FIRM CHARACTERISTICS AND FINANCIAL STABILITY OF COMMERCIAL BANKS IN KENYA

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DECLARATION

This thesis is my original work and has not been presented for any degree in any other University. No part of this thesis should be reproduced without prior authority of the author and/ or Kenyatta University.

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Declaration by Supervisors

We confirm that the work reported in this thesis was carried out by the candidate under our supervision as university supervisor.

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DEDICATION

I devote the thesis to my lovely parents Alex and Florence Wafula for bringing me up in the fear of God and their moral support towards my academic journey and most significantly to my academic sponsors Paul and Cathy Addis; I am sincerely grateful.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

OPERATIONAL DEFINITION OF TERMS

Asset Quality	Ability of bank resources (credits) to provide income; it is the convenient way with which borrowers are meeting their legally binding commitments. Loan loss provision to operating income was utilized as an indicator to asset quality; a lower ratio is desirable.
Bank Liquidity	The capacity of a financial institution to account for commitments at the time of expiry. Bank liquidity was measured based on total loan to customer deposit; a higher ratio is desirable.
Capital Adequacy	A number of assets which a budgetary organization should have and to stay aware of the ultimate objective to lead its business in a sensible way, computed as core capital to total assets of a Commercial bank; a higher ratio is desirable.
Commercial Bank	A formal financial institution that accepts deposit and gives loans with a view to making profits.
Exchange rate	The value of Kenya's currency in relation to another currency; measurement is based on US Dollar vis-à-vis Kshs.
Financial Stability	Interconnection between financial institutions whereby a crisis of one institution can induce uncertainty, resulting in bank failures in the financial sector due to the imbalances in the financial institutions. Fragility index was used as proxy to financial stability.

Firm Characteristics	Attributes whose controls are majorly under the control of firm's management, CAMEL variables was used as Indicators to firm characteristics.
Fragility	is a subset of financial stability and is described as the weakness of a monetary system to a banking crisis.
Fragility Index	An indicator of early warning signal of financial healthiness of an institution, which is a composite measure of financial stability comprised credit risk, liquidity risk and foreign exchange risk.
Operational Efficiency	Bank's ability to turn resources into revenue. Computed as cost to income from operations of the commercial bank; a lower ratio is desirable.
Profitability	What is left after all the obligations that fall due from operations have been taken care of and is computed as profits before tax to total assets.

ABBREVIATIONS AND ACRONYMS

AR (1)	First Order Autocorrealtion
AR(2)	Second Order Autocorrelation
ARDL	Autoregressive Distibution Lag
BCBS	Basel Committee on Banking Supervision
CAMEL	Capital Adequacy, Asset Quality, Management Efficiency, Earnings/ profitability and liquidity.
CBA	Commercial Bank of Africa
CBK	Central Bank of Kenya
CEO	Chief Executive Officer
CMA	Capital Market Authority
CPI	Consumer Price Index
DSE	Dhaka Stock Exchange
ETB	Ethiopia birr
GCC	Gulf Cooperative Council
GDP	Gross Domestic Product
GMM	Generalized Method of Moments
GoK	Government of Kenya
HHC	Hadri Hetroskedastity Consistent
IFRS	International Financial Reporting Standards
IMF	International Monetary Fund
IRF	Impulse Response Function
KCB	Kenya Commercial Bank
KSHs	Kenya Shillings
LLP	Loan Loss Provision

LLC	Levin-Lin- Chu
LM	Lagrange Mutiplier
MENA	Middel East and North Africa Countries
MFLs	Micro Finacial Instituions
NBK	National Bank of Kenya
NIM	Net Income Margin
NPLs	Non Perfoming Loans
OLS	Ordinary Least Square
OIC	Organization of Islamic Countries
PM	Profit Margin
ROA	Return on Asset
ROE	Return on Equity
SFA	Stochastic Frontier Analysis
VIF	Variance Inflation Factor

ABSTRACT

A stable banking sector is significant in ensuring economic growth as well as sound, efficient and stable financial system. However, the banking sector has been considered fragile and this is evident from the increasing trend of non-performing loans, fluctuating deposit trend of some commercial banks and increasing trend of foreign liabilities held by commercial banks in Kenya which is associated with financial stability. Furthermore the collapsing of commercial banks and some being put under receivership is of great concern to the financial stability of the commercial banks in Kenya. The Central Bank of Kenya (CBK) uses the CAMEL model whose firm characteristics namely, capital adequacy, asset quality, management efficiency, earnings/profitability and liquidity are used as measures of ascertaining the financial stability of commercial banks in Kenya. Despite the CBK's adoption of the CAMEL model, the banking sector in Kenya has been considered fragile. It is the need to investigate the link between firm characteristics and financial stability of commercial banks in Kenya, which triggered the desire to undertake this study. The general objective of the study was to establish the effect of firm characteristics on financial stability in commercial banks, Kenya. The specific objectives of the study were to determine the effect of operational efficiency, capital adequacy, bank liquidity, profitability and asset quality on financial stability of commercial banks in Kenya. Exchange rate was utilized to ascertain the moderating effect between firm characteristics and financial stability of commercial banks in Kenya. The study has been underpinned on Agency Theory and supported by Efficiency Structure Theory, Buffer Capital Theory, Liquidity Shiftability Theory and Information Asymmetry Theory. Causal research design was employed. The study was carried out in 17 fragile commercial banks in Kenya, between years 2011 to 2018.The study carried out normality test, panel unit root test, autocorrelation, heteroscedasticity test and multicollinearity test. Generalized Method of Moments (GMM) model guided by dynamic panel regression results revealed that operating efficiency had a statistically significant positive effect on financial stability of commercial banks in Kenya. Capital adequacy had a statistically significant negative effect on financial stability of commercial banks in Kenya. The study further revealed that bank liquidity had a statistically insignificant negative effect on financial stability of commercial bank in Kenya. In addition, profitability had a statistically significant negative effect on financial stability. Asset quality had a statistically significant positive effect on financial stability. Exchange rate had a statistically significant negative effect on the relationship between firm characteristics and financial stability of commercial banks in Kenya. The study concludes that firm characteristics namely operating efficiency, capital adequacy, profitability and asset quality are strongly linked to financial stability of commercial banks in Kenya. The study recommends for mergers and acquisition among the fragile commercial banks as per the fragility index, adoption of internal economics of scale, limits on insider loans to be established, credit to borrowers should not exceed 15% of the capital and adoption of unified exchange rate. This would ensure a sound and vibrant economy towards achieving the Vision 2030 that advocates for well-functioning, efficient and stable financial system.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Financial stability of a commercial bank is the backbone of the whole financial system as banks assume a focal role in the economic growth (Hussein, 2010). Commercial banks contribute to a larger percentage of the counties GDP of 43.22% (Plecher, 2020). In evaluating the financial stability of a commercial bank, special consideration should provide for recognizing exogenous factors and endogenous elements that rely upon the functioning of the bank and to decide the degree of their effect on the state and activities of the commercial banks (Brauers, Ginevicius & Podviezko, 2014). Exogenous elements include political, social and economic factors while endogenous variables comprises of bank's capital adequacy, liquidity, level of profitability, asset quality, management efficiency and the solvency of the bank. These variables are common to all commercial banks; they have a huge effect on the accomplishment of the financial stability state (Dovhal & Chamara, 2015). Hence, the financial stability of the banking sector needs to be established to ensure steadiness in the financial system.

Internal factors (endogenous variables) and external shocks (exogenous variable) largely can collectively hamper the financial stability of a financial institution (Alexandru & Romanescu, 2008). Shocks may emanate from economic policies, macroeconomic conditions and external environments (Azam & Siddiqoui, 2012). When a financial institution system is weak, any externalities can lead to its collapse, however strong the institution, thus halting the financial intermediation process (Lumpkin, 2008). In the outrageous case, it might even prompt a financial crisis with unfriendly ramifications for a given economy (Vento & Ganga, 2010). Internal

(endogenous) variables can be classified as firm characteristics while the external (exogenous) variables can be classified as the external operating environment (Azam & Siddiqoui, 2012).

Globally financial stability among financial institutions has been of major concern since the genesis of banking crises that have adversely affected the economies of developed, emerging and developing countries (Timoumi, Mohamed & Zeitun, 2015). The world at large has experienced five major devastating banking crises of modern times. First, was the Credit Crisis of 1772 which was precipitated by the failure of banks in London and Scotland. Second, was the Banking Crisis of 1933 triggered by the Great Depression of 1929-1933 which began after the stock market crash of October 1929. Third, was the Secondary Banking Crisis of 1973-75 which coincided with the first global oil crisis of 1973 triggered by Organization of the Petroleum Exporting Countries - OPEC (Reid & Kynaston, 2003). Fourth, was the Asian Financial Crisis of 1997 originating from Thailand and engulfing the whole Sub-Asian continent (Zhuang & Dowling, 2002). Lastly, was the Global Financial Crisis of 2007-2009 originating from the United States of America (USA); is classified as the most severe crisis, triggered by the breakdown of the Lehman Brothers which was among the largest venture banks worldwide (White, 2010).

Financial stability has been a critical point of concern with regards to policy makers internationally since the Financial Crisis of 2007-2009 (Beck, 2009). The 2007-2009 Financial Crisis was engineered by the breakdown of an asset price bubble in the housing market in the US (Zywicki & Okloski, 2009). The collapse of the Lehman Brothers investment bank was immediately followed by a credit crunch that translated into liquidity and solvency crises, resulting into a global recession (Mutuku, 2010).

Developed countries were greatly affected by the fundamental banking financial crisis in the U.S and Europe. Capital streams, cross border financial linkages and exchange rates were the main avenues through which the other markets were affected and yet they had a well-developed financial systems (Sin, 2016). The developing countries were drawn into the global financial crisis because of the portfolio outflows that hit hard the developing countries to the extent that some economies took time to recover from the shock (Diery, 2010).

Due to the recurring financial crisis, this triggered the G10 governors to come up with a methodology that would ensure financial stability around the globe and thus the formation of Camel Model in 1974 in Switzerland at Basel City hence the name Basel Committee. The Basel Committee on Banking Supervision (BCBS) has been on the forefront in ensuring financial stability in all financial institutions globally (Kouser, Aamir, Mehvish, &Azeem, 2011). The Basel Committee in 1998 further established Basel Capital Accord I to strength the Camel Model. In June 2004, the Basel Capital Accord II was formulated to strengthen Basel I; in 2010, Basel III was formulated to strengthen Basel II, a risk based approach after the global financial crisis of 2007-2009 (Savluk, 2015). The common narrative among the three accords is the emphasis to strengthen the key internal factors within the financial system, all geared towards attaining financial stability of the sector through establishing minimum requirements of the key internal factors that banks should comply to (BCBS, 2012).

The Central Bank of Kenya (CBK) has traditionally adopted the CAMEL Model proposed by BCBS and International Monetary Fund (IMF) to all financial institutions globally (Baral, 2005; Olweny & Shipho, 2011: Kalunda, 2015), whose firm characteristics namely; liquidity, capital adequacy, management efficiency, asset

quality and earnings/profitability are used to determine the financial stability of banks. Notwithstanding the activity by the controller, the banking sector in Kenya has experienced challenging moments that have seen some commercial banks collapse, and some put under receivership (CBK, 2016).

The current study desired to investigate the effect of firm characteristics on financial stability of commercial banks in Kenya, given the moderating effect of the exchange rate on the study variables. Understanding the effect of CAMEL variables; namely liquidity, capital adequacy, management efficiency, asset quality and earnings/profitability on financial stability will guide policy makers on enforcing the dormant exiting policies that are always formulated by the BCBS with a view to ensuring financial stability in financial institution worldwide, and also come up with new policies that will ensure stability of the banking sector at large.

1.1.1 Financial Stability

Anatolyevna and Ramilevna (2013) classify financial stability into two categories. They describe it first, as an interconnection among financial institutions whereby a crisis of one institution can induce uncertainty, resulting in bank failures in the financial sector. Second, when a shock influences many financial institutions and causes subsequent failures, that destabilizes the entire economy. Alawode and Mohammed (2008) describe financial stability as the smooth task of the divisions of money-related intermediation forms among government, households and firms through a scope of financial institutions supported by a many financial framework. However, a debate on a specific or particular definition of financial stability is still a point of contention (Mohamed, Abouch, Saidi, Abdessamad, Firano & Zakaria, 2012).

Nonetheless, financial stability can be described as the firmness of banking system towards banking crisis.

Banking segment in Kenya has experienced turbulent moments that has seen many banks collapsing, with some put under receivership which has occurred in four waves since 1984 to 2018 (CBK, 2018). The first wave of banks that collapsed in 1984 -1989 before the passing of the 1989 Banking Act, were mainly family, community owned post-independence banking institutions as a result of liquidity problems (Musau, Muathe & Lucy, 2018). Due to the first wave of collapsed banks, the Central Bank of Kenya increased the minimum capital requirement for commercial banks to hold and deposit insurance was a mandatory. Notwithstanding the regulation, the banking industry faced another second wave of bank collapsing between 1993 and 1995 (Matete, Ndede & Ambrose, 2014). The third and fourth waves occurred between years 2007 to 2015 and 2015 to 2018 respectively (see Appendix ii). The fourth wave saw Dubai Bank collapse while Imperial Bank and Chase Bank put under receivership (CBK, 2016).

The placement of M Bank under receivership as at August 2018 was a signal of financial instability in the banking sector in Kenya (Government of Kenya - GoK, 2018). The interconnection between banks locally and globally through inter-borrowings, cross border linkages and common exposures; a shock affecting a specific bank or country would ultimately affect the real economy and the financial system of others and counties respectively as a result of systematic banking crisis (Degryse, Elahi & Penas, 2013). A common denominator in some of the commercial banks that have collapsed in Kenya and some put under receivership has been associated with poor internal management which is wholly depended on the management discretion (Kalani

& Wareru, 2009). Well managed internal factors in financial institutions are associated with economic growth and financial stability. Financial instability can also be attributed to external operating environment (Ongore & Kusa, 2013).

Financial stability is a broader discipline. Chant (2003) categorizes it into three ranges of possibilities namely financial crisis, instability and fragility. However Chant does not bring out the measurement of the respective possibilities. Financial crisis, instability and fragility can collectively communicated as vulnerability of financial sector towards a shock. Given this, the current study extended the research from the fragility index developed by Kibritçioglu, (2002). Whose indicators can be traced from the IMF staff papers (Gonzale, Berjooosillo, 1996: González-Hermosillo, Brenda, Ceyla Pazarbasssıoglu, & Billings, 1997). Fragility is how much small economic stuns have lopsidedly huge unfavorable consequences on the financial bodies (Allen &Gale, 2008). On the other hand, Loloh (2014) points out fragility as the weakness of a monetary system to banking financial crisis. Fragility index as a proxy of financial stability has been employed by a number of studies (Loloh, 2014; Ahmad & Mazlan, 2015).

Many studies have employed Z index as a proxy of financial stability (Laeven & Levine, 2009; Cihak & Hesse, 2010; Karim & Abuduh, 2016; Ameni, Chaibi, & Omri, 2017; Alphonse, Michael & Luc, 2018; Musau, 2018). However, the Z score measure has been criticized as it estimates chance of a loss in a solitary period; it does not mirror the likelihood of a progression of negative benefits which might underestimate banking risk (Beck & Laeven, 2006; Diana & Tomas, 2015). Furthermore Z index makes observations basing on an individual bank independently, possibly disregarding the danger that a default in one bank may make misfortune to other commercial banks

as well (Cihak & Hesse, 2010). Gudmundsson *et al.,* (2013) employed ROE and ROA as an outcome variable of financial stability; however ROE and ROA are employed when ascertaining the profitability levels of commercial banks and not how fragile they are to banking crisis as noted by fragility index in this study.

This study employed fragility index as a composite measure of financial stability that comprises three major indicators namely; credit risk, liquidity risk and foreign exchange risk. Fragility index is preferred for this study since it gives an early warning signal of financial healthiness of an institution (Loloh, 2014). Credit risk is measured by the real value of NPLs in the banking sector, liquidity risk is proxied under real amount of deposits a bank has at a given point that is able to generate more income; foreign exchange risk is measured by the real foreign liabilities of a bank (Allen & Gale, 2008). Foreign exchange risk comes about when a bank holds liabilities and assets in foreign currencies and impacts the earnings and capital of bank due to the variations in exchange rates (Sabri, 2011). Fragility in extension can also be described as advanced financial cracks within the financial system which if not repaired, can lead to instability of a commercial bank and eventually the bank collapses. Thus fragility index is pillar of financial stability (Aykut, 2003, Amoah, 2014).

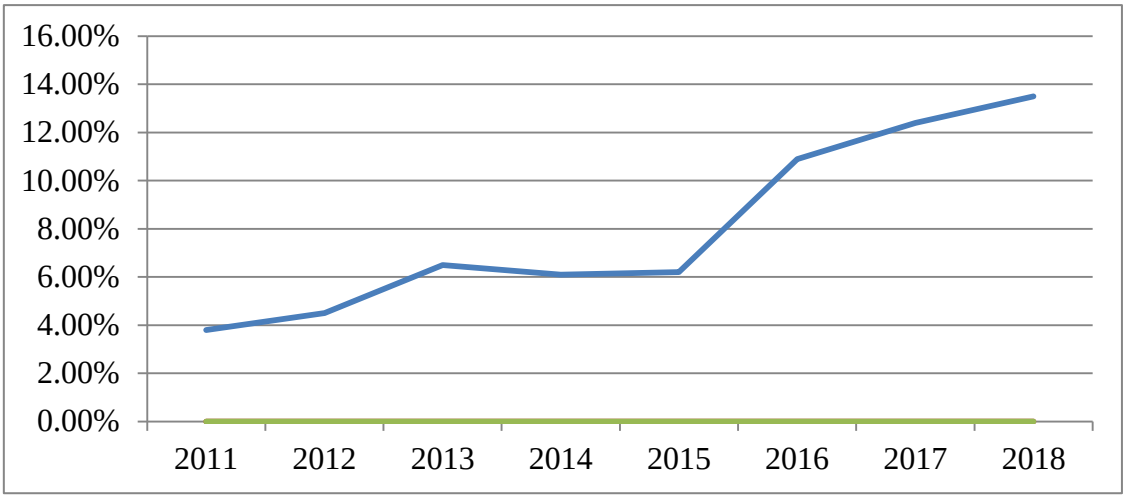

Figure 1.1: Non-Performing Loans Trends in Commercial Banks, Kenya

Source: Cytonn Banking Sector Report (2018)

As illustrated in Figure 1.1, the rate of NPLs in commercial banks in Kenya has been on an increasing trend since 2011; this is a concern to the stability of commercial banks in Kenya. Currently, the NPLs in Kenya are trending at 13.5% as at April 2018; this is way above the recommended standards threshold of 5% (Dayong, Jing, David, Dickinson, & Kutan, 2016). This is a signal of financial instability in the banking sector in Kenya. The real value of NPLs is the proxy of credit risk which is one of the indicators that constitutes fragility index. When default rates are on the increasing rate amongst commercial banks, this erodes the profitability of the commercial banks; in return, they are not able to meet their commitments when they fall due. With reduced profitability and by extension liquidity problems, this directly affects the financial stability of the commercial banks at large.

