). The output of the VAR model shown in table 24 below was evaluated using the Granger causality test output shown in table 25 to determine the short run causal effects. Based on the causality test output, derivatives trading does not granger cause liquidity of underlying stocks in the short run since its lags are not jointly significant in the liquidity of stocks equation. The liquidity of underlying stocks does not also granger cause derivatives trading in the short run since its lags are not jointly significant in the derivatives trading equation. The p-values of 0.934 and 0.874 do not fall below the test significance threshold of 0.05 which means that the null hypothesis cannot be rejected.

H_o= Derivatives trading does not granger cause on the liquidity of underlying stocks.

H_a= Derivatives trading has a granger cause on the liquidity of underlying stocks.

var dstocks dderivatives, lags (1/1)						
Vector autoregression						
Sample: 2019m9-2021m10						
No. of obs= 14						
Log likelihood= -424.4061						
FPE= 1.75e+24						
Det (Sigma_m1) = 7.35e+23						
AIC= 61.48659						
HQIC= 61.46124						
SBIC= 61.76047						
Equation	**Parms**	**RMSE**	**R-sq**	**chi2**	**P>chi2**	
dstocks	3	2.2e+06	0.2103	3.728146	0.1550	
dderivatives	3	490563	0.4987	13.92935	0.0009	
	Coef.	**Std. Err.**	**z**	**P>|z|**	**95% Conf. Interval**	
dstocks						
dstocks						
L1.	-.45693989	.2376688	-1.92	0.055	-.9227612	.0088833
dderivatives						
L1.	.0707431	.8603359	0.08	0.934	-1.615484	1.75697
_cons	-124617.1	530142.3	-0.24	0.814	-1163677	914442.8
dderivatives						
dstocks						
L1.	.0083212	.052276	0.16	0.874	-.0944349	.1110774
dderivatives						
L1.	-.7052825	.1897823	-3.72	0.000	-1.077249	-.333316
_cons	108297.7	116944.6	0.93	0.354	-120909.5	337504.8

Table 24: BAT VAR results

vargranger Granger Causality Wald tests				
Equation	Excluded	chi2	df Prob >	chi2
dstocks	dderiavtives	.00676	1	0.934
dstocks	ALL	.00676	1	0.934
dderiavtives	dstocks	.02519	1	0.874
dderiavtives	ALL	.02519	1	0.874

Table 25: BAT Granger Causality Results

To assess the validity of the VAR model diagnostic tests were carried out to test for autocorrelation , stability, and normality of the residuals. Based on the output below in table 26 there was no autocorrelation at lag order in the residuals and the errors were normally distributed for the VAR model. The VAR system was also stable as none of the eigenvalues were at least one (All the eigenvalues lie inside the unit circle).

varlmar, mlag (1)			
Lagrange-multiplier test			
lag	chi2	df	Prob > chi2
1	1.9406	4	0.74669
H0: no autocorrelation at lag order			
varnorm, jbera			
Jarque-Bera test			
Equation	chi2	df	Prob>chi2
dstocks	13.227	2	0.00134
dderivatives	5.563	2	0.06193
ALL	18.79	4	0.00086
varstable			
Eigenvalue stability condition			
Eigenvalue			Modulus
-0.7076307			0.707631
-0.4545907			0.454591
At the eigenvalues lie inside the unit circle.			
VAR satisfies stability condition.			

Table 26: BAT VAR Model Autocorrelation, Normality and Stability Diagnostic Tests

The output from the Johansen cointegration test (table 27) indicated that there was no cointegration in the model therefore the null hypothesis was not rejected. This was indicated by trace statistic value which was higher than the 5% critical value (45.0616>15.41, 18.1943>3.76).

H_o= There is no cointegration between the variables
H_a= There is cointegration between the variables

Since there was no cointegration between the two variables, the VECM model was not constructed which was to be used to examine the long run causal relationship between derivatives trading and the liquidity of underlying stocks.

Based on the VAR and Granger Causality test output the conclusion is that the trading of BAT derivatives does not impact the liquidity of BAT stock in the short run. The null hypothesis was therefore rejected.

H_{o1}= Derivative Trading does not impact the liquidity of the underlying stock in the short run.

H_{a1}= Derivative Trading impacts the liquidity of the underlying stock in the short run.

vecrank dstocks dderivatives, trend (constant) lags (4)					
Johansen tests for cointegration					
Trend: constant					
Number of obs= 14					
Sample: 2019m9-2021m10					
Lags=4					5%
maximum				trace	critical
rank	parms	LL	eigenvalue	statistic	value
0	2	-446.93695	-	45.0616	15.41
1	5	-433.50331	0.85326	18.1943	3.76
2	6	-424.40614	0.72736		

Table 27: BAT Johansen Test for Cointegration Results

4.3.2.5 East African Breweries Ltd Vector Autoregression Model Results and Diagnostic Tests

The optimal lag length was four as determined by the Akaike Information Criterion (AIC) and Schwartz-Bayesian Information Criterion (SBIC). The output of the VAR model shown in table 28 below was evaluated using the Granger causality test output shown in table 29 to determine the short run causal effects. Based on the causality test output, derivatives trading granger causes liquidity of underlying stocks in the short run since its lags are jointly significant in the liquidity of stocks equation. The liquidity of underlying stocks also granger causes derivatives trading in the short run since its lags are jointly significant in the derivatives trading equation. The p-values of 0.000 and 0.000 fall below the test significance threshold of 0.05 which means that the null hypothesis was rejected.

H_o= Derivatives trading does not granger cause on the liquidity of underlying stocks.

H_a= Derivatives trading has a granger cause on the liquidity of underlying stocks.

Which can be interpreted as there the existence of a causal relationship between derivatives trading and liquidity of underlying stocks in the short run. Therefore, the null hypothesis below was rejected meaning that derivatives trading can help predict the liquidity of underlying stock at the 5% significance level. (The trading of EABL derivatives does impact the liquidity of EABL stock in the short run).

H_{o1}= Derivative Trading does not impact the liquidity of the underlying stock in the short run.