Table 1.1: Deposit Trends in Commercial Banks, Kenya

Year	2014	2015	2016	2017	2018
Percentage	6%	14.3%	6.4%	11.7%	9.4%

Source: Cytonn Banking Sector Report (2018)

As illustrated in Table 1.1, some of the commercial banks in Kenya show fluctuating deposit growth trends over time. This shows an aspect of bank runs by customers within a particular bank. Bank runs occur when customers withdraw their deposits from a particular bank that is perceived to be fragile to banks that are perceived to be more stable (Cytonn, 2018). Fluctuating deposit trends result from bank runs, exposing a commercial bank to liquidity risk. Liquidity hazard is the likelihood of a commercial bank becoming unfit to settle responsibilities with expeditiousness over a particular timespan (Muriithi & Wareru 2017). Liquidity risk at large acts as a hazard to the financial stability of any financial institution. Bank runs is a vital phenomenon that is increasable, happening in modern banking sectors. The US, Russia, Mexico, Asia and Argentina are among the developed economies; they have been affected by bank runs, leading to closure of the affected banks (Kasri, Arundina, Inruswari & Preasetyo, 2017). Bank runs in themselves are a threat to soundness of the banking sector; the banks are interconnected and a closure of one will affect the other banks through the risk of contagion.

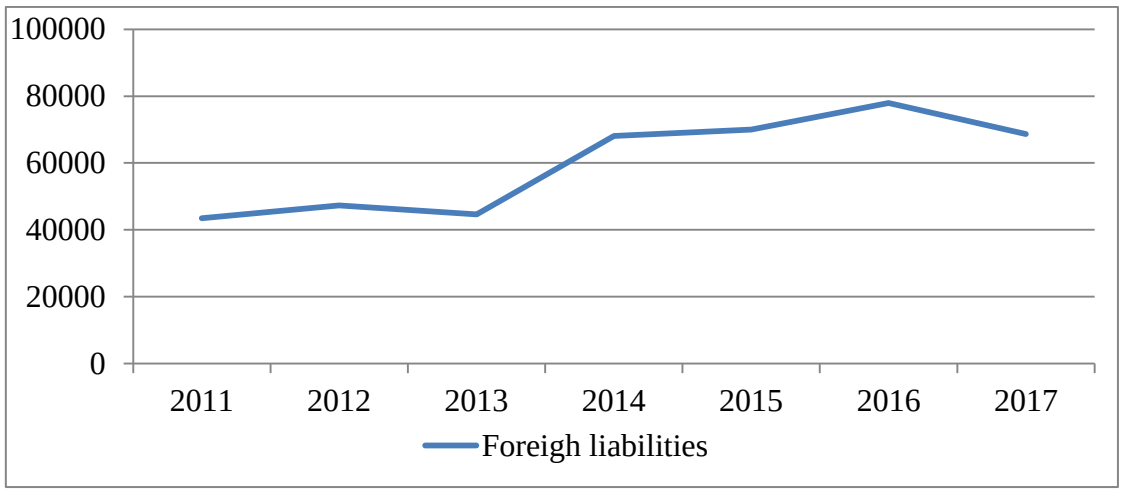

Figure 1. 2: Foreign Liabilities Trends in Commercial Banks, Kenya

Source: Bank Supervisory Report (2017)

As illustrated in Figure 1.2, the increasing trend of foreign liabilities among banks is of incredible unsettle The more foreign liabilities are acquired by commercial banks, the more they are presented to foreign exchange risk which mushrooms from the fluctuations of the exchange rate. Foreign exchange risk comes about when a commercial bank holds more of foreign liabilities; this impacts on banks due to the variations in the exchange rates (Sabri, 2011). With the fluctuations of exchange rates, this increases operating costs. This impact on the efficiency of the financial institution, hence pushing the efficiency ratio to undesirable heights. Over the long haul, it will influence the monetary dependability of the banks. Credit risk, liquidity risk and foreign exchange risk constitute fragility index which was employed as a proxy of financial stability. There exists a negative relationship between financial stability and fragility index. This occurs when fragility index increases; then, instability sets in amongst commercial banks. When fragility index reduces, then a stable state is achieved from the study. Thus, the lower the fragility index, the stable the commercial bank.

Fragility index measures the fluctuations of a financial banking system; it is deemed suitable since it gives an early warning signal of financial heathenness of an institution (Kibritçioglu, 2003). A fragility index of a mean of 0 up to 0.5 signifies a stable and healthy banking sector; any deviations from the threshold and above 0.5 indicate risk-taking activities by an individual commercial bank which is termed as fragile stage (Loloh & Amoah, 2014). Fragile commercial banks do not necessarily imply that an individual commercial bank is collapsing; rather, it signals how vulnerable the banking system is to systematic risk and to external variables like exchange rates which are outside the ability to control by management (Kibritcioglu, 2002). The study separated the fragile commercial banks from the stable commercial banks as per the fragility

index. Commercial banks under early warning phase were further subjected to causal effect with close reference to firm characteristics in the study.

1.1.2 Firm Characteristics

Firm characteristics are the internal variables that are attributed to financial stability of a bank. “Bank” and “Firm” characteristics have been used interchangeably in literature. Nonetheless, they denote to a common denominator (Mdoe, 2017). Okpanachi, Doha and Mohammed (2018) describe firm attributes as variables that are majorly under the control of a firm’s management. Kariuki (2016) describes firm attributes as the parts of an organization that are influenced by firm-level administration. On the other hand, Kandiru, Gachunga, Muturi and Ogutu (2015) points out firm characteristics as the demographic and managerial variables comprising internal environment of the firm. Furthermore, firm characteristics are key attributes of an organization that can influence its performance (Ondigo, 2016).

Kaguri (2013) contends that firm characteristics such as diversification, liquidity, profitability, assets, capital, institutional shareholding, leverage, age of firm, board composition, growth and economic environmental variables have an impact on a business’s monetary performance and its going concern. Gulzara, Hongxing and Muhammad (2018) assert that bank characteristics such as operational efficiency, diversification, funding cost and bank liquidity got a huge impact on the soundness of a financial institution. Athanasoglou, Sophocles and Matthaios (2008) consequently points out that firm characteristics can also be referred to as micro or internal factors that emanate from the financial statements such as statement of financial position and income statements.

Banking Survey (2018) enumerates performance indicators that are employed to determine the stability of the commercial banks namely; asset quality, liquidity, capital adequacy profitability and efficiency which are firm characteristics. The study embraced some firm characteristics as explanatory variables based on CAMEL Model, to be specific operational efficiency was measured as cost to income (Warui, 2016; Ochingo, & Muturi, 2018). Capital adequacy was considered as the second explanatory variable, thus operationalized as core capital to total deposit (Kariuki, 2016; Menicucci & Paolucci, 2017). Bank liquidity was the third explanatory variable, thus total loan to deposit was employed as the measurement (Sporta, 2018). Profitability was the fourth explanatory variable thus profit margin (profit before tax to total asset), utilized as the measurement (Tan, 2016). Asset quality was the firth explanatory variable hence loan loss provision to operating income was employed as the proxy (Sekar, 2014).

'Operational efficiency' and 'management efficiency' have been used interchangeably in literature; they can be described as the capacity of a financial institution to create income from a given number of advantages and make a benefit from a given wellspring of income (Phan & Daly, 2014). The proficiency of a financial framework is shown by its ability to give benefits and keep up the strength of the framework (Ngo, 2012). A bank is seen as continuously effective on the off chance that it can create a given dimension of yield utilizing least measure of resources and thus an improvement in efficiency, which leads to increased profitability hence financial stability of commercial banks (Dulah & Helal, 2017). A commercial bank that is poorly managed will end up being inefficient with its operations. Such a bank will experience high costs than income flowing into the institution. Chase Bank collapsed partly due to mismanagement of resources by the stewards, escalating to liquidity problems (CBK,

2016). The study employed the cost to income as a measure to efficiency; which is utilized by commercial banks in measuring operating efficiency.

Capital adequacy is the measure of bank's available resources which is accessible to help the bank's matter of fact and serve as a cushion against bankruptcy emergencies, restricting the expenses of financial distress by decreasing the likelihood of indebtedness of banks (Athanasoglou *et al.,* 2008; Karminsky & Kostrov, 2014). The Basel Capital Accord recommends for minimum capital requirements that commercial banks should hold. A minimum capital requirement ensures that commercial banks retain stability and reduce the risks of insolvency (Hanke 2013). Capital adequacy is likewise observed to be a vital internal variable of commercial banks' financial stability (Dickson & Marobhe, 2013; Oduora, Ngokab & Odongoba, 2017). The general agreement can be noted that banking sector that possess a larger capital cushions have an advantage to position and help organizations together with family units in terrible moments; buffers assist banks to navigate through constraints and maintain loaning, amidst a downturn (Gudmundsson, Ngoka-Kisinguh & Odongo, 2013). The study employed core capital to deposit liabilities as proxy to capital adequacy, as recommended by the Kenya Banking Act (2008).

Bank liquidity is the capacity of a financial institution to account for commitments at the time of expiry (Dang, 2011). Liquidity is significant with regards to regulatory institutions just as to speculators and banks (Aljifri & Alzarouni, 2014). The liquidity resources of a money-related organization may be stored in various structures including money close by, short term deposit, money at bank in current resources and reserve deposit under a money credit or overdraft game plan (Sulaiman & Haruna, 2018). The powerlessness of a firm to meet its present commitments may mean a default in installment of premium and principal to the lenders; which may prompt insolvency

(Chew & Tahir, 2014). Many commercial banks the likes of family and community owned post-independence financial institutions, Trust Bank and Imperial Bank, collapsed due to liquidity problems (Musau, Muathe & Lucy, 2018).

Profitability can be described as what is left after all the obligations that fall due from operations have been taken care of (Gatete, 2015). Any money-related foundation seeks to augment benefits; commercial banks are dependably in rivalry with each other; consequently, a beneficial bank will in general pull in a greater number of customers than its partner. At the point when a commercial bank reliably makes benefit, it tends to be viewed as financially stable (Banking Survey, 2018). ROE, ROA, NIM and PM are traditional indicators found in literature that studies have used as profitability measures (Gulzara *et al.,* 2018). Most studies have used ROA, ROE and net income margin as proxy to profitability (Trujillo, 2013; Sinha & Sharma, 2016; Bougatef, 2017). However, few studies from developed nations have used profit margin as proxy to profitability; yet it measures the exact profit earned from operations (Tan, 2016). Thus the study employed profit margin measured by profit before tax to total asset ratio as proxy to profitability.

Asset quality is the ability of bank resources (credits) to provide income; it is the convenient way with which borrowers are meeting their legally binding commitments (Sekar, 2014). The asset quality is in this manner conversely identified with the amount of nonperforming resources. Ombaba (2013) posits that a nonperforming advance/resource is a credit office in regard of which the interest or potentially foremost sum has stayed past due for a particular timeframe. Financial stability of an economy generally relies upon the soundness of the financial system. Vigneswara (2015) declared that to accomplish bank soundness and stability, banks ought to guarantee that quality assets are kept up since quality asset results in financial stability.

Vigneswara (2015) further noticed that inability to guarantee banking stability through asset quality could cause monetary delicacy; which may prompt an emergency in case of market illiquidity and the infection impact of banks.

1.1.3 Exchange Rate

Financial stability of a banking sector has been noted to be influenced by external operating environment whose controls transcend the management of banks (Sumaira & Amjad, 2013). External operating environments are the macroeconomic variables which are importantly observed by consumers, business and governments but due to their impact on the banking segment, they are focal points observed by financial institutions (Otambo, 2016). Studies have been directed on effects of macroeconomic components on financial stability of financial institution to be specific (Akram & Eitrhelm, 2008; Pan & Wang, 2013; Diaconu & Onanea, 2014; Criste & Lupu, 2014). However, many of them have ignored the exchange rate; yet it is a key component among the macroeconomic components that influence the tasks of monetary establishments. An exchange rate variance got dual effect on the financial stability of financial sectors. Immediate impact occurs when the banks do not hold the same measure with regards to foreign currency assets and liabilities. Circuitous impact of the exchange rate fluctuations among banks execution can be directed through its impact on the demand for credits, the degree of rivalry, and other internal aspects of banking conditions (Getachew, 2014).

The exchange rate is the cost of a unit of foreign currency as far as the domestic currency (Osundina *et al.,* 2016). Exchange rate bridges the essential connection between the neighborhood and the abroad market for different merchandise, services and financial assets (Reid &Joshua, 2004).Exchange rate fluctuations might influence the price of domestic products, export, import and foreign direct investment (FDI).

This in turn might affect banks' portfolio and operations such as hedging and speculation (Leyla, 2015). Exchange rate fluctuations in Kenya have been varying with times of quick devaluation with regards to residential Kshs negatively influencing the economy (Ahmed, 2015). Fluctuations of exchange rate will definitely impact the foreign liabilities in commercial banks in Kenya, and thus bring about foreign exchange risk. This study further extended its frontiers through assessing the moderating effect of exchange rate on the relationship between firm characteristics and financial stability of commercial banks in Kenya. The present study employed US dollar to Kshs as the measure of exchange rate in the study as used by Lagat and Nyandema (2016) and Almaqtari *et al*., (2019).

1.1.4 Commercial Banks in Kenya

Commercial banks play a crucial role of consolidating savings from surplus unit and funding deficit units in the economy (Obiero, 2010). Banking soundness as a financial pointer can be used to choose if an economy is sufficiently able to withstand both the inside and outside stuns (Sopan & Dutta, 2018). Business banks in Kenya are represented by the CBK through various banking acts and prudential regulations. The acts and prudential regulations are geared towards achieving the goals of the Kenya's Vision 2030 that advocates for a dynamic and well-working sound, proficient and stable budgetary framework (CBK, 2016). To ensure that banks achieve the objective of financial stability, the CBK has traditionally adopted the CAMEL Model which comprises key firm characteristics (Beck, 2009). Despite the initiative by the regulator, the banking sector in Kenya has experienced challenging moments that have seen some commercial banks collapse, and some put under receivership (CBK, 2016).

Because of the significant expense of credit from the money-related organization in Kenya as viewed by the public, the interest capping law had to be implemented as a

way to lower cost of credit and increase access to credit to a large portion of the populace (CBK, 2017). However, this has not been the case, as a result of the cap on lending at 14% banks had to run away from lending to unsecured loans to treasury bills at 15% which is risk free; it is sure of no defaults risks; the move violated the sole objective of the cap and banks existence. For instance, out of the 3.2 million Kenyans who had connected for credits from commercial banks in May and June 2016, just 1.1 million advances were endorsed (Kenya Banker Association, 2017). This is yet another signal that financial stability of the commercial banking sector in Kenya is fragile.

1.2 Statement of the Problem

A stable banking sector is significant in ensuring economic growth, sound, efficient and stable financial system (Gathaiya, 2017). The CBK has traditionally adopted the CAMEL Model as a gauge to ascertain the financial stability of commercial banks in Kenya (CBK, 2010). However, despite the adopted model, commercial banks in Kenya have experienced a turbulent moment that has seen some commercial banks collapse such as Union Bank, Trust Bank, Euro Bank and Dubai Bank with some put under receivership such as Imperial Bank and Chase Bank (CBK, 2016). In addition the rate of NPLs (credit risk) in Kenya is on an increasing trend which is of concern; the NPLs are operating above ideal mark of 5% (Dayong, Jing, David, Dickinson & Kutan, 2016). Fluctuating deposit trend (liquidity hazards) among commercial banks in Kenya is call for worry (Cytonn, 2018). Furthermore, the increasing trend of foreign liabilities (foreign exchange risk) in commercial banks is a point of concern **(**Bank Supervisory Report, 2017). This signals financial instability amongst commercial banks in Kenya. Thus, need arose to investigate the effect of firm characteristics on financial stability of commercial banks in Kenya.

Financial instability of some commercial banks and those put under receivership has been associated with firm characteristics (Kalani & Waweru, 2009; Kandiru *et al.*, 2015). A stable financial institution is attributed to firm characteristics (Ongore & Kusa, 2013). Hence, this displays an astounding opportunity to comprehend the key variables prompting this recurring phenomenon, with specific reference to the firm characteristics. There exists substantive empirical literature on firm characteristics and financial stability in financial institutions (Dulah, & Hela, 2017; MohdZaini, Sok-Gee, & Sallahudin, 2010; Ameni, Chaibi, & Omri, 2017; Yong, 2016; Akram, Bilal, Asif, & Ammar, 2013; Muhammad & Gang, 2016; Gudmundsson *et al.,* 2013; Ochingo & Muturi, 2018). However, some of these investigations are on studies conducted from other counties, those whose discoveries may not be applicable to the neighborhood banking context with regards to differences in market integration, market transparency, market size, market efficiency and market liquidity (Hoyer-Ellefsen, 2004).

On the other hand, local studies have employed ROA and ROE as the measure of financial stability (Gudmundsson *et al.,* 2013; Ngaira & Miroga, 2018: Lagat & Nyandema, 2016; Simiyu & Ngile, 2015). This study, therefore, used fragility index as measure of financial stability since it gives an early warning signal of financial healthiness of an institution (Loloh, 2014). Moreover, this study used GMM model that is guided by dynamic panel regression. This is unlike other studies that have used static panel regression model (Gudmundsson *et al.,* 2013; Githinji & Njuguna, 2016; Sunday & Naimo, 2020; Oduora, Ngokab & Odongoba, 2017) thus making the methodology superior from the previous studies. GMM model was deemed suitable for this study since it took care of endogenity bias and unobserved heterogeneity (Trujillo, 2013). Exchange rate as a macro factor has been ignored in literature, yet it possess a significant effect on the operations of financial institutions. Thus exchange rate was

employed as a moderating variable in the study. The current study, therefore, sought to bridge the research gaps through investigating the effect of firm characteristics on financial stability of commercial banks in Kenya.

1.3 Research Objectives

1.3.1 General Objective

The general objective of the study was to investigate the effect of firm characteristics on financial stability of commercial banks in Kenya.

1.3.2 Specific Objectives

The study sought to achieve the following specific objectives.

(i) To determine the effect of operational efficiency on financial stability of commercial banks in Kenya.

(ii) To establish the effect of capital adequacy on financial stability of commercial banks in Kenya.

(iii) To determine the effect of bank liquidity on financial stability of commercial banks in Kenya.

(iv) To establish the effect of profitability on financial stability of commercial banks in Kenya.

(v) To determine the effect of asset quality on financial stability of commercial banks in Kenya.

(vi) To determine the moderating effect of exchange rate on the relationship between firm characteristics and financial stability of commercial banks in Kenya.

1.4 Research Hypotheses

The study tested the following null hypotheses.

H_{01}: Operational efficiency has no significant effect on financial stability of commercial banks in Kenya.

H_{02}: Capital adequacy has no significant effect on financial stability of commercial banks in Kenya.

H_{03}: Bank liquidity has no significant effect on financial stability of commercial banks in Kenya.

H_{04}: Profitability has no significant effect on financial stability of commercial banks in Kenya.

H_{05}: Asset quality has no significant effect on financial stability of commercial banks in Kenya.

H_{O6}: Exchange rate has no significant moderating effect on the relationship between firm characteristics and financial stability of commercial banks in Kenya.

1.5 Significance of the Study

This study is significant as it informs and contributes to theory, practice and policy in several ways. Through the discoveries in this study, commercial banks in Kenya with the help of their managers will get to know the stage at which their banks are operating at as far as fragile index outcome is concerned. Upon ascertaining the stage this will serve as relief or a signal to the cause of the commercial bank not performing well and restore the industry to stability before an economic crisis hits the industry, which may eventually led to a collapse of the a commercial bank. To the public, this finding will serve as an eye opener for them to determine where to invest their resources, because

the study has brought to lime light the commercial banks in Kenya and their financial conditions. This will also help to reduce on information asymmetry from management side that is hidden to its key stakeholders in the banking sector.

Understanding the link between firm characteristics, exchange rate and financial stability is significant to policy makers. The study is of essence to the CBK and other regulatory institutions like CMA. It becomes a point of reference when coming up with relevant policies, rules and prudential guidelines that would guide the commercial banks in adhering to minimum capital requirement, maximum operating efficiency threshold, and provisions for NPLs as well as maintaining sound financial soundness in the banking sector.

The researcher advanced the study on already established body of knowledge on investigating how agency theory, efficiency structure theory, buffer capital theory, liquidity shiftability theory and information asymmetry theories are applied in the process of firm characteristics and financial stability of commercial banks. The study points out areas of further research on other aspects of firm characteristics, exchange rate and financial stability of commercial banks in Kenya. Further recommendation from the study is that future researcher can employ the findings of the current study to justify the relationship between those variable.

1.6 Scope of Study

This study has focused on 17 commercial banks that were classified as fragile based on the fragility index out of the 38 commercial banks in existence focusing between years 2011 to 2018. The study chose on year 2011 since this was the period that Kenya experienced the lowest NPLs levels. Since then, it has been on an increasing trend. This pattern hampers banks' stability in Kenya and financial institutions at large. On the

other hand, 2011 was the year that Credit Reference Bureaus were fully in operation. It makes this phenomenon a complex puzzle that needs to be uncovered. The study was also interested in how the proxy of financial stability behaves during the increasing stage and the causal effect of firm characteristics on financial stability. A total number of 136 observations were obtained from 17 commercial banks in Kenya within the period of 8 years.

1.7 Limitations of the Study

The nature of the study directs the researcher to collect quantitative data. Thus the study was limited to secondary data which was obtained from published financial statements of the commercial banks in Kenya. Given that the study dealt with panel data; issues of stationary of data, multicollinearity, heteroscedasticity, autocorrelation were dealt with since the study suggested remedy for each diagnostic test that ensured the outcome was efficient and consistent for decision making by interested parties. The study employed Stata software that was able to deal with balanced and unbalanced data.

1.8 Organization of the Study

This study is sorted into five major segments. The first segment brings forth the background of the study, the phenomena under study, main objective and five specific objectives of the study that has been unpacked form the main objective, the null hypotheses, and scope of the study and significance of the study. The second chapter reviews among others, theoretical and empirical literature on the study topic while identifying the research gaps and presents the conceptual framework. The third segment describes the research methodology that has been employed to accomplish the destinations of the study. Chapter four presents and discusses the results of the analysis

of data. The last segment brings to conclusion the summary, conclusions, policy recommendations, contribution to knowledge and grey areas to be considered by scholars for research.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents literature review and research related to firm characteristics and financial stability of commercial banks. It comprises the theoretical review, empirical review, summary of empirical literature and research gaps exiting in empirical literature and conceptual framework to conclude the chapter.

2.2 Theoretical Review

This segment talks about theoretical literature that shapes the premise clarifying the connections between the explanatory and dependent variables. Saunders, Lewis & Thornhill, (2009) clarifies that a theory is an explanation which is upheld by proof intended to clarify some marvel. This section analyzes the relevant theories on which the study is anchored. The specific theories covered include Agency Theory, Efficiency Structure Theory, Capital Buffer Theory, Liquidity Shiftability Theory and Information Asymmetry.

2.2.1 Agency Theory

Agency Theory was propounded by Jensen and Meckling (1976) as the amazing theoretical structure of the corporate organization composing and positioning investors as the fundamental accessory (Lan, & Heracleous, 2010). The a adoption of the agency theory stretched out amidst the 1980s as affiliations begun supplanting the up till now corporate technique for thinking of administrative free undertaking with regards to the impression of chiefs as operators of the investors (Westphal, 2003). Agency theory talks about the issues that surface in the organizations because of the partition of proprietors and supervisors and underlines on the decrease of this issue. This theory

helps in actualizing the different administration systems to control the operators' activity in the mutually held organizations.

The Agency Theory kept an eye out for what had changed into a making concern, that association occupied with region gathering and had a general lack of regard for shareholder interest through giving courses of activity about how the chief should control the specialist to check managerial advantage and self-premium (Fama & Jensen, 1983). This theory is of essence in the sense that it is the main theory that the study is anchored on. It is linked to the financial stability as the dependent variable and by extension, profitability indicator as well. Shareholders are the principal and the agent the manager: they ought to be good stewards of the resources entrusted with them. Agency conflict arises in situations where a commercial bank is placed on receivership and eventually collapses. This narrows down the possibility of the shareholders earning dividends on their investments.

2.2.2 Efficiency Structure Theory

Efficiency Structure Theory was created by Demsetz (1973). It observes that the connection between market structure and execution of any firm is characterized by a firm's proficiency. Firms with prevalent efficient administration have lower costs, hence higher benefits. Saeed and Kent (2009) pointed out this theory's classification into two perspectives in particular: X efficiency and scale productivity speculations. X efficiency speculation implies that increasingly effective firms have lower costs, higher benefits and bigger pieces of the pie (Athanasoglou *et al.,* 2006). This theory as per Sami (2010) specifies that a bank which works more productively than its adversaries accomplishes higher advantages coming about in view of low operational costs. The X-efficiency theory contends that keeping money with better administration and practices

controls expenses and draws the bank nearer to the best-practice and lower bound cost bend. The scale-proficiency theory contends that a few banks accomplish better size of activity and, in this way, lower costs (Miller *et al.,* 2005).

This theory is significant in the sense that it emphasizes on low operating efficiency among financial institutions. Firms should thus ensure that they maintain a low costs to income ratio that eventually leads to financial stability of the banking sector at large. Expenses to income ratio were employed as proxy to operating efficiency; a lower ratio is desirable to ensure financial stability of commercial banks.

2.2.3 Buffer Capital Theory

The theory was developed in 1996 by Calem and Rob. The theory forecast that a bank moving towards the administrative least capital proportion may have a rousing power to help capital and reduce chance so as to maintain a strategic distance from the administrative costs enacted by a rupture of the capital requirements. Ochei (2013) alludes that the conduct of a bank relies upon the span of its capital cushion; banks with high capital buffers will go for keeping up their capital support. Beckmann (2007) concurs that capital assumes an essential job in keeping up the wellbeing and solidarity of banks. It does so by speaking to the buffer gate that keeps any sudden misfortune that may confront and transcend banks, spilling over to depositor reserves. Capital guidelines are enlivened for the most part by the stress that a bank may hold less capital than is socially perfect, concerning its danger as negative externalities coming about due to bank default are not reflected in market capital essentials.

Capital adequacy is one of the CAMEL variables that central banks have adopted for use to ascertain the soundness and financial stability of commercial banks in Kenya. There is much emphasis by regulators for financial institutions to adhere to the

minimum requirement pertaining to capital. This makes capital adequacy one of the key internal factors that is associated with financial stability of financial institution. The choice of capital adequacy was one of the key firm characteristics that this study sought to establish, especially, its effect on financial stability of commercial banks in Kenya. Core capital to deposit ratio was employed as a measure of capital adequacy; a higher ratio is desirable to ensure financial stability of commercial banks.

2.2.4 Liquidity Shiftability Theory

This theory was advocated by Moulton (1915). The foundation of the theory holds that feasibility of banks holding resources can be viably sold for cash to dodge non-attendance of liquidity. This enables banks to manage possible strategies of tending to liquidity needs. When money-related supervisors manage the arrangements and degrees of holding assets, revolve around this theory may help overhaul their capacity in liquidity. Instead of relying upon the help of the Central Bank while meeting unanticipated conditions, commercial banks can regulate convertible assets early to evade mishaps brought about by emergency situations (Ibe, 2013).

The theory further asserts that if commercial banks keep up a significant measure of assets that can be moved on to alternate banks for trade without material misfortune in case of necessity; at that point there is no compelling reason to depend on maturites (Ngwu, 2006). As a result, an asset to be impeccably shiftable must be quickly transferable without capital misfortune when the requirement for liquidity emerges. This is especially relevant to short term market investments such as bills of exchange and treasury bills. These can be instantly be sold at whatever point as deemed fit to raise funds by banks (Casu *et al.*, 2006).

This theory is significant to this study in the sense that when commercial banks need to raise money to take care of the administrative costs that will amount to speeding up loan repayment then they will have to raise money through short-term market investments so

as to take care of liquidity problems within the industry to attain financial stability. Loan to deposit ratio was employed as proxy to bank liquidity. A higher ratio is desirable to ensure financial stability of commercial banks.

2.2.5 Information Asymmetry Theory

The main proponent of this theory Akerlof (1970), states that information asymmetry causes markets to end up being inefficient. This is because of lack of information that is meant to be available in the public domain for participants to make informed decisions. A condition that develops when one gathering host's deficient information about the get-together engaged with an exchange, makes is hard to settle on definite choice when directing the exchange (Mishkin, 2004). Financial intermediaries settle on advancing decision. The borrower is most likely going to have more information than the bank about the risks of the endeavor for which they get assets for (Matthews & Thompson, 2008). There exists proof that adverse selection and moral hazards have prompted huge gathering of nonperforming advances in banks (Ombaba, 2013; Kwambai & Wandera, 2013).

The asset quality is in this manner conversely identified with the amount of loan loss provisions as a result of NPLs. NPLs is the absolute most imperative danger that a bank can confront. To survey its greatness, it is weighed against the complete arrangement of advances that the bank has expanded. A high proportion of NPLs to progresses is an impression of unwise loaning practice and poor credit to the board. It represents a

danger to clients' deposits. The study employed loan loss provision to operating income ratio as proxy to asset quality. A low ratio is therefore desirable to ensure financial stability of commercial banks.

2.3 Empirical Review

This segment discusses the relevant empirical literature that supports the research problem. This ensures that the study's content is informed by past studies that are related to it.

2.3.1 Operational Efficiency and Financial Stability

Mohdzaini *et al.,* (2010) investigated operational efficiency and financial stability in Malaysia and Singapore. Greene (1990) proposed SCF model that was used as a measure to operational efficiency; NPLs were used as a measure of bank stability. The study applied tobit simultaneous equation regression model for the analysis between periods 1998 and 2007. From the findings, it was observed that lower operating efficiency increased NPLs. This in turn leads to instability of the banking sector in Malaysia and Singapore. However, this study was conducted in Malaysia and Singapore whose economic environment is better than that of Kenya. Need, thus, arose to carry out the study in commercial banks in Kenya. Furthermore, the study used fragility index as proxy of financial stability.

Fiordelisi, Marques-Ibanez and Molyneux (2010) investigated efficiency and financial stability of the European banking sector. The study used cost to income ratio as proxy to efficiency and NPL ratio as proxy to financial stability. A granger-causality technique was employed to establish the causal relationship between the study variables. Secondary data was employed where panel data was obtained from published financial statements of the European banking sector. The two step system generalized

methods of moments was employed to remedy the endogeneity issues that arise from the causal effect outcomes in the study. From the findings, efficiency possessed a statistically significant negative effect on financial stability. This study used fragility index as proxy to financial stability since it gives an early warning signal of financial health of an institution.

Alber (2016) sought to establish banking efficiency and financial stability of the banking sector in the Middle East and North Africa (MENA) countries. Data envelopment analysis (DEA) was used as proxy of banking efficiency and NPLs as proxy of financial stability in the study. The study was carried out in 15 MENA countries between the years 2004 and 2013. The generalized method of moments (GMM) was employed to ascertain the relationship between the study variables. Two-step system GMM was employed as a test for heterogeneity and autocorrelation. This was ascertained to be free of those biases. From the analysis, efficiency had a positive and significant effect on financial stability of MENA counties. The study was carried out in MENA counties whose social, legal and technological environments are parallel to those of Kenya.

Helal and Miah (2017) investigated operational efficiency and financial stability of banks in Gulf Cooperative Council (GCC) countries. Data for analysis was sourced from 48 conventional banks and 38 Islamic banks in GCC countries. OLS regression model was employed for data analysis over the period 2004 to 2014. Stochastic Frontier Analysis (SFA) was used as a measure for operational efficiency. Liquid asset to deposit ratio was also applied to evaluate the quality of a bank in the short-term. The Z index was employed as a proxy to financial stability. From the outcome, conventional banks were less stable than Islamic banks in GCC countries. Furthermore,

operating efficiency possessed a statistically significant negative effect on financial stability of Islamic banks in GCC. The study was conducted in Middle Eastern countries whose political and economic environments are different from those of Kenya.

2.3.2 Capital Adequacy and Financial Stability

Gudmundsson *et al.,* (2013) conducted a study on capital adequacy and financial stability of commercial banks in Kenya. The study employed panel regression model to ascertain the association between capital adequacy and financial stability of commercial of banks in Kenya. ROE was used as a measure of financial stability that was the dependent variable of the study. Secondary data was collected from 36 commercial banks in the periods 2004 to 2011. From the analysis, capital adequacy confirms a significant positive effect on financial stability of commercial banks in Kenya. The current study focused on the years 2011 to 2018 among 17 commercial banks in Kenya. Imposition of the interest rate cap on commercial banks and the introduction of international financial reporting standards (IFRS 9) triggered the current study.

Dickson and Marobhe (2013) sought to investigate capital adequacy and asset quality position in commercial banks, Tanzania. The study was carried out in 33 commercial banks between the years 2006 and 2011. Capital adequacy was used as an explanatory variable for the study while NPL ratio was used as proxy to asset quality. Panel regression model was employed to ascertain the relationship between the study variables. From the findings, an increment in capital ratio possessed a significant negative effect on NPLs in commercial banks in Tanzania. The study was carried out in commercial banks in Tanzania whose economic, social and technological environments

are different hence the need to undertake the study in commercial banks in Kenya. Furthermore, the present study used the GMM model.

Githinji and Njuguna (2016) examined capital adequacy and financial stability of commercial banks in Kenya. Descriptive design was employed on 43 commercial banks. A questionnaire was their main tool for data gathering. NPL ratio was used as proxy to financial stability. This was a cross-sectional study, just within a year. Qualitative data was collected, hence could be subject to manipulation. The current study was carried out in 17 commercial banks in Kenya for 8 years within 2011 to 2018. It was both a cross-sectional and longitudinal study. Secondary data was used for analysis; this cannot be easily manipulated (Kerlinger & Lee, 2000). From the findings, capital adequacy had a significant relationship with financial stability in commercial banks in Kenya. The current study utilized fragility index as proxy of financial stability. In addition, the study carried out both cross-sectional and longitudinal study.

Oduora, Ngokab and Odongoba (2017) examined capital adequacy and financial stability in Africa. The study was carried out from 167 banks across African countries between 2000 to 2011, as well as years 2007 to 2013 across 23 African countries among 145 banks. NPL ratio was used as proxy of financial stability. From the findings, small banks possessed a positive and significant effect on financial stability, implying that capital beef up in small banks lead to increase in financial instability in Africa, with exception of big banks. The scope of the study was too wide; furthermore the study did not disclose the countries it reviewed. The present study narrowed down to commercial banks in Kenya. It also used fragility index as a proxy of financial stability; it gives an early warning signal of an institution's financial health.

Karugu, Achoki and Kiriri (2018) examined the effect of capital adequacy ratios on financial stability of commercial banks in Kenya. Core capital to total deposits, total capital to total risk weighted assets and core capital to total weighted assets were employed as the explanatory variable while Z-index was utilized as the proxy to financial stability of commercial banks in Kenya. Logistic regression model was employed to examine the association between capital adequacy ratios and Z-index. Secondary data was extracted from the 43 commercial banks financial statements as per the study period 2009 to 2015. From the findings, core capital to deposit ratio had a statistically significant positive effect on Z index of commercial banks in Kenya. The current study employed GMM as the model. Furthermore, the study was conducted in 17 commercial banks in Kenya that came out as fragile based on the fragility index.

Kiemo, Muturi and Mwangi (2019) examined the effect of capital adequacy on financial stability of commercial banks in Kenya. Capital to total risk weighted assets was employed as proxy to capital adequacy while Altman's Z-Score plus Model for non-manufacturing firms was employed as measure for financial stability. The study was carried out in 39 commercial banks in Kenya between years 2000 to 2015. Secondary data as obtained from the annual reports and financial statement of the commercial banks. GMM model guided by step wise dynamic panel regression was employed. The study found out that capital adequacy had a statistically significant positive effect on financial stability of commercial banks in Kenya as measured by the Altman's Z-Score plus Model for non-manufacturing firms. The current study employed fragility index a proxy to financial stability of commercial banks in Kenya

Sunday and Naimo (2020) sought to determine the effect of capital adequacy on bank stability of Sub Sahara Africa Counties namely Gabon, Kenya, Nigeria, and South-

Africa. Capital adequacy measured by bank regulated capital to risk weighted asset. Z score was employed as a proxy to bank stability. Panel least square regression model was used as a technique to analyze secondary data from World Bank Global Financial Development indicator. The study found out that capital adequacy had a statistically significant negative effect on bank stability of banking sector in Sub Sahara region under study. The current study was carried out in 17 fragile commercial banks and employing fragility index as a proxy to bank stability. The study further employed GMM model under regression which is a superior model to static panel regression given that banking sector are dynamic and not static.

2.3.3 Bank Liquidity and Financial Stability

Muhammad and Gang (2016) assessed the effect of bank liquidity on financial stability of commercial banks in China. The study employed the GMM estimation, fixed and random effect model and pool data techniques for analysis. Data was extracted from 197 listed and unlisted Chinese banks, spanning the period 2005 to 2014. NPL was used as a measure to financial stability. The findings indicated that total liquidity creation by Chinese banks was declining; NPLs ratio had started to increase following a continuous decline from 2005 to 2012. The study concluded that decrease in bank liquidity lead to financial instability among Chinese commercial banks. However, the study was conducted in China whose technological, economic and social environments are different from Kenya. Furthermore, fragility index was used as proxy for financial stability.

Ameni *et al.,* (2017) studied the effect of bank liquidity on bank stability in the MENA region, Saudi Arabia and Tunisia. The study comprised 49 banks operating in the region from 2006 to 2013. Secondary data was obtained from banking annual reports.

The GMM model was used to examine the relationship between the study variable and the Z index as the measure of bank stability. From the analysis, liquidity risk significantly affected the bank stability of MENA region; increase in liquidity risk contributed to bank instability. The current study used fragility index as measure for financial stability of 17 commercial banks in Kenya.