H_{a1}= Derivative Trading impacts the liquidity of the underlying stock in the short run.

var dstocks dderivatives, lags (1/4)						
Vector autoregression						
Sample: 2019m12-2021m12						
No. of obs= 13						
Log likelihood= -370.2193						
FPE= 5.65e+ 23						
Det (Sigma_m1) = 1.87e+32						
AIC=59.726						
HQIC=59.565						
SBIC=60.508						
Equation	**Parms**	**RMSE**	**R-sq**	**chi2**	**P>chi2**	
dstocks	9	1.7e+06	0.8655	83.6594	0.0000	
dderivatives	9	278688	0.9070	126.8431	0.0000	
	Coef.	**Std. Err.**	**z**	**P>|z|**	**95% Conf. Interval**	
dstocks						
dstocks						
L1.	-.4812919	.3727974	-1.29	0.197	-1.211961	.24937
L2.	-.1929698	.3574201	-0.54	0.589	-.8935004	.5075607
L3.	.7799262	.453672	1.72	0.086	-.1092545	1.669107
L4.	.6085394	.3417402	1.78	0.075	-.0612591	1.278338
dderivatives						
L1.	4.782491	1.099107	4.35	0.000	2.628282	6.9367
L2.	5.243601	1.655523	3.17	0.002	1.998835	8.488368
L3.	.4119911	1.91359	0.22	0.830	-3.338577	4.162559
L4.	-1.126264	3.490049	-0.32	0.747	-7.966634	5.714106
_cons	-426741.9	317369	-1.34	0.179	-1048774	195289.9
dderivatives						
dstocks						
L1.	-.0138405	.0621826	-0.22	0.824	-.1357161	.1080351
L2.	-.3517356	.0596176	-5.90	0.000	-.4685841	-.22348872
L3.	-.5052568	.0756724	-6.68	0.000	-.6535721	-.3569416
L4.	-.2608618	.0570022	-4.58	0.000	-.3725841	-.1491394
dderivatives						
L1.	-1.219985	.1833309	-6.65	0.000	-1.579307	-.860663
L2.	-.628091	.2761412	-2.27	0.023	-1.169318	-.0868643
L3.	.6383152	.3191867	2.00	0.046	.0127208	1.26391
L4.	2.381022	.5821399	4.09	0.000	1.240049	3.521996
_cons	153002	52937.12	2.89	0.004	49247.18	256756.9

Table 28: EABL VAR results

vargranger Granger Causality Wald tests				
Equation	Excluded	chi2	df Prob >	chi2
dstocks	dderiavtives	33.051	4	0.000
dstocks	ALL	33.051	4	0.000
dderiavtives	dstocks	48.368	4	0.000
dderiavtives	ALL	48.368	4	0.000

Table 29: EABL Granger Causality Results

To assess the validity of the VAR model diagnostic tests were carried out to test for autocorrelation , stability, and normality of the residuals. Based on the output below shown in table 30 there was no autocorrelation at lag order in the residuals and the errors were normally distributed for the VAR model. However, the system was not stable as some of the eigenvalues were at least one.

varlmar, mlag (4)			
Lagrange-multiplier test			
lag	chi2	df	Prob > chi2
1	6.7846	4	0.14772
2	0.7813	4	0.94093
3	1.3989	4	0.84439
4	5.4036	4	0.24833
H0: no autocorrelation at lag order			
varnorm, jbera			
Jarque-Bera test			
Equation	chi2	df	Prob>chi2
dstocks	5.556	2	0.06217
dderivatives	1.353	2	0.50835
ALL	6.909	4	0.14079
varstable			
Eigenvalue stability condition			
Eigenvalue			Modulus
-1.406725			1.40672
-0.663122	+	1.036654i	1.2306
-0.663122	-	1.036654i	1.2306
0.8076856	+	.5851867i	0.997396
0.8076856	-	.5851867i	0.997396
0.01686437	+	.9394471i	0.939598
0.01686437	-	.9394471i	0.939598
-0.6174083			0.617408
At least one eigenvalue is at least 1.0			
VAR does not satisfy stability condition			

Table 30; EABL VAR Model Autocorrelation, Normality and Stability Diagnostic Tests

The output from the Johansen cointegration test (table 31) indicated that there was no cointegration in the model therefore the null hypothesis was not rejected. This was indicated by trace statistic value which was higher than the 5% critical value (29.6006>15.41,8.0053>3.76).

H_o= There is no cointegration between the variables
H_a= There is cointegration between the variables

Since there was no cointegration between the two variables, the VECM model was not constructed which was to be used to examine the long run causal relationship between derivatives trading and the liquidity of underlying stocks.

vecrank dstocks dderivatives, trend (constant) lags (4)					
Johansen tests for cointegration					
Trend: constant					
Number of obs= 13					
Sample: 2019m12-2021m12					
Lags=4					5%
maximum				trace	critical
rank	parms	LL	eigenvalue	statistic	value
0	14	-385.01958	-	29.6006	15.41
1	17	-374.22191	0.81009	8.0053	3.76
2	18	-370.21926	0.45979		

Table 31: EABL Johansen Test for Cointegration Results

4.3.2.6 ABSA Kenya Vector Autoregression Model Results and Diagnostic Tests

The optimal lag length was one as determined by the Akaike Information Criterion (AIC) and Schwartz-Bayesian Information Criterion (SBIC). The output of the VAR model shown in table 32 below was evaluated using the Granger causality test output shown in table 33 to determine the short run causal effects. Based on the causality test output, derivatives trading does not granger cause liquidity of underlying stocks in the short run since its lags are not jointly significant in the liquidity of stocks equation. The liquidity of underlying stocks does not also granger cause derivatives trading in the short run since its lags are not jointly significant in the derivatives trading equation. The p-values of 0.934 and 0.874 do not fall below the test significance threshold of 0.05 which means that the null hypothesis cannot be rejected.

H_o= Derivatives trading does not granger cause on the liquidity of underlying stocks.

H_a= Derivatives trading has a granger cause on the liquidity of underlying stocks.

var dstocks dderivatives, lags (1/1)						
Vector autoregression						
Sample: 2019m7-2021m4						
No. of obs= 10						
Log likelihood= -324.0255						
FPE= 1.65e+26						
Det (Sigma_m1) = 4.78e+25						
AIC=66.00509						
HQIC=65.80593						
SBIC=66.18665						
Equation	**Parms**	**RMSE**	**R-sq**	**chi2**	**P>chi2**	
dstocks	3	2.4e+07	0.4403	7.867172	0.0196	
dderivatives	3	711988	0.0243	.2491938	0.8829	
	Coef.	**Std. Err.**	**z**	**P>Izl**	**95% Conf. Interval**	
dstocks						
dstocks						
L1.	-.713061	.2546916	-2.80	0.005	-1.212247	-.2138745
dderivatives						
L1.	.3787499	6.281993	0.06	0952	-11.93373	12.69123
_cons	-3162406	3724073	-0.85	0.396	-1.05e+07	4136643
dderivatives						
dstocks						
L1.	.0009784	.0129103	0.08	0.940	-.0243253	.0262821
dderivatives						
L1.	-.1560547	.3184335	-0.49	0.624	-.7801728	.4680635
_cons	35313.58	188772.8	0.19	0.852	-334674.3	405301.5