Ngaira and Miroga (2018) sought to investigate the effect of liquidity on financial stability of 11 listed commercial banks in Kenya. The study employed questionnaires as a tool of data collection. 356 employees were the target population among the listed commercial banks in Kenya. Multiple regression model was utilized to support the analysis. Real bills doctrine of liquidity management theory, financial inclusion theory, Bank lending channel theory and theory of systemic risk and design of prudential bank regulation were theories that the study used. From the findings liquidity had a significant positive effect on financial stability of listed commercial banks in Kenya. The current study was conducted on 17 fragile commercial banks in Kenya between years 2011 to 2018. The study further employed dynamic panel regression model for the analysis. The current latter study employed secondary data unlike the former study whose data is subject to manipulations.

2.3.4: Profitability and Financial Stability

Albulescuab (2015) studied bank profitability and financial soundness indicators of the banking sector in emerging countries located in Central and South America. Liquidity, bank capitalization, interest rate margins, non-interest expense and NPLs were used as proxies to financial soundness indicators of the study. ROE and ROA were used as proxies of profitability. From the findings, liquidity, interest rate margins and bank capitalization had a positive and significant effect on profitability while non-interest

expense and NPLs had a significant negative effect on profitability. The study however, was conducted in emerging markets whose market size and market transparency is different from developing countries such as Kenya.

Yong (2016) examined the relationship between profitability and stability of commercial banks in China. The study employed causal research design to ascertain the effect of profitability on stability of Indian commercial banks, applying the GMM model. The secondary data was drawn from 83 city commercial banks, five state-owned commercial banks and 12 joint-stock commercial banks the years 2003 to 2013. ROA was employed as a measure of profitability; Z-index was used as proxy to stability. From the analysis, there is a negative relationship between profitability and stability of commercial banks in China; the higher the profits, the lower the stability. This study focused on the effect of profitability on financial stability of commercial banks in Kenya for the periods between 2011 to 2018; the profit margin was used as proxy of profitability.

Ali and Chin (2018) sought to explore bank profitability and stability of commercial banks in Pakistan. The study examined internal determinants of bank profitability as bank size, liquidity risk, credit risk and funding risk, used as the study's explanatory variable. The study was carried out in 24 commercial banks from 2007 to 2015. Panel regression model was employed to aid inferential statistics based on balanced panel data. From the findings, liquidity risk, bank size and funding risk had statistically significant effect on stability. Credit risk had an insignificant effect on financial stability. The study was carried out in Pakistan which is economically and socially different from Kenya. Furthermore, the GMM was used as a model for the current study.

2.3.5 Asset Quality and Financial Stability

Lucky and Nwosi (2015) sought to determine asset quality and performance of commercial banks in Nigeria. Multiple regression model was employed to ascertain the relationship between asset quality and performance of commercial banks in Nigeria. Secondary data was extracted from listed commercial banks in Nigeria. Nigeria Stock Exchange platform was utilized for data collection. Profitability ratio was used as measure of banks' performance while LLP to total asset ratio and LLP to total loan were employed as proxy to asset quality. From the findings, both LLP to total asset and LLP to total loan had a statistically insignificant negative effect on profitability ratio. The current study looked at asset quality which was proxied by loan loss provision to operating income ratio while fragility index was employed as proxy of financial stability. Furthermore, GMM model was employed for the study.

Sopan and Dutta (2018) determined the effect of asset quality on liquidity risk of banks in India. The study employed panel data to ascertain the relationship between asset quality and liquidity risk of Indian banks. NPLs to total advances was employed as the proxy to asset quality while liquid asset to total asset ratio was employed as proxy to liquidity risk of Indian banks. Data was extracted from 45 Indian banks comprising state Bank of India group banks that were used for the analysis. From the finding, asset quality had a spastically significant negative effect on liquidity risk of Indian banks. The current study however, looked at asset quality measured by loss loan provision to operating income as the explanatory variable and fragility index as proxy to financial stability as the dependent variable. GMM model was also employed in the study. The study was carried out in commercial banks in Kenya.

Syajarul, Mohd and Shifa (2018) investigated the effect of asset quality on liquidity risk in the banking sector from the sixteen selected Organizations of Islamic Countries (OIC). The study employed loan loss reserve to gross loans as proxy to asset quality while net loan to deposit ratio was used as proxy of liquidity risk in the study. Fixed effect model was utilized to examine the liquidity risk determinants. The data was extracted from the World Development Indicator (WDI) World Bank and the data from the level banks between years 1999 and 2013. From the findings, the study established that asset quality had a statistically significant negative effect on liquidity risk of OICs. The current study employed loan loss provision to operating income ratio as proxy to asset quality while fragility index was employed as a measure of financial stability in commercial banks in Kenya.

2.3.6: Exchange Rate and Financial Stability

Getachew (2015) examined the effect of exchange rate on profitability of commercial banks in Ethiopia. USD to ETB was used as a measure to exchange rate in the study while ROE was employed as a proxy to profitability in the study. Panel data was extracted from the financial statements of the commercial banks in Ethiopia. The study was carried from 2004 and 2014. From the empirical findings, the study found out that exchange rate had a statistically significant negative effect on profitability measured by ROE in the study. The current study was carried out in commercial banks in Kenya between years 2011 and 2018. Furthermore, Stata software was employed as a statistical tool to ascertain the relationship between the study variables. In addition, GMM model was employed in the current study. The current study utilized exchange rate as a moderating variable.

Lagat and Nyandema (2016) sought to investigate exchange rate on financial stability of commercial banks listed at NSE. The study employed ROE and return on capital employed of financial stability in the study. Multivariate linear regression model was employed to ascertain the relationship between the study variable. Listed commercial bank at the NSE was the target population where data was extracted from the financial statements at the custody of CBK database within years 2006 and 2013. The study found out that the exchange rate had a statistically insignificant positive effect on the profitability indicators. The study concluded that the positive relationship implies that exchange volatility could have contributed to banks' profitability. However, the impact was not significant. The current study was carried out incorporating all the commercial banks in Kenya. Furthermore, the GMM model was utilized.

Merz (2017) sought to determine exchange rate and credit risk of international developed markets in European nations. Exchange rate was used as the explanatory variable and currency as a measure. NPL ratio was employed as measure of credit risk which was also the predicator variable for the study. GMM's model was used to ascertain the relationship between the study variables. The study was carried out between years 2000 and 2014 across 62 counties in European nations. GMM model was employed to take care of endogenity bias that is omitted variable, measurement errors and reverse causality in the study. From the findings, exchange rate had a significant positive effect on NPLs. The study was conducted in European nations which are developed countries, unlike Kenya a developing country whose political, social and economic environments are different. In addition, fragility index was used as proxy to financial stability.

Almaqtari *et al.,* (2019) examined the effect of exchange rate on liquidity risk of Indian commercial banks found on Bombay Stock Exchange. The study also looked at the effect of the bank specific factors on liquidity risk of commercial banks in India. Exchange rate was employed being an explanatory variable and liquidity risk as the dependent variable proxied by liquid assets to total asset. GMM model as employed for data analysis. The data was extracted from 37 commercial banks trading on Bombay Stock Exchange between years 2008 and 2017. From the findings the study found out a positive statistically significant effect of exchange rate on liquidity risk of commercial banks trading on Bombay Stock Exchange. The current study employed exchange rate as a moderating variable on the effect between firm characteristics and financial stability of commercial banks in Kenya.

2.3.7 Exchange Rate and Firm Characteristics

Rizeanu, Majerbi and Chung (2015) assessed exchange risk premium and firm characteristics of firms in South Korea. Foreign ownership, firm size and liquidity were used as proxies of firm characteristics in the study. Cross-sectional data was carried out from Korea stock market at industry and firm levels. Panel regression model was employed to aid in inferential statistics in the study. From the findings, it emerged that exchange risk premium had a statistically significant positive effect on firm liquidity while exchange risk premium had a statistically significant negative effect on foreign ownership and firm size. The study was carried out in South Korea which is a more developed country than Kenya in terms of market size, market transparency and market liquidity. Furthermore, the GMM model was used in the analysis.

Simiyu and Ngile (2015) determined the effect of exchange rate on financial stability of listed commercial banks in Kenya. Panel regression model was used in data analysis.

Exchange rate was employed as the explanatory variable and measured by Ksh. to dollar rate while financial stability was the dependent variable measured by ROE. The study was carried out among the 11 listed commercial banks on NSE from years 2001 to 2012. The study further examined the effect of GDP and interest rate on profitability of listed commercial banks in Kenya. From the findings, the study found out that exchange rate had a statistically significant positive effect on profitability of commercial banks listed at the Nairobi Securities Exchange. Exchange rate was employed as a moderator variable in the study.

Wibowo and Anggono (2016) sought to investigate exchange rate and bank specific factors on capital adequacy of commercial banks in Indonesia. The study investigated the effect of cost to income, external funding ratio, NPLs, return on asset, return on equity, bank size, risky liquid asset, less risky liquidity asset and Rupiah exchange rate on capital adequacy on Indonesia commercial banks. The study was carried out between years 2008 and 2014 from 19 commercial banks in Indonesia. From the findings, external funding ratio had a positive and insignificant effect on capital adequacy. Rupiah exchange rate and NPLs had an insignificant negative effect on capital adequacy. Less risky liquidity asset risky liquid asset ROE had a positive and significant effect on capital adequacy. Bank size, cost to income and ROE had a negative and significant effect on capital adequacy.

2.4 Summary of Empirical Literature and Research Gaps

Table 2.1: Summary of Empirical Literature and Research Gaps

Author(s) Years	Focus	Key Findings	Research Gaps	Addressing the gap
Helal & Miah, (2017).	Operational efficiency and financial stability of banks in Gulf Cooperative Council (GCC) countries	Conventional banks were less stable than Islamic banks in (GCC) countries. Furthermore operating efficiency has a negative statistically significant effect on financial stability of Islamic banks in GCC.	*Adopted (OLS) regression model *The study centered on Islamic and conventional banks *Adopted Z index as a proxy to financial stability which underestimate banking risk	*Current study adopted GMM Model that takes care of endogeneity and heterogeneity issues in the data. *The current study concentrated on the fragile banks, which were termed as risky * Current study adopted fragility index which gives an early warning signal of a financial health of a commercial bank
MohdZain i*etal.* (2010)	Operational efficiency and financial stability in Malaysia and Singapore.	It was observed that lower operational efficiency increase non-performing loans which in return leads to instability of the banking sector in Malaysia and Singapore	*Adopted tobit simultaneous equation regression model *The study was done in Malaysia and Singapore banks whose economic environment is better. *Adopted NPL as proxy to financial stability	*Current study adopted generalized method of moment model *The current study concentrated on the fragile banks *Focused on fragility index as proxy to financial stability which is a robust measure

Gudmundsson *et al.*, (2013)	Capital adequacy and financial stability of commercial banks in Kenya	Capital adequacy had a significant effect on financial stability of commercial banks in Kenya	*Conducted between 2004 to 2011. *ROE was used as a measure of stability *Adopted Panel regression model	* Current study focused on fragility index as proxy of financial stability *Employed dynamic panel regression model
Githinji (2016)	Capital adequacy and financial stability of commercial banks in Kenya	Capital adequacy had a significant relationship with financial stability in commercial banks in Kenya	*NPLs as proxy of financial stability *Cross sectional study *Descriptive research design was used which is subject to manipulations	*Focused on fragility index as proxy of financial stability *Longitudinal study was be carried out (Years 2011-2018) *Adopted Causal research design
Karugu, Achoki & Kiriri (2018)	Effect of capital adequacy ratios on financial stability of commercial banks in Kenya.	From the findings Core capital to deposit ratio had a positively statistically significant effect on Z score of commercial banks in Kenya.	*The study used Z index as proxy of stability *Conducted in 43 commercial banks in Kenya	*Focused on fragility index as proxy of financial stability *Focused on fragile commercial banks in Kenya
Ameni *et al.*, (2017)	Effect of liquidity on bank stability in MENA region Saudi Arabia and Tunisia	Liquidity significantly affect bank stability of MENA region, increase in liquidity risk contribute to bank instability.	*The study used Z index as proxy of stability *Carried out in MENA regions	*Focused on fragility index as proxy of financial stability *Focused fragile in commercial banks in Kenya
Muhammad & Gang (2016)	Effect of liquidity on stability of commercial banks in Chinese	The finding indicated that total liquidity creation by Chinese banks was declining, and NPLs ratio had started to increase following a continuous decline between 2005 and 2012.	*The study used Non-performing loans as proxy of financial stability *The study was carried out in Chinese banks whose market transparency is better than that of Kenya	*Focused on fragility index as proxy to financial stability *Focused fragile in commercial banks in Kenya

Yong (2016)	Profitability and stability in Chinese banks.	It was concluded that higher profitability leads to lower bank stability in Chinese banks.	*The study was carried out in China whose market transparency is better than that of Kenya	* Focused on fragile index commercial banks in Kenya
Karim & Abduh (2016)	Macroeconomic variables and financial stability of banking sector in Indonesia	Islamic banks showed no evidence of long term relationship between macroeconomic factors and stability; however the study noted limitation of data on Islamic banks	*Z-index was utilized as proxy to financial stability *Autoregressive distributive lag (ARDL) and Impulse Response Function (IRF) models	*Focused on fragility index as proxy to financial stability *Adopted the generalized method of moments as a model

Source: Researcher (2019)

2.5 Conceptual Framework

A conceptual framework is a research apparatus proposed to help a specialist to create mindfulness and comprehension of the circumstance under investigation and to convey it (Smith, 2004). Financial stability was used as the dependent variable while fragility index was employed as a proxy of financial stability in the study. This study likewise investigated different a number of variables pertinent to firm characteristics as it affects the financial stability of commercial banks. Firm characteristics comprises of operational efficiency, capital adequacy, bank liquidity, profitability and asset quality, which are the explanatory variables for the study. Exchange rate was employed as the moderating variable to ascertain the moderating effect. To guide the study, the interrelationship between variables discussed above is presented in the conceptual framework model shown in Figure 2.1.

2.5 Conceptual Framework

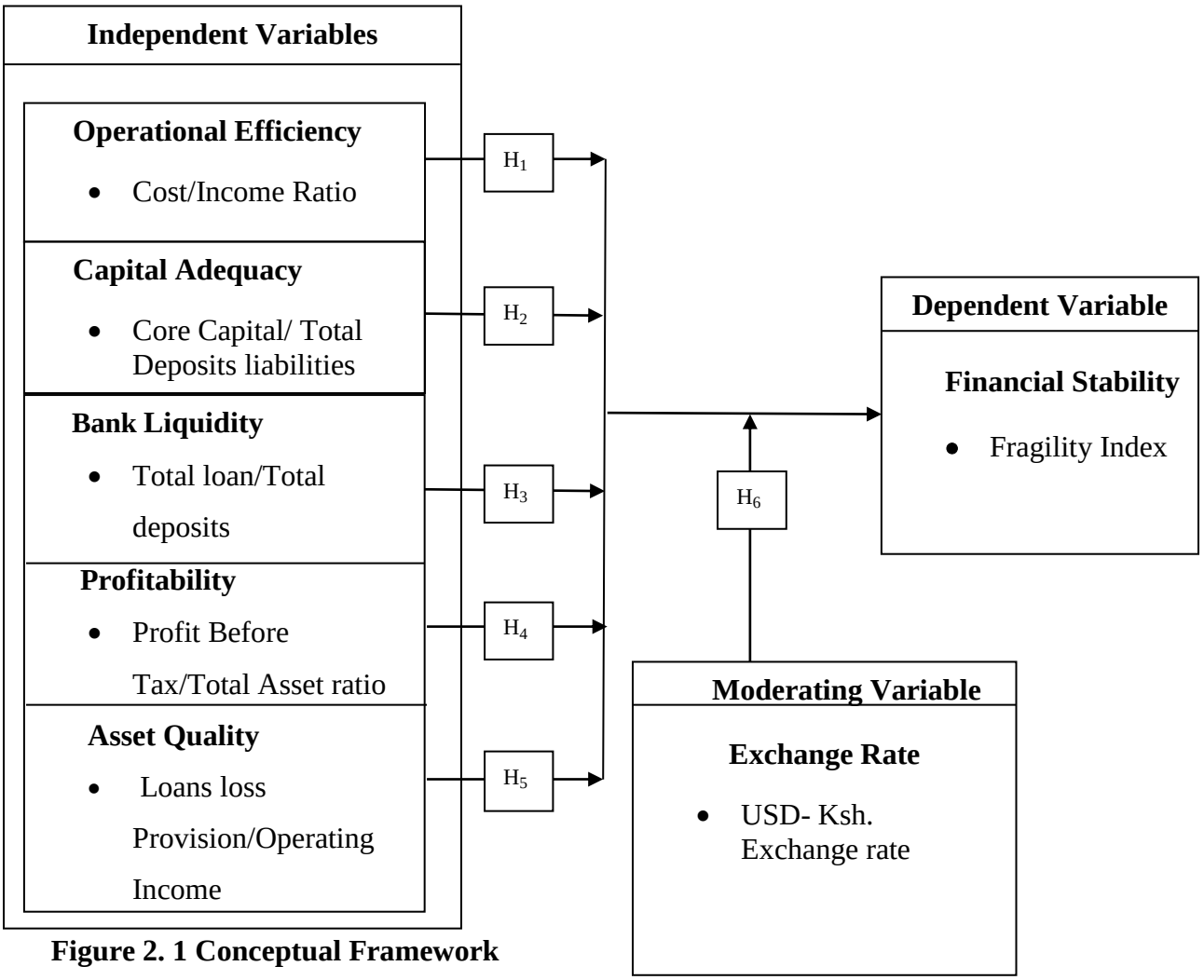

Figure 2. 1 Conceptual Framework

Source: Researcher (2019)

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter sheds light on the methodology that was used to meet the study objectives. It thus explains the research philosophy, research design, theoretical model, empirical model, operationalization and measurement of the study variables. The chapter further discusses the target population, data collection instruments and procedures. Finally it presents, data analysis and presentation, diagnostic tests and ethical considerations.

3.2 Research Philosophy

Research philosophy is a conviction about the way in which information encompassing a phenomenon ought to be gathered and examined. There are a number of philosophies discussed in literature, namely, interpretive, functionalist, pragmatism, subjectivism, objectivism, realism and positivism (Saunders *et al.,* 2006). However, their applicability depends on the research approach (Polit & Beck, 2008). Steen and Roberts (2011) allude that for quantitative approach, positivism should be the preferred philosophy.

Positivism is associated with the philosophical position of the natural scientist. It involves working with a noticeable social reality where results are ultimately generalized (Maylor & Blackmon, 2005). A debate still rages as to which philosophy is for natural science or social sciences. However, Alavi and Carlson (1992), Orlikowski and Baroundi (1991) noted that positivism as a philosophy is mostly used and more prevalent in information system. This study adopted positivism as the most preferable philosophy. This is because by its nature, the investigation was directed to the causal relationships between firm characteristics and financial stability of commercial banks

in Kenya. Deductive approach was employed as the study calls for testing of the hypotheses and proving the exiting theory pertaining the phenomena (Robson, 2002). The study used quantitative data that comprised figures that were reliable over years, leaving no room for data manipulation (Bryman & Bell, 2011).

3.3 Research Design

Research design is a blueprint that is benchmarked to implement the study through the data collection and analysis phases of the research project. It ensures that the study is relevant to the phenomena while utilizing economical procedure (Churchill & Iacobucci, 2005). The study adopted causal research design. This design determines reasons for current status of the phenomena under study. Its variables of interest may not be manipulated as in experimental research (Cooper & Schindler, 2009). With causal research design, the study has the capacity to determine the effect of the explanatory variable(s) on the outcome variable in a study (Ginsburg, 2011). The causal research design was relevant since the study sought to establish the causal effect between firm characteristics and financial stability of commercial banks in Kenya.

3.4 Theoretical Model

Kibritcioglu (2002) developed the fragility index model which comprises three leading indicators of banking sector crises: Non performing loans, bank deposits and foreign liabilities. The model has been used by Aykut (2003): Loloh (2014): Ahmad and Mazlan (2015), to measure how fragile a banking industry is. By extension, it measures the financial stability of the banking sector through ascertaining the degree of stability that an individual bank is operating at. To arrive at the fragility index, the basic model is as shown in equation 3.1. The commercial banks under early warning phase were further subjected to causal effect with close reference to firm characteristics in the

study. The study focused on the fragile commercial banks. This is because they are perceived risky and vulnerable to financial crisis. They are also based on Basel Accords requirements that commercial banks should embrace the risk based approach to ensure financial stability of the banking sector at large. This thus explains the decision to focus on fragile commercial banks in the study.

The basic model for computing the fragility index is as follows;

$$FI_{it} = \frac{\left(\frac{r\,NPL - \mu NPL}{\delta NPL}\right) + \left(\frac{r\,DEP - \mu\,DEP}{\delta DEP}\right) + \left(\frac{r\,FL - \mu\,FL}{\delta FL}\right)}{3} \quad \text{……..(3.1)}$$

Where

FI_{it} = Fragility Index of a commercial bank i at time t

μ = Arithmetic Mean/Min of NPL, DEP and FL of the banking sector

δ= Standard Deviation of SC, DEP, and FL of the banking sector

r = Real Value of NPL, DEP and FL of a commercial bank i at time t

NPL= Non Performing Loan of a commercial bank i at time t

DEP = Banking Sector Deposits of a commercial bank i at time t

FL =Foreign Deposit Liabilities of a commercial bank i at time t

3.5 Empirical Model

In order to investigate the effect of firm characteristics on financial stability of commercial banks in Kenya, the study adopted two-step system generalized method of moment GMM model, whose proponents are Arellano and Bover (1995), and applied by Mariusz and Katarzyna (2015), Gulzara (2018) as shown in Equation 3.5. The study was guided by dynamic panel regression model. The advantage with dynamic panel-data approach is that the left-hand side indicator is singular (Roodman, 2009). This is unlike probit, tobit and logistic model that require the left hand side indicator to be binary or multinomial (Field, 2009). Another unique merit of dynamic panel-data

model is that it gives the fundamental stage to represent past behavior impact straightforwardly on current behavior (Adenutsi, 2014). GMM model was deemed suitable model for this study since it took care of endogenity problems and unobserved heterogeneity (Trujillo, 2013).

The dynamic panel regression model is given by:

$y_{it} = \beta_0 + \beta_i y_{it-1} + \beta_i x_{it} + u_i + \varepsilon_{it}$ ……..(3.2)

Here, the dependent variable y_{it} is proxy of financial stability for bank *i* in period *t*; y_{it-1} is the lagged dependent variable, and x_{it} is the explanatory variable firm characteristics u_i, unobserved subject while ε_{it} disturbance term. The empirical approach was based on system generalized method of moments GMM estimators that properly account for endogeneity bias (Blundell & Bond, 1998).

Equation 3.5 was further expanded to obtain Equation 3.6 whereby y_{it} was substituted with fragility index as proxy to financial stability while the x_{it} was substituted to occupy the explanatory variables role for the study, which was used for estimation.

$FI_{it} = {}_0 + \beta_i FI_{it-1} + \beta_1 OPE_{it} + \beta_2 CPA_{it} + \beta_3 BLQ_{it} + \beta_4 PRT_{it} + \beta_5 ASQ_{it} + u_i + \varepsilon_{it}$

……..(3.3)

Where:

FI_{it} = Fragility Index of commercial bank *i* at time *t*;

OPE_{it} = Operational Efficiency of commercial bank *i* at time *t*;

CPA_{it} = Capital Adequacy of commercial bank *i* at time *t*;

BLQ_{it} = Bank Liquidity of commercial bank *i* at time *t*;

PRT_{it} = Profitability of commercial bank *i* at time *t*;

ASQ_{it} = Asset Quality of commercial bank *i* at time *t*;

β_0 = Constant term;

y_{it-1} =Lagged dependent variable;

β_s = Coefficients of explanatory variables;

u_i = unobserved time invariant

ε_{it} = Disturbance term;

Subscript *i* = Commercial banks (Cross - section dimension) ranging from 1 to 41

Subscript *t* = Years (time - series dimension) ranging from 2011 to 2018.

3.5.1 Moderating Effect Model

To assess on the better side the moderating effect of exchange rate on the relationship between firm characteristics and financial stability, two-approach procedure was used basing on Whisman and McClelland, (2005). In the first approach, model 3.7 which includes exchange rate as independent variable was estimated to establish the effect of the explanatory variable on the dependent variable. In the second approach, model 3.8 which captures the association between independent variables and moderator was computed. Thus, the moderating effect of exchange rate on the association between firm characteristics and financial stability of commercial banks in Kenya was analyzed as illustrated in equations 3.7 and 3.8.

Approach One

$$FI_{it} = \beta_0 + \beta_0 FI_{it-1} + \beta_1 OPE_{it} + \beta_2 CPA_{it} + \beta_3 BLQ_{it} + \beta_4 PRF_{it} + \beta_5 ASQ_{it} + \beta_6 EXR_{it} + u_i + \varepsilon_{it} \quad (3.4)$$

Approach Two

$$FI_{it} = \beta_0 + \beta_0 FI_{it-1} + \beta_1 OPE_{it} + \beta_2 CPA_{it} + \beta_3 BLQ_{it} + \beta_4 PRF_{it} + \beta_5 ASQ_{it} + \beta_6 EXR_{it} + \beta_7 [OPE_{it} * EXR_{it}] + \beta_8 [CPA_{it} * EXR_{it}] + \beta_9 [BLQ_{it} * EXR_{it}] + \beta_{10} [PRF_{it} * EXR_{it}] + \beta_{11} [ASQ_{it} * EXR_{it}] + u_i + \varepsilon_{it} \quad (3.5)$$

Where

EXR = Exchange rate (Moderating Variable)

OPE*EXR = Interaction between operational efficiency and exchange rate

CPA* EXR = Interaction between Capital Adequacy and exchange rate

BLQ*EXR = Interaction between bank liquidity and Exchange rate

PRF*EXR = Interaction between profitability and Exchange rate

ASQ*EXR = Interaction between asset quality and Exchange rate

Table 3.1 below displays the criterion that was employed to conclude whether exchange rate moderated the relationship between firm characteristics variables and financial stability of commercial banks in Kenya

Table 3.1 Moderation Decision Making Criteria

Analysis	**Outcome**	**Criteria for Decision Making**
Approach One: Equation 3.7 Exchange Rate as an Explanatory Variable	Significant coefficient of exchange rate	Exchange rate is an explanatory variable
	Insignificant coefficient of exchange rate	Exchange rate can moderate relationship between firm characteristics and financial stability of commercial banks in Kenya
Approach Two: Equation 3.8 Exchange Rate as a Moderator Variable	Significant coefficient of exchange rate	Exchange rate moderates the relationship between firm characteristics and financial Stability of commercial banks in Kenya
	Insignificant coefficient of exchange rate	Exchange rate do not moderate the relationship between firm characteristics and financial stability of commercial banks in Kenya
	Significant coefficient of interaction terms FMC* Exchange rate	Exchange rate is a moderator
	Insignificant coefficient of interaction FMC * Exchange rate	Exchange rate is not a moderator

Source: Researcher (2019)

Where FMC = Firm Characteristics

Table 3.2 displays the summary of the data analysis techniques utilized to test the objective of this thesis and the methodology applied in the study as dynamic panel data (DPD) regression while generalized method of moments (GMM) model was the platform for the analysis.

Table 3.2 Summary of Data Analysis Techniques

	Specific Objectives	**Methodology**
i	To determine the effect of operational efficiency on financial stability of commercial banks in Kenya.	GMM model (DPD Regression)
ii	To establish the effect of capital adequacy on financial stability of commercial banks in Kenya.	GMM model (DPD Regression)
iii	To determine the effect of bank liquidity on financial stability of commercial banks in Kenya.	GMM model (DPD Regression)
iv	To establish the effect of profitability on financial stability of commercial banks in Kenya	GMM model (DPD Regression)
v	To determine the effect of asset quality on financial stability of commercial banks in Kenya.	GMM model (DPD Regression)
vi	To determine the moderating effect of operating environment on the relationship between firm characteristics and financial stability of commercial banks in Kenya.	Stepwise Regression

Source: Researcher (2019)

Table 3.3: Operationalization and Measurement of Variables

Category	Variable	Operationalization	Measurement	Expected Sign
Dependent Variable	Financial Stability	Is the going concern of a financial institution.	• Fragility Index (See Equation 3.1)	Negative
Independent Variable	Operational Efficiency	Bank's ability to turn resources into revenue.	OPE • Cost/ Income ratio	Positive
	Capital Adequacy	Quantum of assets which a financial institutions ought to have and plan to keep.	CPA • Core capital/Total Deposit ratio	Negative
	Bank Liquidity	Capacity of a financial institution to account for commitments at the time of expiry.	BLQ • Total loan/ Customer deposit	Negative
	Profitability	Ability of a business to earn a return from investment.	PRF • Profit before tax/ Total assets	Negative
	Asset Quality	Ability of bank resources (credits) to provide income; it is the convenient way with which borrowers are meeting their legally binding commitments.	ASQ • Loan loss provision/ Operating income	Positive
Moderating Variable	Exchange Rate	Value of one country's currency in relation to another currency.	(EXR) • US Dollar vs. Ksh	Positive

Source: Researcher (2019)

3.6 Target Population

Target population can be portrayed as the components that meet certain criteria for incorporation in an investigation. It comprises all individuals from a genuine or theoretical arrangement of individuals, occasions or articles (Borg & Gall, 2007). The target population was 38 commercial banks out of the total 41 (CBK, 2017; see

Appendix I). Three commercial banks were on statutory management, hence 38 commercial banks constituted the target population. Based on the fragility index, 17 commercial banks were selected. The nature of the study required the researcher to separate the fragile commercial banks from the stable ones. Accordingly, 17 commercial banks became the unit of observation while the units of analysis were the financial statements of individual banks that were identified as fragile based on the index for the period under study.

3.7 Data Collection Instrument

The researcher applied the study review guide document that was used to extract and compile the financial information for analysis (see Appendix III). The information was extracted from the financial statements, specifically, statements of financial position, notes to the accounts and the income statement. Therefore, the sample data begun from year 2011, ending in the year 2018. The extraction of information for all the variables in the study was based on the published annual financial reports of Tier One, Tier Two and Tier Three commercial banks between years 2011 and 2018. It was important that secondary data be collected.

3.8 Data Collection Procedure

A study permit from National Commission for Science, Technology and Innovation (NACOSTI) was acquired as a license for data collection from published financial statements of commercial banks in Kenya from the CBK. This amounted to balanced panel data, which consisted of cross-sections and time series. The time series comprised years between 2011 and 2018 whereas cross sectional data consisted of 17 commercial banks. A mixture of cross-sections and time series increases the chances and amount of data to heights that are unattainable with only one of the two

aspects.The study developed a document review guide (refer to Appendix III) that helped in consolidating the input under one table.

3.9 Data Analysis and Presentation

The study used quantitative data comprising cross section and time series data. The study carried out both descriptive and inferential statistical analysis. Descriptive statistics employed mean, standard deviation, maximum and minimum values and trend analysis. Inferential statistics analysis was analyzed using correlation and regression analysis. Correlation analysis was carried out to establish the directional relationship between two variables under study. Regression comes in play as the researcher intended to ascertain the effect of firm characteristics on financial stability of commercial banks in Kenya. Information extracted from the financial statement of each commercial bank was presented in excel work sheet before importation to STATA program that supported the analysis. Data has been presented in form of tables, figures and graphs.

3.10 Diagnostic Tests

The study conducted diagnostic test that ensured consistent, efficient and reliable outcomes are obtained through conducting multicollinearity test using variance inflation factor (VIF) test, normality test using Bera and Jarque Test, autocorrelation using the AR first order condition and second order conditions test and test for heteroscedasticity using pagan–hall test. Stationarity test was done using hadri LM test and model specification test.

3.10.1 Multicollinearity Test

To test whether the degree of multicollinearity in the assessed models could be endured, fluctuation expansion factor was utilized. The dependable guideline is that an

estimation of Variance Inflation Factor (VIF) that is under 10 implies that the degree of multicollinearity can be endured. A VIF for all the independent less than 3 (VIF $\leq$ 3) indicates no multicollinearity while a VIF of $\geq$ 3 indicates collinearity; more than 10 indicated a problem with multicollinearity (Myers, 1990). The Tolerance Statistics esteems underneath 0.1 demonstrate a significant issue while those beneath 0.2 show a possible issue. In case of violation of the test, the study rectifies it by employing ridge regression.

3.10.2 Normality Tests

The trial of criticalness, for example, the standard error and t-tests are moored on the supposition that the error term is typically conveyed and has consistent difference. In this way, the study needed to set up that the single direction error component models in the panel informational indexes and in objectives were regularly distributed and that they had a consistent distribution. The study used Bera and Jarque (1981) to tests for normality. The test has a null hypothesis that the components of the error term are normally distributed. The study would reject the null hypothesis if the P– value was less than 5% level of significance.

3.10.3 Auto Correlation Test

The phenomenon of autocorrelation is the case where successive residuals appear to be correlated with each other (Arrelano & Bond, 1991). Autocorrelation test assumes stationarity.Arellano Bond test was employed test to ascertain for auto correlation in the study. The null hypothesis is that there is no serial correlation in either first order autocorrelation or second order autocorrelation. Failure to reject the null hypothesis signifies absence of serial autocorrelation while the rejection of the null hypothesis signifies presence of the given order of serial correlation.

3.10.4 Heteroscedasticity Test

Heteroscedasticity is a regression issue that is normal with cross-section information, where there are expansive contrasts in measure between perceptions. It shows itself by methods for the error term that does not have a steady difference. One of the regressions suppositions is that the error terms of observation must be homoscedastic, that is, they should have a steady variance (White, 1980). At the point when the error terms of perceptions have diverse variance, heteroscedasticity is available in the model. On the off-chance that the study was utilizing the OLS as an estimator, the presence of heteroscedastic error terms would prompt inaccurate standard error. Hypothesis of the study states that the error variance is homoscedastic. The study used Pagan–Hall test as suggested by Pagan and Hall (1983) to test for hetroscedasticity.

3.10.5. Stationarity Test

Stationary process is one whose statistical properties do not change over time that is mean, variance and autocorrelation (Nason & Sapatin, 2001). When dealing with panel data by extension, the researcher is interacting with cross sectional and time series data. Thus, the researcher needs to take care of the stationary and non-stationary issues that are associated with panel data; failure to that then the data is equivalent to sham results (Phillips & Moon, 1999). The hypothesis of the study under stationary test is that panel has a unit root. The study employed hadri LM test since it takes care of missing data (Hadri, 2000).

3.10.6 Model Specification Test

There are two basic suppositions made about the individual explicit effect under panel information analysis: the irregular effect presumption and the fixed effects. The arbitrary effect suspicion made in an irregular effect model is that the individual

explicit effects are uncorrelated with the regressors (Greene, 2008). On the off chance that the irregular effect supposition holds, at that point the arbitrary effect model is more proficient than the fixed effect model (Martinez, 2007). The study utilized Hausman's specification test (1978) to choose whether fixed or random effect was appropriate. The test had a null hypothesis that individual heterogeneity and regressors were strictly exogenous. If the Hausman test rejects the null hypothesis, then random effects would be a proficient estimator. In case of rejecting the null hypothesis, the fixed effects model would bequeath superior approximation of coefficients.

3.11 Ethical Considerations

When detailing the outcome of the study, the analyst guaranteed that the research report precisely speaks to what was seen after appropriate analysis of the considerable number of information gathered. Journals and course readings utilized in any piece of this study have been duly acknowledged, utilizing APA Referencing Style.

CHAPTER FOUR

RESEARCH FINDINGS AND DISCUSSIONS

4.1 Introduction

This chapter presents and discusses the research findings. The chapter has two sub sections. The first subsection presents descriptive statistics in form of tables and figures; together with their respective interpretations and discussion. The second subsection presents inferential statistics comprising diagnostic tests and dynamic panel regression results. Dynamic panel regression results incorporate the direct effect model, evaluating the effect of firm characteristics on financial stability. This is together with the indirect effect model, examining the moderating effect of exchange rate on the relationship between firm characteristics and financial stability of commercial banks in Kenya.

4.2 Descriptive Statistics

This section summarizes the collected data. It describes the numerical information in form of tables, figures in form of diagrams. Table 4.1 contains descriptive statistics for data used in the analysis. Figure 4.1 shows the trend of fragility index, Figure 4.2 the trend of operating efficiency, Figure 4.3 the trend of capital adequacy, Figure 4.4 the trend of bank liquidity, Figure 4.5 the trend of profitability, Figure 4.6 the trend of asset quality and Figure 4.7 the trend of exchange rate for the years 2011 to 2018.

Table 4.1 Descriptive Statistics of the Study

Variable	Obs	Mean	Std. Dev.	Min	Max
Fragility Index	136	1.211765	0.8961695	0.2	4.2
Operating Efficiency	136	0.6495869	0.3801746	0.2291031	3.244755
Capital Adequacy	136	0.1806939	0.0435236	0.0210838	0.2888626
Bank Liquidity	136	0.7552303	0.2675307	0.1518293	1.427561
Profitability	136	0.0344108	0.0247068	-0.0613063	0.0988981
Asset Quality	136	0.2470032	0.2536721	0.0204832	1.70049
Exchange Rate	136	94.01235	7.384122	84.39	103.39

Source: Researcher (2019)

The outcome in Table 4.1 indicates that the mean value of fragility index is 1.211765 with a standard deviation of 0.8961695, a minimum value of 0.2 and a maximum value of 4.1 respectively. A fragility index of 1.211765 implies that the commercial banks under study were fragile since the value 1.2 is above the threshold of 0.5. A minimum value of 0.2 implies that some of the commercial banks under study were operating at a stable state before transiting to fragility state over the study period. The maximum value of 4.1 shows how far some of the commercial banks deviated from the threshold of 0.5. The higher the fragility index, the risky the commercial bank is to a financial crisis.