Table 32: ABSA VAR results

vargranger Granger Causality Wald tests				
Equation	Excluded	chi2	df Prob >	chi2
dstocks	dderivatives	.00364	1	0.952
dstocks	ALL	.00364	1	0.952
dderivatives	dstocks	.00574	1	0.940
dderivatives	ALL	.00574	1	0.940

Table 33: ABSA Granger Causality Results

To assess the validity of the VAR model diagnostic tests were carried out to test for autocorrelation , stability, and normality of the residuals. Based on the output below shown in table 34, there was no autocorrelation at lag order in the residuals and the errors were normally distributed for the VAR model. The VAR system was also stable as none of the eigenvalues were at least one (All the eigenvalues lie inside the unit circle).

varlmar, mlag			
Lagrange-multiplier test			
lag	chi2	df	Prob > chi2
1	2.6909	4	0.61081
2	2.406	4	0.66155
H0: no autocorrelation at lag order			
varnorm, jbera			
Jarque-Bera test			
Equation	chi2	df	Prob>chi2
dstocks	0.644	2	0.72468
dderivatives	0.843	2	0.65606
ALL	1.487	4	0.82894
varstable			
Eigenvalue stability condition			
Eigenvalue	Modulus		
-0.7137254	0.713725		
-0.1553902	0.15539		
All the eigenvalues lie inside the unit circle.			
VAR satisfies stability condition.			

Table 34: ABSA VAR Model Autocorrelation, Normality & Stability Diagnostic Tests

The output from the Johansen cointegration test (table 35) indicated that there was no cointegration in the model therefore the null hypothesis was not rejected. This was indicated by trace statistic value which was higher than the 5% critical value (25.7014>15.41,8.4256>3.76).

H_o= There is no cointegration between the variables

H_a= There is cointegration between the variables

Since there was no cointegration between the two variables, the VECM model was not constructed which was to be used to examine the long run causal relationship between derivatives trading and the liquidity of underlying stocks.

Based on the VAR and Granger Causality test output the conclusion is that the trading of ABSA derivatives does not impact the liquidity of ABSA stock in the short run. The null hypothesis was therefore rejected.

H_{o1}= Derivative Trading does not impact the liquidity of the underlying stock in the short run.

H_{a1}= Derivative Trading impacts the liquidity of the underlying stock in the short run.

vecrank dstocks dderivatives, trend (constant) lags (4)					
Johansen tests for cointegration					
Trend: constant					
Number of obs= 10					
Sample: 2019m7-2021m4					
Lags=1					5%
maximum				trace	critical
rank	parms	LL	eigenvalue	statistic	value
0	2	-336.87618	-	25.7014	15.41
1	5	-328.23829	0.82229	8.4256	3.76
2	6	-324.02547	0.56939		

Table 35: ABSA Johnsen Test for Cointegration Results

4.3.3 Summary of the Impact of derivatives trading on the liquidity of underlying stocks in the short run and long run

In summary based on the Vector Autoregressive model output and Granger Causality test output results the conclusion is that derivatives trading does not impact the liquidity of the underlying stock in the short run for Safaricom, KCB, BAT, ABSA, and Equity. There no cointegration between the variables hence the Vector Error Correction Model used to examine the long run impact was not constructed for the Safaricom, KCB, BAT and ABSA. For Equity, there was cointegration between the variables as measured by the Johansen Test hence the Vector Error Correction model was constructed and based on the output trading of Equity derivatives had an impact on the liquidity of its underlying stock in the long run.

Derivatives trading had an impact the liquidity of its underlying stock for EABL in the short run which was based on the Vector Autoregressive model and Granger Causality test output however there was no cointegration between the variables hence the Vector Error Correction Model used to examine the long run impact was not constructed.

In conclusion derivatives trading had an impact on the liquidity of stocks in the short run for EABL and in the long run for Equity. (There was a causal relationship between derivatives trading and the liquidity of underlying stocks for EABL in the short run and a causal and cointegrating relationship between derivatives trading and the liquidity of underlying stocks Equity in the long run).

4.4 Key derivatives market participants view on the impact of derivatives trading on the equity market.

To evaluate the views from key market participants on the impact of derivatives trading on the equity market which was the third research objective a five-point Likert scale questionnaire was administered measuring three aspects relating to derivatives trading in Kenya namely, the general working of the NEXT platform, Impact of Liquidity on the cash market after the introduction of

derivatives and Investor participation at the derivatives market. The Likert Scale was coded as follows: 1= Strongly Disagree, 2=Disagree, 3= Unsure, 4=Agree and 5=Strongly Agree. To access internal consistency the Cronbach coefficient was applied the calculation of the average correlation of the responses. The Cronbach's Alpha (α) ranges from 0 to 1 which is interpreted as follows: The closer the (α) is to 1: the higher the reliability; Zero (α) denotes no internal consistency; an Alpha (α) of 1 (one) complete internal consistency (Goforth, 2015).

Cronbach's Alpha	N of Items
.822	21

Table 36: Cronbach Alpha Statistics

From the above statistics, the Cronbach Alpha statistic was 0.822 which shows that the data was highly reliable and hence reliable inferences can be derived from the analysed data. The respondents of the study were AIB-AXYS Africa, EGM Securities, Faida Investment Bank, Genghis Capital Limited, Kingdom Securities Limited, NCBA Investment Bank, Standard Investment Bank and Sterling Capital.

4.4.1 Summary of Questionnaire Responses from NEXT Accredited trading members

4.4.1.1 NEXT trading platform is working exceptionally (reliable and efficient)

NEXT trading platform is working exceptionally (reliable and efficient)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Neutral	1	12.5	12.5	12.5
	Agree	6	75.0	75.0	87.5
	Strongly Agree	1	12.5	12.5	100.0
	Total	8	100.0	100.0	

Table 37: Summary of responses 1

Overall, 87.5% accredited members agreed that the Next platform is working exceptionally with 12.5% being neutral about the working of the platform. The mean as per the Likert scale used was 4 (Agree) with a standard deviation of 0.53.

4.4.1.2 The requirements to participate in the derivatives market are too stringent

The requirements to participate in the derivative market are too stringent

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	4	50.0	50.0	50.0
	Disagree	2	25.0	25.0	75.0
	Agree	2	25.0	25.0	100.0
	Total	8	100.0	100.0	

Table 38: Summary of responses 2

Overall, 75% of accredited trading members disagreed that the requirements to participate in the derivatives market are too stringent while 25% of the respondents agreed the requirements are too stringent. The mean as per the Likert scale used was 2 (Disagree) with a standard deviation of 1.31.