From the findings, the mean value of operating efficiency is 0.6495869. This indicates that on average, most of the commercial banks have their costs more than incomes. The recommended threshold of operating efficiency is 0.5 and below (Cytonn, 2019), efficiency above 0.5 exposes a bank to a fragile state. Table 4.1 shows that capital adequacy had a mean of 0.1806939 with minimum and maximum value of 0.0210838 and 0.2888626 respectively. The minimum value of 0.0210838 indicates that some of the commercial banks were operating below the required capital base, thus making them risky commercial banks to customer clientele. Table 4.1 indicates that the mean value of bank liquidity is 0.7552303 with minimum and maximum values as 0.1518293 and 1.427561 respectively. The minimum value indicates that some commercial banks were having liquidity problems during the study period, since they were operating below the recommended threshold of 20% and below (Cytonn, 2019).

Table 4.1 further indicates the mean value of profitability as 0.0344108 and the minimum and maximum values as -0.0613063 and 0.0988981 respectively. The minimum value of -0.0613063 indicates that many commercial banks have been

reporting negative profits during the study period. In this way, they are made vulnerable to healthy competition in the market. The mean asset quality as indicated in table 4.1 shows a value of 0.2470032 with the minimum and maximum values as 0.0204832 and 1.70049 respectively. The mean value of 0.2470032 implies that banks have been experiencing high bad loans, making them create provisions for bad debts, defaults on loan places a bank in fragile state. On exchange rate, results indicate that the mean value of 94.01235 with minimum and maximum values as 84.39 and 103.39 respectively.

4.3 Trend Analysis

This section is an analysis of patterns among variables. The study has directed a pattern analysis to build up the development of the variables over time. This aids in conducting unit root tests as the pattern analysis graphically demonstrates the outline of development in the variables.

4.3.1 Trend in Fragility Index

Financial stability in this study was measured by fragility index which comprised three components: credit risk, liquidity risk and foreign exchange risk. Credit risk was measured by the absolute value of NPLs of commercial banks in Kenya. Liquidity risk was measured by the absolute values of customer deposits of commercial banks in Kenya. Foreign exchange risk was measured by the absolute values of foreign liabilities held by commercial banks in Kenya. The combined measures resulted to a fragility index as a proxy to financial stability of commercial banks in Kenya. This section presents the trend of the fragility index, summarized in Figure 4.1.

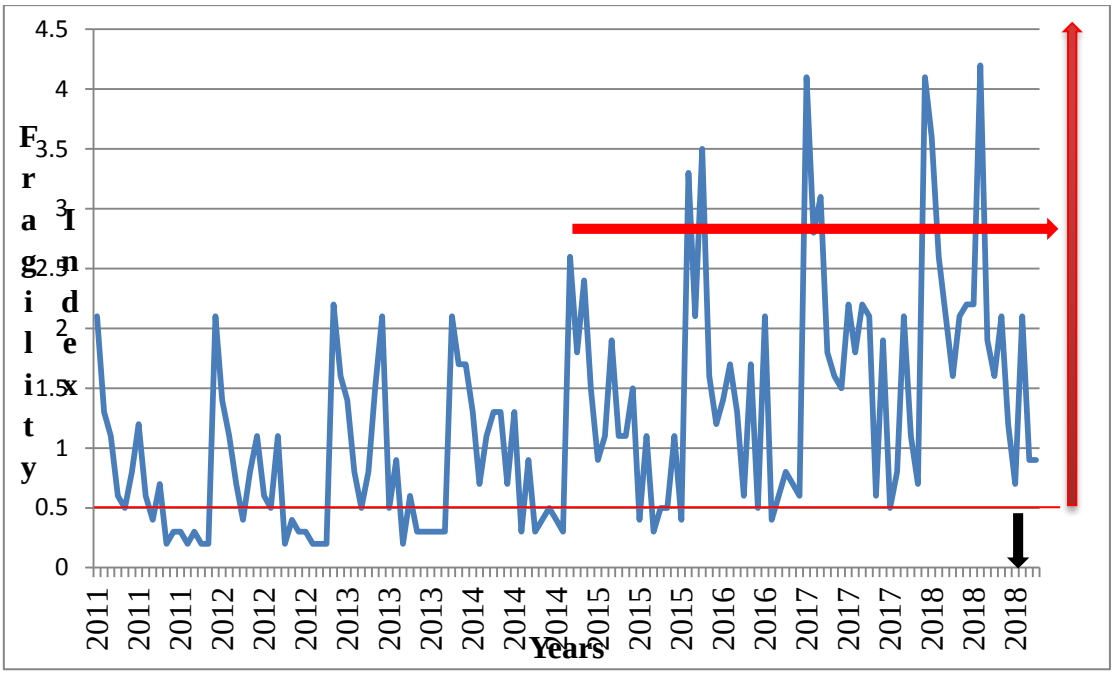

Figure 4.1: Trend of Fragility Index for the Year 2011 to 2018

Source: Researcher (2019)

Figure 4.1 documents the fragility index trend for the fragile commercial banks for the years 2011 to 2018. The fragility index comprised credit risk proxied by NPLs. Liquidity risk was measured by the customers' deposits. Foreign exchange risk was measured by the foreign liabilities. A higher fragility index shows how vulnerable the banking sector is to shocks; a lower fragility index below 0.5 indicates a stable state of a commercial bank. The trend indicates that the fragility index of the commercial banks under study had been fluctuating, moving from stable to fragile state. Fragility index below 0.5 indicates the years that some of the commercial banks were stable and then moved to fragile state above 0.5. The fluctuations rate of the fragility index were characterized by the increasing rates of non-performing loans in commercial banks, bank runs among the commercial banks and increase in foreign liabilities from commercial banks in Kenya. Since 2011 fragility index has been operating above the threshold thus exposing the banking sector to banking crisis; however at the end of 2014 to 2018 there was a sharp increase and fluctuation in the fragility index. It can be

noted that within this period that's when Dubai Bank, Chase Bank and Imperial Bank were put under receivership.

4.3.2 Trends in Firm Characteristics

Firm characteristics were represented by operating efficiency, capital adequacy, bank liquidity, profitability and asset quality. Figure 4.2 displays the trend of operating efficiency, Figure 4.3 the trend of capital adequacy, Figure 4.4 the trend of bank liquidity, Figure 4.5 the trend of profitability, Figure 4.6 the trend of asset quality and Figure 4.7 the exchange rate trend over the study period as a moderator variable.

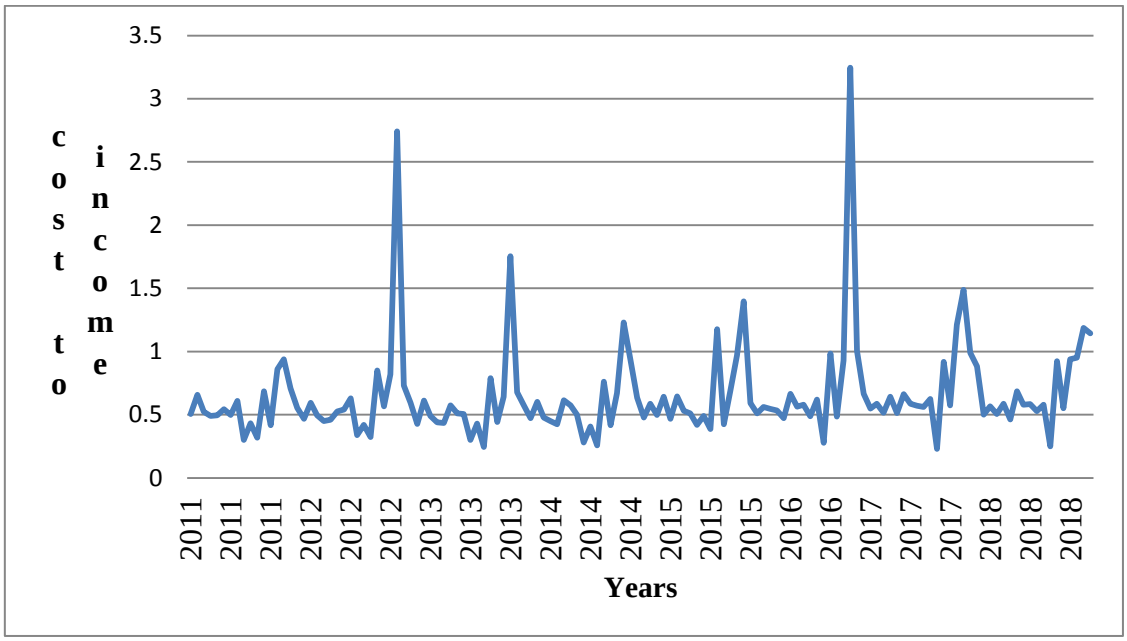

Figure 4.2: Trend of Operating Efficiency for the Year 2011 to 2018

Source: Researcher (2019)

Figure 4.2 shows the operating efficiency trend for the fragile commercial banks from the year 2011 to 2018. The trend indicates that there had been fluctuating operating efficiency over the study period. The period 2012 to 2017 had been climaxed with sharp fluctuations of the operating efficiency, thus operating above the recommended

threshold of 0.5 (Cytonn, 2019). Increase in operating efficiency affects the financial stability of a commercial bank significantly. High costs than income being experienced has an influence also on the profitability of the commercial banks at large, hence the financial stability of the commercial banks at stake. Increase in operating efficiency adversely affects the financial stability of commercial banks (Fiordelisi, Marques-Ibanez & Molyneux, 2010).

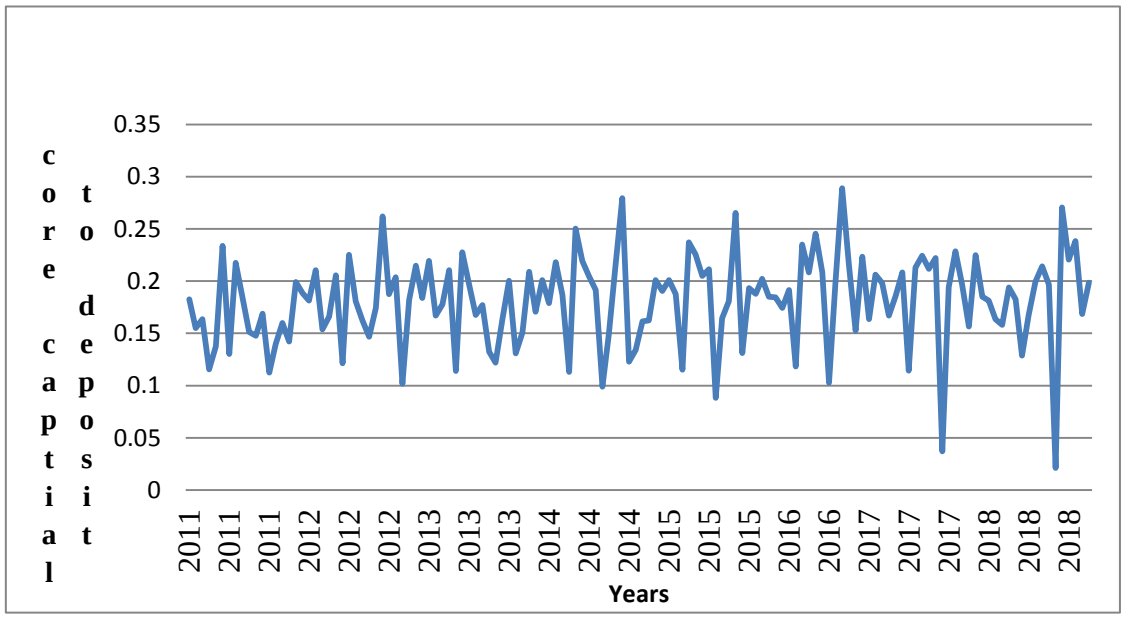

Figure 4.3: Trend of Capital Adequacy for the Year 2011 to 2018

Source: Researcher (2019)

Figure 4.3 indicates the capital adequacy trend for the fragile commercial banks from the year 2011 to 2018. Capital adequacy was measured by core capital to deposit ratio; over the years, capital adequacy trend has been fluctuating. Extreme decrease in capital adequacy as seen in 2017 and 2018 in some of the commercial banks in not a good indicator towards the stability of the banking sector. Increase in buffer capital improves the bank performance and thus by extension, financial stability of a financial institution (Gudmundsson *et al.*, 2013). All commercial banks have a minimum capital requirements that they adhere to. Capital adequacy ratio combines core capital to

customer deposit which is recommended to be at 8% and above (Kenya Banking Act, 2008). Commercial banks that operate below the threshold could imply that bank runs are active within a bank. Figure 4.3 shows how some of the commercial banks under study were operating below the threshold. This was a pointer of bank runs, a case where customers were withdrawing their deposits from a particular bank, a gloomy signal to the banking sector at large.

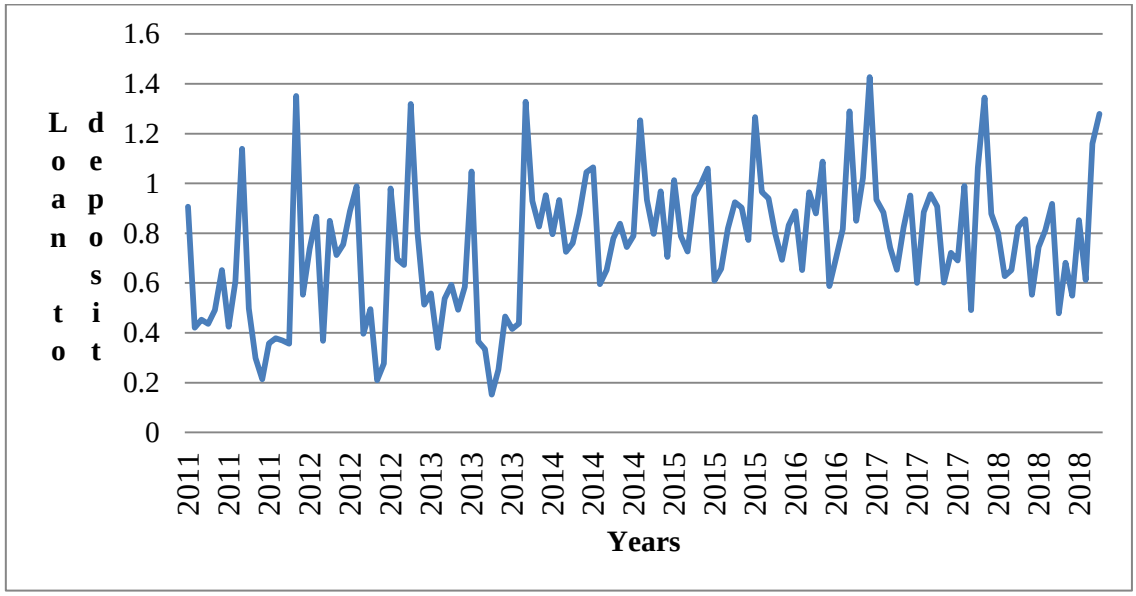

Figure 4.4: Trend of Bank Liquidity for the Year 2011 to 2018

Source: Researcher (2019)

Figure 4.4 shows the bank liquidity trend for the fragile commercial banks from the year 2011 to 2018. Bank liquidity has been marked with fluctuating trend over the study period, years 2011 to 2013 was marked with the lowest level of liquidity experienced in the banking sector. Bank liquidity is the ability of a financial institution to account for commitments at the time of expiry (Dang, 2011). From the year 2014 to 2018 commercial banks under study on average have been able to account for commitments at the time of expiry thus on average operating above the required minimum requirement of 20% (Central Bank Supervision Report, 2017) as shown in

Table 4.1. However, the fluctuating trend being experienced is a worrying trend. It also implies that some of the commercial banks under study have been struggling to meet their obligations based on the minimum value under Table 4.1 operating below the requirement. The up and down of the bank liquidity trend could also imply deposit fluctuations as a result of bank runs. In cases of bank runs, the commercial banks ought to impose deposit terms to customer in that the customers can only withdraw their money after a maturity period; this will cut on bank runs. Deposit insurance is also another remedy for bank runs, commercial banks need to assure its customer of their money in case of a collapse of the bank in future. This will build the trust of the customers not to panic in case of a bank closure.

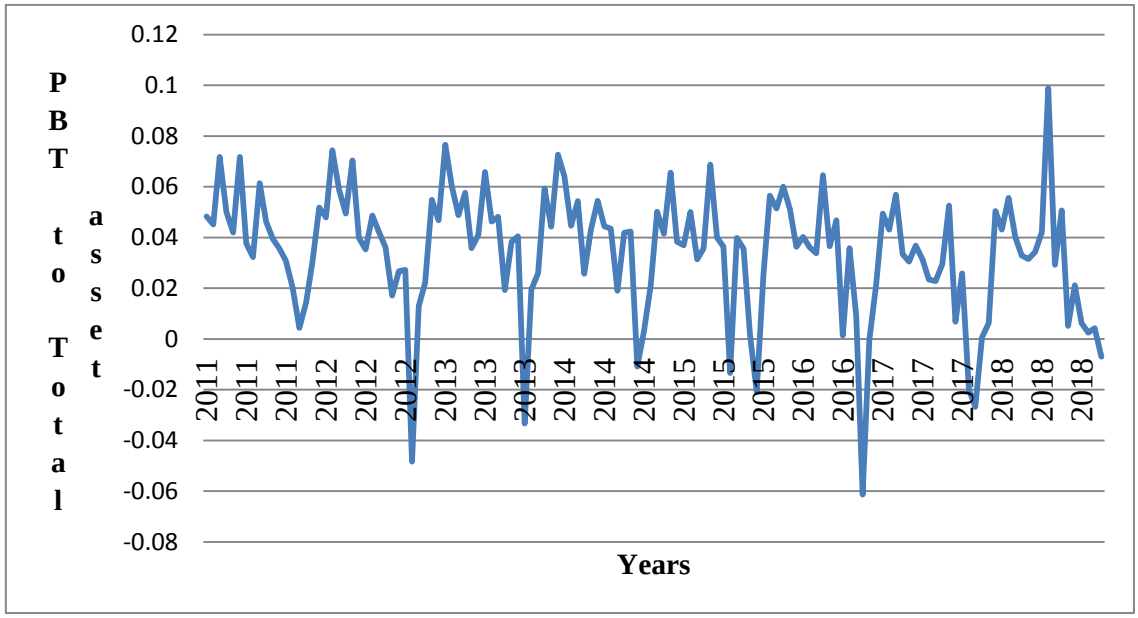

Figure 4.5: Trend of Profitability for the Year 2011 to 2018

Source: Researcher (2019)

Figure 4.5 documents the profitability trend for the fragile commercial banks from the year 2011 to 2018. Profitability trend measured by profit before tax to total asset has been marked with fluctuating trends over the years. However, in the years 2012 to 2018, it has to be marked with sharp decline in the profitability of commercial banks

under study. Profits are what are left after all the obligations that fall due have been met (Gatete, 2015). In this case, many commercial banks under study were only left with negative profits after tax, thus exposing the banking sector to fragile state. The recommended profitability threshold is 3% and above. However, as observed from Table 4.1, the minimum value displayed is below the threshold; this clearly indicates a struggling sector amongst some of the commercial banks in the period under study.

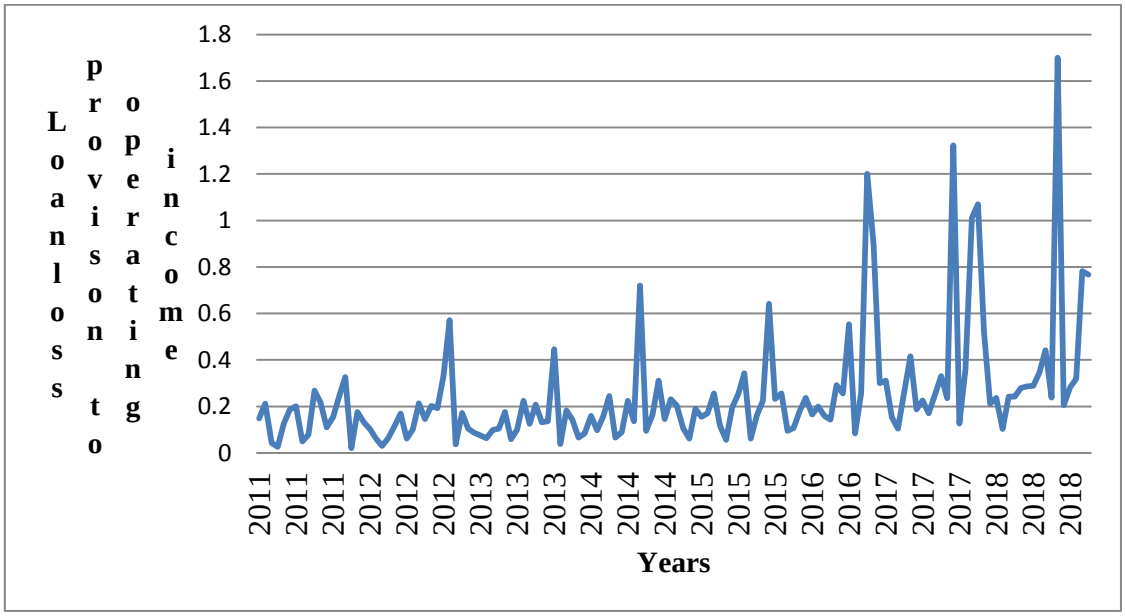

Figure 4.6: Trend of Asset Quality for the Year 2011 to 2018

Source: Researcher (2019)

Figure 4.6 documents the asset quality trend for the fragile commercial banks from the year 2011 to 2018. Evidently, an increasing trend of asset quality ratio can be seen form years 2011 to year 2018. The increasing trend indicates a high level of bad loans over the years, thus commercial a bank creates a huge provision for loss loans due to NPLs. When the loan loss provisions consume the operating income, it implies that a bank is having more bad loans. The period under study has experienced the high levels of NPLs since 2011 as indicated with the increasing trend from asset quality ratio. The

NPL threshold is 5% and below, while loan loss provision to operating income (asset quality) is pegged at 15% and below (Dayong, Jing, David, Dickinson &Kutan, 2016).

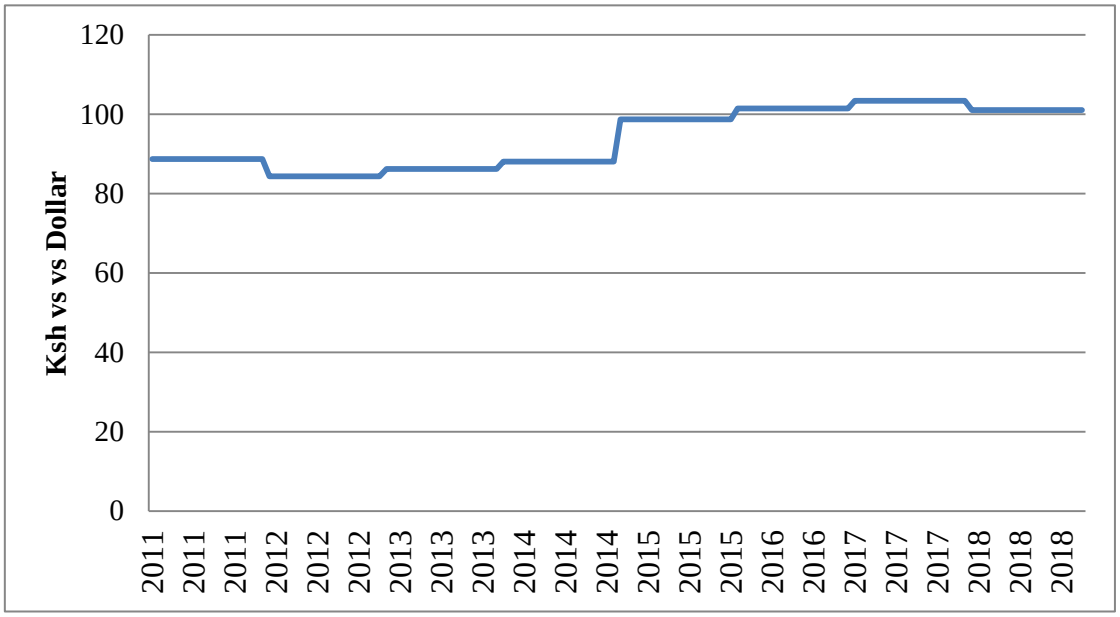

Figure 4.7: Trend of Exchange Rates for the Year 2011 to 2018

Source: Researcher (2019)

Figure 4.7 displays an increasing trend of the exchange rate of Ksh. against the US Dollar (USD) over the years. The findings show a sharp increase (devaluation) of Ksh. in 2014. The increase in 2014 reflected the strengthening of the USD, reduced regional trade due to competition from China and low exports revenue on falling global tea prices. There was decline in tourism revenues on insecurity jitters, rising import bill and shocks to short-term capital flows reflected in relative decline in foreign investors' participation at the Nairobi Stock Exchange (NSE) between June and December 2014 (Kenya Financial Sector Stability Report, 2014). The Ksh. depreciating against the USD in 2016 has also been associated with increased demand in increased USD demand from oil importers (Cytoon, 2017). The sharp increase from 2014 to 2018 was marked with instability in the banking sector that saw Dubai Bank collapse while Imperial Bank and Chase Bank put under receivership (CBK, 2016). Increase in the

exchange rate would in turn increase the operating expenses within the banking sector. This in return would increase the operating efficiency of the banking sector.

4.4 Diagnostic Tests

This segment presents the outcomes of the following diagnostic tests: Multicollinearity test normality test, autocorrelation test, heteroscedasticity test, panel unit root, and model specification test which comprise fixed and random effect models.

4.4.1 Multicollinearity

The study with the help of regression model was able to obtain variance inflation factors (VIF) and tolerance for use in ascertaining whether multicollinearity would pose a problem in analysis. The independent variables of VIF of less than 10 and a tolerance value greater than 0.1 is recommendable for ruling out the possibility of multicollinearity (Myers, 1990). The results for test of multi-collinearity is as shown in Table 4.2.

Table 4.2 : Multicollinearity Test Results

Coefficients			
	Tolerance	**VIF**	**Remark**
Operating Efficiency	0.523260	1.91	Absence of Severe Multicollinearity
Capital Adequacy	0.779683	1.28	Absence of Severe Multicollinearity
Bank Liquidity	0.788908	1.27	Absence of Severe Multicollinearity
Profitability	0.452978	2.21	Absence of Severe Multicollinearity
Asset Quality	0.570446	1.75	Absence of Severe Multicollinearity
Exchange Rate	0.669695	1.49	Absence of Severe Multicollinearity
		Mean VIF 1.65	Absence of Severe Multicollinearity

Source: Researcher (2019)

Table 4.2 documents the VIF for operating efficiency (VIF=1.91), capital adequacy (VIF=1.28), bank liquidity (1.27), profitability (2.21), asset quality (1.75), exchange rate (1.49), and mean VIF was 1.65. A VIF for all the independent less than 3 (VIF $\leq$ 3) indicates no multicollinearity while a VIF of $\geq$ 3 indicates collinearity and more than 10 indicated a problem with multi-collinearity (Myers, 1990). The outcome, thus inferred as non-presence of a multicollinearity issue among the variables and henceforth the degree of multicollinearity in the model, could be endured.

4.4.2 Test for Normality

The study utilized Jarque-Bera test to see whether the variables were normally distributed or not.

Table 4.3: Normality Test Results

Skewness/ Kurtosis tests for Normality					
Variable	Observations	Pr (Skewness)	Pr (Kurosis)	Adj chi2	Prob>chi 2
My Residuals	109	0.0898	0.2152	4.50	0.1051

Source: Researcher (2019)

From the outcome in Table 4.3, the study utilized Jarque-Bera test as test of normality. The null hypothesis under this test was that the residuals were not significantly different from a normal distribution. Given that the p-value is more than 0.05 significant level for the residual, the null hypothesis was not rejected, hence the conclusion that the residuals were normally distributed.

4.4.3 Test for Autocorrelation

The study employed Arrelano and Bond (1991) autocorrelation test that was suitable for dynamic panel model. The phenomenon of autocorrelation is the case where successive

residuals appear to be correlated with each other. The study hypothesis is that there is no serial correlation in either first order autocorrelation or second order autocorrelation.

Table 4.4: Autocorrelation Test for Fragility Index

Order	Z	Prob>Z
1	-1.5645	0.1177
2	0.04859	0.9612

Source: Researcher (2019)

The output in Table 4.4 presents no significant evidence of serial correlation in the first-differenced errors at order 1 and at order 2. Thus, the null hypothesis of no serial correlation is evident and the study concluded that residuals were not serially correlated.

4.4.4 Heteroscedasticity Test

Heteroscedasticity is a regression issue that is normal with cross-section information, where there are expansive contrasts in measure between perceptions. It shows itself by methods for the error term that does not have a steady difference. The researcher used Breuch Pagan test to detect the problem of heteroscedasticity in the model.

Table 4.5: Heteroscedasticity Test Results

Breusch – Pagan / Cook-Weisberg heteroscedasticity test
Chi2(1) = 2.61
Prob>chi2 =0.1065

Source: Researcher (2019)

As shown in Table 4.5, the study tested for heteroscedasticity, utilizing Breusch-Pagan test. The null hypothesis was that the error term was homoscedastic. The calculated *p* value for variables fitted values of fragility index 0.1065 which is more than the critical value 0.05, implying that the error terms were homoscedastic.

4.4.5 Panel Unit Root Tests

This study utilized hadri Lagrange Multiplier (LM) test; null hypothesis is that panel has a unit root. The study employed hadri LM test since it takes care of missing data unlike other panel roots that cannot execute the data with missing information. Table 4.6 presents the panel unit root test at level difference.

Table 4.6: Panel Unit Root Test

Variable	Test	At Level difference	
		Statistics	**Significance**
Fragility Index	Hadri LM Test Z	12.6943	0.0000
Operating Efficiency	Hadri LM test Z	3.8444	0.0001
Capital Adequacy	Hadri LM test Z	8.6547	0.0000
Bank Liquidity	Hadri LM test Z	6.8268	0.0000
Profitability	Hadri LM test Z	3.2405	0.0006
Asset Quality	Hadri LM test Z	10.9923	0.0000
Exchange Rate	Hadri LM test Z	12.7212	0.0000

Source: Researcher (2019)

As reported in table 4.6 the hadri LM test presented *p*-values that are less than 0.05. These finding had to reject the null hypothesis that all panel have unit root for fragility index, operating efficiency, capital adequacy, bank liquidity, profitability, asset quality and exchange. The study in this scenario reached a consensus that all the variables under study did not have unit root; they were in that case used at that level instead of their first difference. This implies that the outcome extracted was not misleading.

4.4.6 Model Specification Test

Baltagi (2005) alludes that for a researcher to conclude whether to employ fixed effect model or random effect model on the panel data, model specification test is significant. Table 4.7 displays the model specification test for fragility index, showing whether to apply fixed or random effect model in the analysis.

Table 4.7 Model Specification Test for Fragility Index

	Hausman Coef			
	Fixed	**Random**	**Differences**	**S.E**
Operating Efficiency	.1318926	.2512869	-.1193944	.2259843
Capital Adequacy	-.1825975	-.1818691	-.0007284	.0398839
Bank Liquidity	-.1131818	-.0479555	-.0652263	.043929
Profitability	.1883397	.2932805	-.1049409	.0521985
Asset Quality	.3413771	.3248076	.0165695	.0282881
Exchange Rate	4.762135	4.887621	-.1254856	.1198546
Chi2(4) = 9.70 Prob>chi2 = 0.1380				

Source: Researcher (2019)

From the output obtained in Table 4.7, the null hypothesis is that random effects model is appropriate; the alternative hypothesis is that fixed effects model is appropriate under model specification test. If *P* value is greater than the critical value 0.05, the null hypothesis is not rejected. In this finding, the *P* value was greater than the critical value with (p-value=0.1380>0.05). The random effect model was appropriate for the model as suggested by Green (2008).

4.4 Correlation Analysis

Correlation coefficients extend from -1 to 1. A positive relationship coefficient implies that the two variables will in general move together: a perception which has a high incentive for one variable is likely to have a high variable for the other, and vice versa. The bigger the coefficient the more grounded the relationship. A negative relationship coefficient implies that they will in general move in inverse bearings. Variables which are autonomous will have a correlation of zero. Table 4.8 presents the correlation results between firm characteristics variables and financial stability of commercial banks in Kenya.

Table 4.8: Correlation Results on Firm Characteristics and Financial Stability

	Fragility Index	Operating Efficiency	Capital Adequacy	Bank Liquidity	Profitability	Asset Quality	Exchange Rate
Fragility Index	1.0000						
Operating Efficiency	0.0978	1.0000					
Capital Adequacy	-0.0389	-0.0157	1.0000				
Bank Liquidity	-0.1426	-0.0497	0.3305	1.0000			
Profitability	-0.2604	-0.8137	0.1003	0.0497	1.0000		
Asset Quality	0.1453	0.5937	-0.2901	-0.1267	-0.6114	1.0000	
Exchange Rate	0.5184	0.1285	0.1241	0.3444	-0.1918	0.3760	1.0000

Source: Researcher (2019)

From Table 4.2, it is evident that the correlation between fragility index and operating efficiency is 0.0978, asset quality is 0.1453 and exchange rate is 0.5184, all being positively correlated. The positive coefficient implies that an increase in operating efficiency, asset quality and exchange rate would lead to increase in fragility index in the same direction and magnitude. This could also imply that an increase in fragility index would lead to an increase in operating efficiency, asset quality and exchange rate in the same direction and magnitude. Correlation between fragility index and capital adequacy is -0.0389, bank liquidity is -0.1426 and profitability is -0.2604. The negative coefficients imply that an increase in capital adequacy, bank liquidity and profitability would lead to a decrease in fragility index in the same direction and magnitude. On the other hand, a decrease in fragility index would lead to an increase in capital adequacy, bank liquidity and profitability in the same direction and magnitude.

Furthermore the correlation coefficient between capital adequacy and operating efficiency is -0.0157 which implies that capital adequacy and operating efficiency variables move in the opposite direction. Correlation coefficient between bank liquidity and operating efficiency is -0.0497. This implies that bank liquidity and operating efficiency are negatively correlated, thus an increase in bank liquidity would lead to a decrease in operating efficiency and vice versa. Correlation coefficient between profitability and operating efficiency is -0.8137, the variables are negatively correlated. This implies that an increase in operating efficiency would lead to a decrease in profitability. Correlation coefficient between asset quality and operating efficiency is 0.5937, the variables are positively correlated. This implies that an increase in asset quality would lead to an increase in operating efficiency in the same direction and magnitude. Correlation coefficient between exchange rate and operating efficiency is 0.1285, and were positively correlated.

Correlation between capital adequacy and bank liquidity, profitability and exchange rate were 0.3305, 0.1003, and 0.1241 respectively. The correlations between the variables are positively correlated. This implies that an increase in capital adequacy would lead to an increase in bank liquidity, profitability and exchange rate in the same direction and magnitude. Correlation between capital adequacy and asset quality is -0.2901, which indicates a negative correlation between capital adequacy and asset quality.

Furthermore, correlation between bank liquidity and profitability is 0.0497. This means that there is a zero correlation between bank liquidity and profitability. The zero correlation implies that the variables are independent. Correlation coefficient between bank liquidity and asset quality is -0.1267. The variables are negatively correlated

while the correlation between bank liquidity and exchange rate is 0.3444, showing a positive correlation among the variables.

Correlation between profitability and asset quality is -0.6114 while the correlation between profitability and exchange rate is -0.1918. This means that the variables are negatively correlated. An increase in profitability would lead to a decrease in asset quality and exchange rate respectively. Lastly, the correlation between asset quality and exchange rate is 0.3760. It implies that asset quality and exchange rate are positively correlated. An increase in asset quality would lead to an increase in exchange rate in the same direction and magnitude as per the sample.

4.6 Dynamic Panel Regression Results

The dynamic panel regression results are presented in two tiers, namely, the direct effect model and indirect effect model. The direct effect model results have the basis that there is a direct effect between firm characteristics, namely, operating efficiency, capital adequacy, bank liquidity, profitability and asset quality on financial stability of commercial banks in Kenya proxied by fragility index. The indirect effect model is based on the fact that exchange rate has a moderating effect on the relationship between firm characteristics and financial stability of commercial banks in Kenya. To establish the statistical significance of the stated hypotheses, dynamic panel regression analysis was conducted at 95% confidence level (α=0.05).

The results of the dynamic panel regression models employed to test hypotheses and the discussions are displayed in the subsequent sections. The discussion gives the elucidation of the empirical background, contrasting them with the theoretical foundation. It also discusses the findings of past studies on firm characteristics and financial stability of commercial banks as presented in the literature review. The results

center on the major findings of the study and are organized by the specific objective of the study.

4.6.1 Test for Direct Effect

The direct effect model was tested, based on the hypothesis as stated in the subsequent section under hypothesis testing. The null hypothesis was that there was no statistically significant effect of firm characteristics, namely, operating efficiency, capital adequacy, bank liquidity profitability and asset quality on financial stability of commercial banks in Kenya. The study was conducted to prove otherwise.

4.6.2 Hypotheses Testing

This section presents outcomes of hypotheses testing as they were presented in Chapter One, Section 1.4. Hypothesis H_{01}, H_{02}, $H_{03,}$ $H_{04}H_{05}$ and H_{06}were based on firm characteristics dimensions and were analyzed using dynamic panel regression model to establish the statistical significance at 95 percent confidence level (α= 0.05).The outcomes are displayed in Table 4.9

H_{01}: Operating efficiency has no significant effect on financial stability of commercial banks in Kenya.

H_{02}: Capital adequacy has no significant effect on financial stability of commercial banks in Kenya.

H_{03}: Bank liquidity has no significant effect on financial stability of commercial banks in Kenya.

H_{04}: Profitability has no significant effect on financial stability of commercial banks in Kenya.

H_{05}: Asset quality has no significant effect on financial stability of commercial banks in Kenya.

H_{06}: Exchange rate has no significant moderating effect on the relationship between firm characteristics and financial stability of commercial banks in Kenya.

4.6.3 Effect of Firm Characteristics on Financial Stability

Table 4.9 presents the outcome of dynamic panel regression Model 3.6 on the direct effect of firm characteristics and fragility index. Firm characteristics were the independent variables, with financial stability as the dependent variable measured by fragility index.