4.4.1.3 The rules and regulations set for derivatives trading are sufficient

The rules and regulations set for derivatives trading are sufficient

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Neutral	1	12.5	12.5	12.5
	Agree	6	75.0	75.0	87.5
	Strongly Agree	1	12.5	12.5	100.0
	Total	8	100.0	100.0	

Table 39: Summary of responses 3

Overall, 87% of the respondents agreed that the rules and regulations set for derivatives trading are sufficient while 12.5% disagreed that the rules and regulations are not sufficient. The mean as per the Likert scale used was 4 (Agree) with a standard deviation of 0.53.

4.4.1.4 As an accredited member of NEXT you are well acquainted with/about your role in the derivatives market

As an accredited member of NEXT you are well acquainted with/about your role in the derivatives market

	Frequency	Percent	Valid Percent	Cumulative Percent

Valid	Neutral	1	12.5	12.5	12.5
	Agree	2	25.0	25.0	37.5
	Strongly Agree	5	62.5	62.5	100.0
	Total	8	100.0	100.0	

Table 40: Summary of responses 4

Overall, 87.5% of the respondents agreed that they are well acquainted with the role they play in the derivatives market. The mean as per the Likert scale used was 5 (Strongly Agree) with a standard deviation of 0.76

4.4.1.5 The clearing process works very efficiently

The clearing process works very efficiently

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	12.5	12.5	12.5
	Neutral	1	12.5	12.5	25.0
	Agree	4	50.0	50.0	75.0
	Strongly Agree	2	25.0	25.0	100.0
	Total	8	100.0	100.0	

Table 41: Summary of responses 5

Overall, 75% of the respondents agreed that the derivatives clearing process works very efficiently with 12.5% disagreed that the clearing process works efficiently. The mean as per the Likert scale used was 4 (Agree) with a standard deviation of 1.28.

4.4.1.6 The relationship between key derivative market participants and stakeholders works effectively and efficiently

The relationship between key derivative market participants and stakeholders works effectively and efficiently

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Neutral	2	25.0	25.0	25.0
	Agree	3	37.5	37.5	62.5
	Strongly Agree	3	37.5	37.5	100.0
	Total	8	100.0	100.0	

Table 42: Summary of responses 6

Overall, 75% of the respondents agreed that the relationship between key market derivatives

participants works effectively and efficiently. The mean as per the Likert scale used was 4 (Agree) with a standard deviation of 0.83.

4.4.1.7 Trading activity in the cash market has increased

Trading activity in the cash market has increased

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	3	37.5	37.5	37.5
	Disagree	3	37.5	37.5	75.0
	Neutral	1	12.5	12.5	87.5
	Agree	1	12.5	12.5	100.0
	Total	8	100.0	100.0	

Table 43: Summary of responses 7

Overall, 75% of the respondents disagreed that trading activity in the cash market has increased since the launch of derivatives with 12.5% agreeing that trading activity has increased. The mean as per the Likert scale used was 2 (Disagree) with a standard deviation of 1.07.

4.4.1.8 Liquidity of stocks whose futures participate in derivatives trading increased in the short run

Liquidity of stocks whose futures participate in derivatives trading increased in the short run

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	2	25.0	25.0	25.0
	Disagree	4	50.0	50.0	75.0
	Agree	2	25.0	25.0	100.0
	Total	8	100.0	100.0	

Table 44: Summary of responses 8

Overall, 75% disagreed that the liquidity of stocks whose futures participate in derivatives trading increased in the short run while 25% agreed liquidity of stocks increased in the short run. The mean as per the Likert scale used was 2 (Disagree) with a standard deviation of 1.16.

4.4.1.9 Liquidity of stocks whose futures participate in derivatives trading decreased in the long run

Liquidity of stocks whose futures participate in derivatives trading increased in the long run

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	3	37.5	37.5	37.5
	Disagree	3	37.5	37.5	75.0
	Agree	2	25.0	25.0	100.0
	Total	8	100.0	100.0	

Table 45: Summary of responses 9

Overall, 75% disagreed that the liquidity of stocks whose futures participate in derivatives trading increased in the long run while 25% agreed liquidity of stocks increased in the long run. The mean as per the Likert scale used was 2 (Disagree) with a standard deviation of 1.25.

4.4.2. Liquidity of the overall cash market increased after the introduction of a derivatives market

Liquidity of the overall cash market increased after the introduction of a derivatives market

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	12.5	12.5	12.5
	Disagree	5	62.5	62.5	75.0
	Neutral	1	12.5	12.5	87.5
	Agree	1	12.5	12.5	100.0
	Total	8	100.0	100.0	

Table 46: Summary of responses 10

Overall, 75% of the respondents disagreed that liquidity in the cash market increased after the introduction of a derivatives market while 12.5% agreed liquidity of the cash market increased after the introduction of a derivatives market. The mean as per the Likert scale used was 2 (Disagree) with a standard deviation of 0.89.

4.4.2.1 Trading volume increased in the equities market after the introduction of derivatives at the NSE.

Trading volume increased in the equities market after the introduction of derivatives at the NSE

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	12.5	12.5	12.5
	Disagree	5	62.5	62.5	75.0
	Neutral	1	12.5	12.5	87.5
	Agree	1	12.5	12.5	100.0
	Total	8	100.0	100.0	

Table 47: Summary of responses 11

Overall, 75% of the respondents disagreed that trading volume increased in the equities market after the introduction of derivatives at the NSE while 12.5% agreed that trading volume increased in the equities market after introduction of derivatives at the NSE. The mean as per the Likert scale used was 2 (Disagree) with a standard deviation of 0.89.

4.4.2.2 Share price level increased for stocks whose futures participate in futures trading

Share price levels increased for stocks whose futures participate in futures trading

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	12.5	12.5	12.5
	Disagree	3	37.5	37.5	50.0
	Neutral	2	25.0	25.0	75.0
	Agree	2	25.0	25.0	100.0
	Total	8	100.0	100.0	

Table 48: Summary of responses 12

Overall, 50% of the respondents disagreed that share price levels increased for stocks whose futures participate in derivatives trading while 25% agreed that there was an increase in share price levels for stocks whose futures participate in futures trading. The mean as per the Likert scale used was 2 (Disagree) with a standard deviation of 1.06.

4.4.2.3 There was an increase in the volatility of share prices at the NSE due to derivatives trading

There was an increase in the volatility of share prices at the NSE due to derivatives trading

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	12.5	12.5	12.5
	Disagree	5	62.5	62.5	75.0
	Neutral	1	12.5	12.5	87.5
	Agree	1	12.5	12.5	100.0
	Total	8	100.0	100.0	

Table 49: Summary of responses 13

Overall, 75% of the respondents disagreed that there was an increase in volatility of share prices at the NSE due to derivatives trading while 12.5% agreed that volatility of share prices increased because of derivatives trading. The mean as per the Likert scale used was 2 (Disagree) with a standard deviation of 0.89.

4.4.2.4 Investors are interested in participating in the derivatives market

Investors are interested in participating in the derivatives market

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	8	100.0	100.0	100.0

Table 50: Summary of responses 14

100% of the respondents agreed that investors are interested in participating in the derivatives market. The mean as per the Likert scale used was 4 (Agree) with a standard deviation of 0.00

4.4.2.5 Investors are well acquainted with knowledge of how the derivatives market works

Investors are well acquainted with knowledge of how the derivatives market works

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	3	37.5	37.5	37.5
	Disagree	2	25.0	25.0	62.5
	Neutral	2	25.0	25.0	87.5
	Agree	1	12.5	12.5	100.0
	Total	8	100.0	100.0	

Table 51: Summary of responses 15

Overall, 62.5% of respondents disagreed that investors are well acquainted with knowledge of how the derivatives market works while 12.5% agreed investors are knowledgeable about how the derivatives works. The mean as per the Likert scale used was 2 (Disagree) with a standard deviation of 1.12.

4.4.2.6 Investors who were already trading in the NSE platform were quick to take up derivatives trading

Investors who were already trading in the NSE platform were quick to take up derivatives trading

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	3	37.5	37.5	37.5
	Neutral	2	25.0	25.0	62.5
	Agree	3	37.5	37.5	100.0
	Total	8	100.0	100.0	

Table 52: Summary of responses 16

Overall, 62.5% of respondents disagreed that investors who were already trading using the NSE platform were quick to take up derivatives trading while 37.5% agreed that investors who were already trading using the NSE platform were quick to take up derivatives trading. The mean as per the Likert scale used was 3 (Unsure) with a standard deviation of 0.93.

4.4.2.7 The launch of NEXT gives your investors a range of products to choose from

Do you think the launch of NEXT gives your investors a range of products to choose from

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	1	12.5	12.5	12.5
	Agree	2	25.0	25.0	37.5
	Strongly Agree	5	62.5	62.5	100.0
	Total	8	100.0	100.0	

Table 53: Summary of responses 17

Overall, 87.5% of the respondents agreed that the launch of NEXT will give investors a range of products to choose from while 12.5% disagreed it will give investors a range of products to choose from. The mean as per the Likert scale used was 4 (Agree) with a standard deviation of 1.06.

4.4.2.8 The NEXT trading platform is user friendly

The NEXT trading platform is user-friendly

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	1	12.5	12.5	12.5
	Neutral	1	12.5	12.5	25.0
	Agree	5	62.5	62.5	87.5
	Strongly Agree	1	12.5	12.5	100.0
	Total	8	100.0	100.0	

Table 54: Summary of responses 18

Overall, 62.5% of the respondents agreed that the NEXT trading platform is user-friendly while 12.5% disagreed that the platform is user friendly. The mean as per the Likert scale used was 3.75 (Agree) with a standard deviation of 0.88.

4.4.2.9 Direct market access will increase investor participation in the derivatives market

Direct Market Access will increase investor participation in the derivatives market

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	3	37.5	37.5	37.5
	Strongly Agree	5	62.5	62.5	100.0
	Total	8	100.0	100.0	

Table 55: Summary of responses 19

100% of the respondents agreed that direct marker access would increase investor participation in the derivatives market. The mean as per the Likert scale used was 4 (Agree) with a standard deviation of 0.52.

4.4.3 The derivatives market has attracted international investors

The derivatives market has attracted international investors

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	2	25.0	25.0	25.0
	Neutral	3	37.5	37.5	62.5
	Agree	3	37.5	37.5	100.0
	Total	8	100.0	100.0	

Table 56: Summary of responses 20

Overall, 37.5% agreed that the derivatives market has attracted international investors while 25% disagreed that the derivatives market has attracted international investors. The mean as per the Likert scale used was 2 (Disagree) with a standard deviation of 1.25.

4.4.3.1 The number of investors has increased on the trading platform

The number of investors who participate in derivatives trading through your platform has increased since the introduction of derivatives at the NSE

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	12.5	12.5	12.5
	Disagree	2	25.0	25.0	37.5
	Agree	4	50.0	50.0	87.5
	Strongly Agree	1	12.5	12.5	100.0
	Total	8	100.0	100.0	

Table 57: Summary of responses 21

Overall, 75% of the respondents agreed that there has been an increase in the number of investors participating in their platform since the launch of derivatives at the NSE while 12.5% disagreed. The mean as per the Likert scale used was 3.25 (Unsure) with a standard deviation of 1.39.

4.4.3 Summary of key derivatives market participants view on the impact of derivatives trading on the equity market.

To answer the third objective on the views from key market participants on the impact of derivatives trading on the equity market three aspects relating to the derivatives market were evaluated: the general working of NEXT, the Impact of Liquidity on the cash market after the introduction of derivatives and Investor participation at the derivatives market. On the general working of NEXT the reliability of the trading platform, requirements to participate in the derivatives market, rules, and regulations, clearing process and relationship between key derivative market stakeholders were the aspects assessed. The impact on the liquidity of the cash market the trading activity and trading volume were assessed and investor participation in terms of investor interest in derivatives trading, uptake of derivatives trading by new and existing investors and the role direct market access would have in attracting investor participation.

4.5 Chapter Summary

The key findings of the study were presented in this chapter: liquidity of listed stocks pre and post derivative listing, impact of derivatives trading on the liquidity of underlying stocks in the short run and long run and the impact of derivatives trading on the equity market.

The average returns decreased six months and one year post derivatives listing for ABSA and EABL while the average returns for BAT and Equity increased six months post derivatives listing and then decreased one year post derivatives trading. Safaricom average returns decreased six months post derivatives listing and then increased one year post derivatives listing while with KCB there was no change for both periods. The illiquidity ratio increased six months and one year post derivatives listing for Safaricom, KCB and ABSA which shows a decrease in liquidity. For Equity, EABL and BAT the illiquidity ratio decreased six months and one year post derivatives listing which shows an increase in liquidity.

Based on the Vector Autoregressive model output and Granger Causality test output the conclusion is derivatives trading does not impact the liquidity of the underlying stock in the short run for Safaricom, KCB, BAT, ABSA, and Equity. There no cointegration between the variables hence the Vector Error Correction Model used to examine the long run impact was not constructed for the Safaricom, KCB, BAT and ABSA. For Equity, there was cointegration between the variables as measured by the Johansen Test hence the Vector Error Correction model was constructed and based on the output trading of Equity derivatives trading had an impact on the liquidity of its underlying stock in the long run. Derivatives trading had an impact the liquidity of its underlying stock for EABL in the short run which was based on the Vector Autoregressive model and Granger Causality test output however there was no cointegration between the variables hence the Vector Error Correction Model used to examine the long run impact was not constructed by the researcher.

The views from key market participants on the impact of derivatives trading on the equity market was categorized in this research into three aspects relating to the derivatives market: the general working of NEXT, the Impact of Liquidity on the cash market after the introduction of derivatives and Investor participation at the derivatives market. The findings indicated that the derivatives market had been operating efficiently since its launch, the relationship between key participants had been working effectively, the clearing process was efficient, and the rules and regulations of the derivatives market were sufficient. There was no observable change in liquidity of the cash market after the introduction of derivatives.

CHAPTER FIVE:

SUMMARY, CONCLUSION AND RECOMMENDATIONS

This chapter presents the summary of the research findings based on the research objectives, the study conclusion, and recommendations for further research. It is organized as follows: **5.1:** Summary of key findings ; **5.2:** Conclusion; **5.3:** Contribution to knowledge **5.4:** Recommendations; **5.5:** Limitations to the Study.

5.1 Summary of Key Findings

5.1.1 Impact of Single Stock Futures (SSF) trading (derivatives trading) on the liquidity of underlying stocks.

The liquidity of stocks was measured using the Amihud (2002) Illiquidity price ratio interpreted as: the higher the illiquidity ratio the lower the liquidity of the stocks and the lower the illiquidity ratio the higher the liquidity of the stocks. The change in the liquidity levels post derivatives listing observed was not the same for all the six listed stocks.

The Amihud illiquidity ratio increased six months and one year post derivatives listing for Safaricom Plc, Kenya Commercial Bank Group Plc and ABSA Kenya stocks which indicated a decrease in their individual stock liquidity. These findings were consistent with Narasimhan & Kalra (2014) who through their research found that the illiquidity of stocks at the National Stock Exchange of India (NSE) increased in the short run post derivatives introduction which could have been as a result of a shift in the cash market volume to the derivative market using Amihud's illiquidity ratio as a measure of liquidity a similar measure used in this research. Narashiman & Karla (2012) using liquidity beta as a measure of liquidity found that the negative value of liquidity beta had increased after derivative trading introduction in India which resulted in an increase in the sensitivity of liquidity shocks on asset prices. Gygax, Liu and Long (2006) who analyzed the liquidity effects on the underlying stocks following the introduction of the single stock futures (SSF) contracts on the One Chicago exchange using bid ask spread as the liquidity measure also observed a reduction in the liquidity of SSF stocks because of the significant increase in the spreads of the stock three moths post the introduction period.

The Amihud illiquidity ratio decreased six months and one year post derivatives listing for Equity Group Holdings Plc, East African Breweries Ltd and British American Tobacco Kenya Plc stocks which indicated an increase in their individual stock liquidity. These findings were consistent with Fedenia & Grammatikos (1992) who found that the bid-ask spreads in stock markets narrowed after derivative listing. Bid ask spread a different liquidity measure used from the Amihud Illiqudity ratio which was used in this research is the cost of trading incurred by a trader while executing a trade whereby a minimal bid-ask spread is preferred which is an

indicator of higher stock liquidity. Fang and Xu (2007) also observed an increase in trading volume which is a liquidity measure by carrying out a comparative study in Korea, India, and China's Taiwan stock markets after the introduction of stock index futures. However, their research focused on index futures unlike this study which focused on single stock futures.

5.1.2 Impact of Single Stock Futures (SSF) trading (derivatives trading) on the liquidity of underlying stocks in the short run and long run.

Derivatives trading did not have an impact on the liquidity of underlying stocks in the short run based on the Vector Autoregressive Model output and the Granger Causality test output for Safaricom Plc, Kenya Commercial Bank Group Plc, British American Tobacco Kenya Plc and ABSA Kenya stocks. The long run impact of derivatives trading on liquidity of underlying stocks was not examined for Safaricom Plc, Kenya Commercial Bank Group Plc, British American Tobacco Kenya Plc and ABSA Kenya stocks as there was no cointegration between the variables meaning that the Vector Error Correction Model was not constructed.

For Equity Group Holdings Plc stock, derivatives trading did not have an impact on the liquidity of its underlying stock in the short run based on the Vector Autoregressive Model output and the Granger Causality test output. The long run impact of derivatives trading on liquidity of underlying stocks was examined and the Vector Error Correction Model constructed as there was cointegration between the variables. From the VECM model output derivatives trading had an impact on the liquidity of its underlying stock in the long run.

Derivatives trading had an impact the liquidity of its underlying stock for East African Breweries Ltd stock in the short run which was based on the Vector Autoregressive model and Granger Causality test output however there was no cointegration between the variables hence the Vector Error Correction Model used to examine the long run impact was not constructed.

Based on the findings the decrease in liquidity of underlying stocks for Safaricom Plc, Kenya Commercial Bank Group Plc and ABSA Kenya cannot be explained by derivatives trading. The increase in liquidity of stocks as measured by the Amihud illiqudity ratio for British American Tobacco Kenya Plc post derivatives listing was not because of derivatives trading in the short run. These findings are compliment Beer (2008) research findings which revealed that SSF trading had little impact on the underlying share prices and a reduction in the level and changes in the structure of spot market volatility.

The increase in stock liquidity for Equity Group Holdings Plc can be explained by derivatives trading in the long run and the increase in stock liquidity for East African Breweries Ltd can be explained by derivatives trading in the short run. These findings compliment Chen and Zhang (2015) study who also observed that a co-integration relationship existed in the short term and long term between stock index futures and the stock market.

5.1.3 Key market participants view on the impact of derivatives trading on the equity market

The impact of derivatives trading on the equity market from key market participants which was the third objective of the research was categorized into three aspects relating to derivatives trading in Kenya namely, the general working of the NEXT platform, Impact of Liquidity on the cash market after the introduction of derivatives and Investor participation at the derivatives market.

On the general working of the NEXT, the respondents indicated that the derivative's trading platform was reliable, efficient and user friendly. The requirements to participate in derivatives market were not too stringent as an accredited trading member, the rules and regulations applied were sufficient and the clearing process is efficient. They also indicated that as accredited trading members they were well acquainted with their role in the derivatives market and the relationship between key derivatives market stakeholders works efficiently and effectively. Which are key aspects for proper functioning of the derivatives market.

The impact on liquidity of the cash market after the introduction of derivatives based on the research findings was that liquidity of underlying stocks had not increased in the short run and long run which meant that the liquidity of the overall cash market had not increased. There was also no increase in the trading activity, trading volume, volatility and share price levels post derivatives introduction in the exchange consistent with Beer (2008) study findings that revealed that SSF trading had little impact on the underlying share prices and Chen and Zhang (2015) whose study revealed that the index futures did not have a significant effect on the spot market volatility.

On investor participation the respondents indicated that investors were interested in participating in the derivatives market but were not well acquainted with knowledge about how the derivatives market works. The derivatives market has attracted the interest of international investors and increased the range of products offered by the exchange promoting diversification. There has been a gradual increase in the number of investors participating in the derivatives market since its launch. Investors who were already trading in the NSE platform were also quick to take up derivatives trading through their platforms. The respondents also believe that Direct Market Access would aid in increasing investor participation in the derivatives market.

5.2 Conclusion

This research examined the impact of derivatives trading on the liquidity of underlying stocks using data available from the six listed companies whose futures have participated in derivatives trading at NEXT since 4th July 2019. To study the aspect of liquidity of underlying

stocks the Amihud Illiquidity price ratio was used to compare liquidity pre and post derivatives listing which was complimented by the Vector Autoregressive Model output which examined the impact of derivatives trading on the liquidity of underlying stocks in the short run and long run. Through the issuance of questionnaires to NEXT accredited trading members who are key market participants the study was also able to evaluate their views on the impact of derivatives trading on the equity market.

The first and second objective of this research was to determine the short run and long run impact of Single Stock Futures (SSF) trading on the liquidity of underlying stocks at the NSE and to evaluate the views on the impact of derivatives trading on the equity market from key market participants which was the third objective.

Safaricom Plc, Kenya Commercial Bank Group Plc and ABSA Kenya stocks experienced a decrease in their individual stock liquidity six months and one year post derivatives listing as measured by the Amihud illiquidity ratio. The decrease in their individual stock liquidity for the study period was not due to derivatives trading in the short run as derivatives trading did not have an impact on their underlying stock liquidity based on their Vector Autoregressive Model output and the Granger Causality test outputs. The long run impact of derivatives trading on liquidity of underlying stocks was also not examined for Safaricom Plc, Kenya Commercial Bank Group Plc and ABSA Kenya stocks as there was no cointegration between the variables meaning that the Vector Error Correction Model was not constructed.

British American Tobacco Kenya experienced an increase in its stock liquidity six months and one year post derivatives listing as measured by the Amihud illiquidity ratio. The increase in stock liquidity was not due to derivatives trading in the short run as derivatives trading did not have an impact on their underlying stock liquidity based on the Vector Autoregressive Model output and the Granger Causality test outputs. The long run impact of derivatives trading on liquidity of underlying stocks was also not examined as there was no cointegration between the variables meaning that the Vector Error Correction Model was not constructed.

East African Breweries Ltd experienced an increase in its stock liquidity six months and one year post derivatives listing as measured by the Amihud illiquidity ratio. The increase in stock liquidity can be explained by derivatives trading in the short run as derivatives trading had an impact on its underlying stock based in the Vector Autoregressive Model output and Granger Causality test output. The long run impact of derivatives trading on liquidity of underlying stocks was not examined as there was no cointegration between the variables meaning that the Vector Error Correction Model was not constructed.

Equity Group Holdings Plc experienced an increase in its stock liquidity six months and one year post derivatives listing as measured by the Amihud illiquidity ratio. The increase in stock liquidity was not due to derivatives trading in the short run as derivatives trading did not have

an impact on their underlying stock liquidity in the short run based on the Vector Autoregressive Model output and the Granger Causality test output. In the long run the increase in stock liquidity can be explained by derivatives trading as the long run impact of derivatives trading on liquidity of underlying stocks was examined and the Vector Error Correction Model constructed as there was cointegration between the variables. The VECM model output showed that derivatives trading had an impact on the liquidity of the underlying stock in the long run.

The findings of this research show that derivatives trading has an impact on the liquidity of underlying stocks at the Nairobi Securities Exchange in the short run as exhibited by Equity Group Holdings Plc stocks and in the long run as in the case of East African Breweries Ltd stocks.

Accredited NEXT trading members who represented key market participants for this research also shared their view on the impact of derivatives trading on the equity market. This was categorized into three aspects relating to derivatives trading in Kenya namely, the general working of the NEXT platform, Impact of Liquidity on the cash market after the introduction of derivatives and Investor participation at the derivatives market. On the general working of the NEXT, the respondents indicated that the derivative's trading platform was reliable, efficient and user friendly. The requirements to participate in derivatives market were not too stringent as an accredited trading member, the rules and regulations applied were sufficient and the clearing process is efficient. They also indicated that as accredited trading members they were well acquainted with their role in the derivatives market and the relationship between key derivatives market stakeholders works efficiently and effectively. The impact on liquidity of the cash market after the introduction of derivatives based on the research findings was that liquidity of underlying stocks had not increased in the short run and long run which meant that the liquidity of the overall cash market had not increased. On investor participation the respondents indicated that both local and international investors were interested in participating in the derivatives market as a gradual increase in the number of investors participating in the derivatives market since its launch had been observed. Direct Market Access would also aid in increasing investor participation in the derivatives market.

5.3 Contribution to Knowledge

Previous studies that have been done focused on developed countries with mature exchanges with very few being done in developing countries and particularly in the Kenyan context which was where this study was based. The aim of this study was to add and complement the existing literature focused on the derivatives market and equity/cash market globally and in Africa. Studies done in Kenya that relate to the derivatives market were done before the launch of the derivatives market in Kenya which is a research gap the findings of this study intends to fill.

5.4 Recommendations

Based on the findings of this study, the following recommendations have been made by the researcher:

Policy Recommendations:

Stock Market Regulators (the Capital Markets Authority and Nairobi Securities Exchange) should encourage listed companies to participate in the derivatives market as a causal relationship was observed between derivatives trading and liquidity of underlying stock. This can be used to enhance liquidity at the equity market as derivatives increase the opportunities available to potential investors. They should also carry out aggressive campaigns aimed at investor sensitization about the derivatives market both locally and internationally. This should include information about the range of products offered at NEXT to encourage participation and increase in trading activity.

Managerial Recommendations

For investors and companies, the Nairobi Securities Exchange should encourage more listed firms to participate in the derivatives market as investors are keen on participating in the derivatives market which would increase the options available at NEXT. Direct market access would also encourage investor participation in the derivatives market.

Areas of further research

For researchers, further study can be done to compare the impact of derivatives trading on the liquidity of underlying stocks for companies that had low liquidity and those that had high liquidity before derivatives listing. A follow up study can also be done to access the impact of Equity Index Futures trading on the NSE25 Share Index.

5.5 Limitations to the study

The response rate 66% though sufficient was because of accredited trading members who were registered but were not active at the derivatives market. The research aimed at a 100% response rate since the target population was the 12 accredited trading members to get detailed information of the functioning of the derivatives market from the perspective of key market players.

Derivatives trading data was missing for some companies in some months which reduced the number of observations in the construction of the Vector Autoregressive Model.

The derivatives market is relatively young with a limitation on the number of listed firms participating in the derivatives market which resulted in a small population for the study.

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APPENDICES

Appendix 1: Ethical Clearance Letter

Strathmore UNIVERSITY

19th August 2021

Ms Muthanga Naomi,
naomi.muthanga@strathmore.edu

Dear Ms Muthanga,

RE: An Analysis of Liquidity of Stocks and The Impact of Derivative Trading on Their Liquidity at the Nairobi Securities Exchange

This is to inform you that SU-IERC has reviewed and **approved** your above **SU- independent** research proposal. Your application reference number is **SU-IERC1054/21.** The approval period is **19th August 2021 to 18th August 2022.**

This approval is subject to compliance with the following requirements:

i. Only approved documents including (informed consents, study instruments, MTA) will be used
ii. All changes including (amendments, deviations, and violations) are submitted for review and approval by SU-IERC.
iii. Death and life-threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to SU-IERC within 48 hours of notification
iv. Any changes, anticipated or otherwise that may increase the risks or affected safety or welfare of study participants and others or affect the integrity of the research must be reported to SU-IERC within 48 hours
v. Clearance for export of biological specimens must be obtained from relevant institutions.
vi. Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. Attach a comprehensive progress report to support the renewal.
vii. Submission of an executive summary report within 90 days upon completion of the study to SU-IERC.

Prior to commencing your study, you will be expected to obtain a research license from National Commission for Science, Technology and Innovation (NACOSTI) https://research-portal.nacosti.go.ke/ and also obtain other clearances needed

Yours sincerely,

Dr Virginia Gichuru,
Secretary; SU-IERC

Cc: Prof Fred Were,
Chairperson; SU-IERC

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Appendix II: NACOSTI Permit

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION

Ref No: **646806**

Date of Issue: **20/May/2021**

RESEARCH LICENSE

This is to Certify that Ms.. Naomi Wangu Muthanga of Strathmore University, has been licensed to conduct research in Nairobi on the topic: AN ANALYSIS OF LIQUIDITY OF STOCKS AND THE IMPACT OF DERIVATIVE TRADING ON THEIR LIQUIDITY AT THE NAIROBI SECURITIES EXCHANGE. for the period ending : 20/May/2022.

License No: **NACOSTI/P/21/10653**

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Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION

Verification QR Code

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Appendix III: Letter of Introduction

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Strathmore UNIVERSITY
BUSINESS SCHOOL

11th May 2021

RE: FACILITATION OF RESEARCH – NAOMI MUTHANGA

This is to introduce Naomi Muthanga who is a Master of Commerce (MCOM) Student at Strathmore University Business School, admission number MCOM/059750. As part of our MCOM Program, Naomi is expected to do applied research and undertake a project. This is in partial fulfilment of the requirements of the MCOM course. To this effect, Naomi would like to request for appropriate data from your organization.

Naomi is undertaking a research paper on "**AN ANALYSIS OF LIQUIDITY OF STOCKS AND THE IMPACT OF DERIVATIVE TRADING ON THEIR LIQUIDITY AT THE NAIROBI SECURITIES EXCHANGE.**" The information obtained shall be treated confidentially and shall be used for academic purposes only.

Our MCOM seeks to establish links with industry, and one of these ways is by directing our research to areas that would be of direct use to industry. We would be glad to share our findings with you after the research, and we trust that you will find them of great interest and of practical value to your organization.

We appreciate your support and shall be willing to provide any further information if required.

Yours sincerely,

Caroline Tiara
Manager – Graduate Programs.
Strathmore University Business School.

Strathmore Business School is a Proud member of:
Association of African Business Schools AABS EFMD AACSB

Appendix IV: Questionnaire

The researcher will use this questionnaire to collect additional qualitative information to supplement quantitative results on the impact of derivatives trading on the liquidity of underlying stocks at the NSE. The information collected will be used for purposes of this study only.

Please fill out the following questionnaire to help the researcher understand the impact of derivatives trading on the equity market (cash market) in the Kenyan context.

Thank you for your participation.

Name of Accredited Trading Firm: …… Date: ……

1. **Kindly tick the option that represents your position. (Likert Scale Strongly Disagree=1, Strongly Agree=5)**

Statement	**Strongly Agree**	**Agree**	**Unsure**	**Disagree**	**Strongly Disagree**
NEXT trading platform is working exceptionally					
The requirements to participate in the derivatives market too stringent					
The rules and regulations set for derivatives trading are sufficient.					
As an accredited member of NEXT are well acquainted with your role (Was your management well oriented)					
The clearing process works very efficiently					
The relationship between key derivative market participant and stakeholders works					

effectively and efficiently.					

2. Since the launch of derivatives at the NSE: (Likert Scale Strongly Disagree=1, Strongly Agree=5)

Statement	Strongly Agree	Agree	Unsure	Disagree	Strongly Disagree
Trading Activity in the cash market has increased					
Liquidity of stocks whose futures has participate in derivatives trading increased in the short run.					
Liquidity of stocks whose futures participate in derivatives trading increased in the long run.					
Liquidity of the overall cash market increased after the introduction of a derivatives market.					
Trading volume increased in the equities market after the introduction of derivatives at the NSE.					
Share price levels increased for stocks whose					

futures in futures trading.					

3. **Kindly tick the option that represents your position. (Likert Scale Strongly Disagree=1, Strongly Agree=5)**

Statement	**Strongly Agree**	**Agree**	**Unsure**	**Strongly Disagree**	**Disagree**
Investors are interested in participating in the derivatives market.					
Investors are well acquainted with knowledge of how the derivatives market works.					
Investors who were already trading in the NSE platform were quick to take up derivatives trading.					
Do you think the launch of NEXT gives your investors a range of products to choose from?					
The NEXT trading platform is user-friendly.					
Direct Market Access will make derivatives trading the platform investor focused					
The derivatives market has attracted international investors					

The trading activity increased after the introduction of derivatives on your platform.						