Table 4.9: Dynamic Panel Regression Results Based on Fragility Index

Fragility Index	**Coef.**	**Std. Err**	**z**	**P>|z|**
Fragility Index L1.	0.7688454*	0.1177298	6.53	0.000
Operating Efficiency	0.3104109*	0.1491036	2.08	0.037
Capital Adequacy	-0.1560403*	0.0796032	-1.96	0.050
Bank Liquidity	-0.0073553	0.0490955	-0.15	0.881
Profitability	-0.1064231*	0.0508232	-2.09	0.036
Asset Quality	0.0987029*	0.0459348	2.15	0.032
_cons	-0.0504875	0.3295215	-0.15	0.878
Wald chi2(6) = 147.55 Prob> chi2 = 0.0000 **(*)** denote 5% level of significance				

Source: Researcher (2019)

As per the outcome in Table 4.11 the following model was extracted:

$$FI_{it} = -0.0504875 + 0.7688454FI_{it-1} + 0.3104109OPE_{it} - 0.1560403CPA_{it} - 0.0073553BLQ_{it} - 0.1064231PRT_{it} + 0.0987029ASQ_{it} + \varepsilon \quad (4.1)$$

Where:

FI_{it} = Fragility index at commercial bank *i* and time *t*;

FI_{it-1}=Lagged fragility index at commercial bank *i* and time *t*;

OPE_{it} = Operational Efficiency of commercial bank *i* at time *t*;

CPA_{it} = Capital Adequacy of commercial bank *i* at time *t*;

BLQ_{it} = Bank Liquidity of commercial bank *i* at time *t*;

PRT_{it} = Profitability of commercial bank *i* at time *t*;

ASQ_{it} = Asset Quality of commercial bank *i* at time *t*;

The outcome in Table 4.9 shows that Wald Chi square is highly significant (P=0.000<0.05). This suggests that jointly fragility index lag 1, operating efficiency, capital adequacy, bank liquidity, profitability and asset quality determined financial stability as measured by fragility index. From the findings, the fragility index lag 1 had a significant p value of less than 0.05 (0.000<0.05). It implies that the previous year's fragility index had an accrue effect on current year's fragility index as per the sample.

H_{01}: Operating efficiency has no significant effect on financial stability of commercial banks in Kenya

The first specific objective of the study sought to determine the effect of operating efficiency on financial stability of commercial banks in Kenya**.** The outcomes are as presented in Table 4.9. To meet this objective, a null hypothesis, **H_{01}** that operating efficiency has no significant effect on financial stability of commercial banks in Kenya was developed. In Table 4.9, the coefficient of cost to income ratio (operating efficiency) (β= 0.3104109, p=0.037<0.05) indicates that operating efficiency has a statistically significant positive effect on financial stability as measured by fragility

index. In this case, the null hypothesis that operating efficiency has no significant effect on financial stability of commercial banks in Kenya was rejected at 5% level of significance. This implies that there is a 5% chance that the outcome streams from a random distribution. It signifies that there is a 95% probability that operating efficiency has a technically statistically significant positive effect on financial stability of commercial banks in Kenya.

The positive coefficient of 0.31041090 in the finding indicates that a unit increase in operating efficiency holding other variable constant would lead to a 0.3104109 increase in fragility index hence financial instability as per the outcome. The positive sign obtained in this study agrees with Efficiency Structure Theory stated earlier in the study. Briefly, the Efficiency Structure Theory states that low cost to income ratio would lead to a stable firm; a higher ratio of operating efficiency would imply unstable commercial bank. The result corroborates with those of Alber (2016) and Helal and Miah (2017). However, the findings were inconsistent with those of Fiordelisi *et al.*, (2010). The inconsistency could be due to differences in contextual aspects. Kenya is operating on a frontier market; the latter study was carried out in a developed country.

H_{02}: Capital Adequacy has no significant effect on financial stability of commercial banks in Kenya

The second specific objective of the study sought to establish the effect of capital adequacy on financial stability of commercial banks in Kenya. The finding summarizing this analysis is in Table 4.9. To meet this objective, the researcher developed a null hypothesis, $\mathbf{H_{02}}$ that capital adequacy has no significant effect on financial stability of commercial banks in Kenya. In Table 4.9, the coefficient of core capital to deposit ratio (capital adequacy) (β = -0.1560403, p = 0.050<0.05) indicates

that capital adequacy has a statistically significant negative effect on financial stability as measured by fragility index. In this case, the null hypothesis that capital adequacy has no significant effect on financial stability of commercial banks in Kenya was rejected at 5% level of significance.

The negative coefficient of -0.1560403 in the outcome indicates that a unit increase in capital adequacy, holding other variables constant, would lead to a 0.1560403 decrease in fragility index hence financial stability. Nevertheless, a unit decrease in core capital to deposit ratio (capital adequacy) would lead to an increase in fragility index hence financial instability as a result of bank runs that emerge from the customer deposits. The findings further approve the necessities by Basel III guidelines on the utilization of the capital adequacy proportion to foresee and monitor the financial stability of the banking sector. The finding furthermore concurs with Buffer Capital Theory. In a nutshell the theory states that the more capital a commercial bank has the more stable it is. The results were also consistent with those of Gudmundsson *et al.,* (2013), Githinji and Njuguna (2016), Oduora, Ngokab and Odongoba (2017). However, the findings were inconsistent with those of Dickson and Marobhe (2013), Karugu *et al.,* (2018). The inconsistency in the former study could be due to differences in markets while the latter could be due to contextual differences. The latter study by Karugu *et al.,* (2018) was carried out in 43 commercial banks in Kenya; the current study was carried out in the 17 fragile commercial banks in Kenya.

H_{03}: Bank Liquidity has no significant effect on financial stability of commercial bank in Kenya

The third specific objective of the study sought to determine the effect of bank liquidity on financial stability of commercial banks in Kenya. The findings displaying this

analysis are in Table 4.9. A null hypothesis was developed to achieve this objective, **H_{03}** that bank liquidity has no significant effect on financial stability of commercial banks in Kenya. Table 4.8 on the coefficient of bank liquidity measure by total loan to deposit ratio (β= -0.0073553, p = 0.881>0.05) shows that bank liquidity has statistically insignificant negative effect on financial stability as measured by fragility index. Therefore, the null hypothesis that bank liquidity has no significant effect on financial stability of commercial banks in Kenya was not rejected at 5% level of significance. This implies that bank liquidity coefficient is not different from zero since the p value is not less than 0.05.

The negative coefficient of bank liquidity of -0.0073553 indicates that a unit increase in loan to deposit ratio (bank liquidity) holding other variables constant would lead to a decrease in fragility index in the same direction and magnitude hence financial stability. This implies an increase in loan disbursement by commercial banks to loyal customers, the more stable the industry becomes due to monies earned from such activities. However, the effect was not significant. This implies that increase in loan disbursement does not guarantee stability due to defaults rate that occasionally accrue from such activities. The finding corroborates with that of Muhammad and Gang (2016).

H_{04}: Profitability has no significant effect on financial stability of commercial banks in Kenya

The fourth objective sought to establish the effect of profitability on financial stability of commercial banks in Kenya. The outcome summarizing this analysis is in Table 4.9. We developed a null hypothesis to achieve this objective, **H_{04},** that profitability has no significant effect on financial stability of commercial banks in Kenya. In Table 4.9, the

coefficient of profitability proxy by profit before tax over total asset ratio (β= -0.10642319, p= 0.036<0.05) shows that profitability has statistically significant negative effect on financial stability as measured by fragility index. Therefore, the null hypothesis that profitability has no significant effect on financial stability of commercial banks in Kenya was rejected at 5% level of significance.

The negative coefficient of -0.10642319 in the outcome reveals that a unit increase in profitability holding other variables constant leads to -0.10642319 decrease in fragility index hence financial stability of commercial banks in Kenya. The finding implies that commercial banks reporting negative profit before tax at the end of the financial year, in a great way affects the stability of the institution negatively. From the analysis, the study found out that some commercial banks were reporting negative profits. This places not only that individual bank to the risk of collapse but rather the stability of the industry at jeopardy. Shareholders of negative reporting commercial banks would not be able to get returns from their investment, hence conflicts between the shareholders and the managers emerges. In this way, the Agency Theory comes in play. When one bank collapses, the other banks are also affected through the risk of contagion because of the interconnection among commercial banks. This finding corroborates with that of Yong (2016).

H_{05}: Asset Quality has no significant effect on financial stability of commercial bank in Kenya

The fifth specific objective of the study sought to establish the effect of asset quality on financial stability of commercial banks in Kenya. The outcome summarizing this analysis is in Table 4.9. The study formulated a null hypothesis to achieve this objective, **H_{05},** that asset quality has no significant effect on financial stability of

commercial banks in Kenya. In Table 4.9, the coefficient of asset quality measured by loan loss provision to operating income (β= 0.0987029, p= 0.032<0.05) indicates that asset quality has statistically significant positive effect on financial stability as measured by fragility index. In this case, the null hypothesis that asset quality has no significant effect on financial stability ofcommercial banks in Kenya was rejected at 5% at level of significance. This implies that there is a 5% chance that the outcome has come from a random distribution.

The positive coefficient of 0.0987029 in the outcome reveals that a unit increase in asset quality holding other variables constant lead to 0.0987029 increase in fragility index hence financial instability. The finding, therefore, implies that an increase in loan loss provision is a clear indication the bad loans are being experienced within the industry: this is a stake to the stability of commercial bank. This further implies that the operating incomes are being consumed by the LLP created. This finding tallies with the reality in Figure 4.6, indicating an increasing trend in the ratio of loan loss provision to operating income (asset quality). The findings concur with the Information Asymmetry Theory. The theory brings about the idea of insufficient information that the lender receives from the borrowers, thus bad loans being experienced as a result of information asymmetry. However the finding is inconsistent with those of Lucky and Nwosi, (2015), Sopan and Dutta (2018) who found out a negative effect on bank performance.

4.6.4 Moderating effect of exchange rate on the relationship between firm characteristics and financial stability of commercial banks in Kenya

The study employed Whisman and McClelland (2005) two-step approaches in testing for moderator effects. In the first approach, model 3.7 which includes exchange rate as

an independent variable was estimated to establish the effect of the explanatory variable on the dependent variable. In the second approach, model 3.8 which captures the association between independent variables and moderator was computed. Thus, the moderating effect of exchange rate on the association between firm characteristics and financial stability of commercial banks in Kenya was analysed as illustrated in equation 3.7 and 3.8, based on Table 4.10 for first-approach model and Table 4.11 for second-approach model respectively.

Table 4.10: Effect of Exchange Rate as an Explanatory Variable on Fragility Index

Fragility Index	**Coef.**	**Std. Err**	**z**	**P>|z|**
Fragility Index L1.	0.7095508*	0.1236904	5.74	0.000
Operating Efficiency	0.3183786*	0.1448354	2.20	0.028
Capital Adequacy	-0.137422**	0.0783103	-1.75	0.079
Bank Liquidity	-0.0242906	0.0495305	-0.49	0.624
Profitability	-0.1044264*	0.0493302	-2.12	0.034
Asset Quality	0.0844069**	0.046023	1.83	0.067
Exchange Rate	0.3450865	0.2622543	1.32	0.188
_cons	-1.684343	1.283836	-1.31	0.190
Wald chi2(6) = 170.34 Prob> chi2 = 0.0000 **(*) (**)** denotes 5% and 10% level of significance respectively				

Source: Researcher (2019)

$$FI_{it} = -1.684343 + 0.7095508\,FI_{it-1} + 0.3183786OPE_{it} - 0.137422CPA_{it} - 0.0242906BLQ_{it} - 0.1044264PRF_{it} + 0.0844069ASQ_{it} + 0.3450865EXR_{it} + \varepsilon_{it} \quad (4.2)$$

Where;

FI_{it} = Fragility index at commercial bank *i* and time *t*;

FI_{it-1}=Lagged fragility index at commercial bank *i* and time *t*;

OPE_{it} = Operational Efficiency of commercial bank *i* at time *t*;

CPA_{it} = Capital Adequacy of commercial bank *i* at time t;

BLQ_{it} = Bank Liquidity of commercial bank *i* at time *t*;

$\mathbf{PRT}_{it}$ = Profitability of commercial bank *i* at time *t*;

$\mathbf{ASQ}_{it}$ = Asset Quality of commercial bank *i* at time *t*;

$\mathbf{EXR}_{it}$ = Exchange rate (Moderating Variable) of commercial bank *i* at time *t*;

The outcome in Table 4.10 shows that Wald Chi square is highly significant (P=0.000<0.05). This suggests that jointly fragility index lag 1, operating efficiency, capital adequacy, bank liquidity, profitability, asset quality and exchange rate determined financial stability as measured by fragility index. From the findings the fragility index lag 1 had a significant *p* value (0.000<0.05). It implies that the previous year's fragility index had an accrued effect on the following year's fragility index.

The coefficient of operating efficiency at (β= 0.3183786p= 0.028< 0.05) shows a statistically significant positive effect on financial stability as measured by fragility index of commercial banks in Kenya. The regression coefficient of 0.3183786 obtained in this case implies that a unit increase in operating efficiency would lead to 0.3183786 increases in fragility index hence financial instability. The coefficient of capital adequacy (β=0.137422p=0.079<0.10) indicates a statistically significant negative effect of on fragility index. The coefficient of bank liquidity (β= -0.0242906 p=0.624> 0.05) shows a statistically insignificant negative effect on financial stability as measured by fragility index. The coefficient of profitability (β=-0.1044264p=0.034<0.05) indicates a statistically significant negative effect of profitability on financial stability as measured by fragility index. The coefficient of asset quality (β= 0.0844069p=0.067<0.10) shows a statistically significant positive effect on financial stability as measured by fragility index of commercial banks in Kenya.

The coefficient of exchange rate (β=0.3450865 p=0.188>0.05) shows a statistically insignificant positive effect on financial stability as measured by fragility index of

commercial banks in Kenya. This indicates that exchange rate does not directly affect financial stability hence can moderate the relationship between exchange rate and financial stability. The coefficient of 0.3450865 implies that a unit increase in exchange rate would lead to a 0.3450865 increase in fragility index hence financial instability. However, the relationship is not significant, implying that the coefficient of exchange rate is not different from zero. However, the findings are inconsistent with those of Rizeanu, Majerbi and Chung (2015) and Wibowo and Anggono (2016).

Table 4.11: Moderating Effect of Exchange Rate on the Relationship Between Firm Characteristics and Fragility Index

Fragility Index	**Coef.**	**Std. Err**	**z**	**P>|z|**
Fragility Index L1.	.7002715*	.1467384	4.77	0.000
Operating Efficiency	.0891694	.3345953	0.27	0.790
Capital Adequacy	.3933838	.3393498	1.16	0.246
Bank Liquidity	.1058875	.1879807	0.56	0.573
Profitability	-.068105	.0623892	-1.09	0.275
Asset Quality	.0466172	.0725113	0.64	0.520
Exchange Rate	.0103672*	.0051792	2.00	0.045
Operating Efficiency* Exchange Rate	-.0043575	.0068527	-0.64	0.525
Capital Adequacy* Exchange Rate	-.0078383	.0205471	-0.38	0.703
Bank Liquidity*Exchange Rate	-.0029811	.00376	-0.79	0.428
Profitability*Exchange Rate	-.0191642	.0236637	-0.81	0.418
Asset Quality*Exchange Rate	.003068	.0034211	0.90	0.370
_cons	.1848764	.793152	0.23	0.816
Wald chi2(6) = 186.42 Prob> chi2 = 0.0000 **(*)** denotes 5% level of significance				

Source: Researcher (2019)

$$FI_{It} = 0.1848764 + 0.7002715FI_{it-1} + 0.0891694\ OPE_{it} + 0.3933838\ CPA_{it} + 0.1058875\ BLQ_{it} - 0.068105PRF_{it} + 0.0466172ASQ_{it} + 0.0103672\ EXR_{it} - 0.0043575[OPE_{it} * EXR_{it}] - 0.0078388\ [CPA_{it} * EXR_{it}] - 0.0029811[BLQ_{it} * EXR_{it}] - 0.0191642[PRF_{it} * EXR_{it}] + 0.003068[ASQ_{it} * EXR_{it}] + \varepsilon_{it} \quad \ldots\ldots\ldots\ldots\ldots\ldots (4.3)$$

Where:

EXR = Exchange rate (Moderating Variable)

OPE*EXR = Interaction between operational efficiency and exchange rates

CPA* EXR = Interaction between capital adequacy and exchange rates

BLQ*EXR = Interaction between bank liquidity and exchange rates

PRF*EXR = Interaction between profitability and exchange rates

ASQ*EXR = Interaction between asset quality and exchange rates

The outcome in Table 4.11 shows that Wald Chi square is highly significant (P=0.000<0.05), suggesting that jointly lagged fragility index, operating efficiency, capital adequacy, bank liquidity, profitability, asset quality, exchange rate and the interactions of exchange rate with firm characteristics determined financial stability as measured by fragility index. From the findings, the fragility index lag 1 had a significant *p* value (0.000<0.05), implying that the previous year's fragility index had an accrued effect on the following year's fragility index.

The coefficient operating efficiency at β=0.0891694 p=0.790 >0.05, shows that operating efficiency has a statistically insignificant negative effect on financial stability as measured by fragility index. The regression coefficient of 0.0891694 obtained at this level indicates that a unit increase of the operating efficiency would lead to 0.0891694 increase in fragility index hence financial instability. The coefficient capital adequacy at β=0.3933838p=0.246>0.05 shows that capital adequacy has a statistically insignificant positive effect on financial stability as measured by fragility index. The regression coefficient of 0.3933838obtained in this level implies that a unit increase of the capital adequacy would lead to 0.3933838 increase in fragility index hence financial instability. The coefficient bank liquidity at β=0.1058875 p=0.573>0.05 shows that bank liquidity has a statistically insignificant positive effect on financial stability as measured by fragility index.The coefficient profitability at β=-0.068105p=0.275>0.05 shows that profitability has a statistically insignificant negative

effect on financial stability as measured by fragility index. The coefficient asset quality at β=0.0466172 p=0.520>0.05 shows that asset quality has a statistically insignificant positive effect on financial stability as measured by fragility index.The coefficient exchange rate at β=0.0103672 p=0.045<0.05 showsthat exchange rate has a statistically significant positive effect on financial stability as measured by fragility index. The regression coefficient obtained at this level indicates that one unit increase in exchange rate would lead to an increase in fragility index hence financial instability of commercial banks holding other variables constant. Exchange rate in this scenario can therefore be used as a moderator variable and not as an explanatory variable.

Table 4.11 shows that when operating efficiency and exchange rate, capital adequacy and exchange rate, bank liquidity and exchange rate, profitability and exchange rate, asset quality and exchange rate were interacted, they collectively displayed negative coefficients as β -0.0043575, -0.0078383,-0.0029811 and -0.0191642 respectively with insignificant p values as 0.525, 0.703, 0.428 and 0.418 respectively. The negative coefficient implies that one unit increase in any of the variables holding other variables constant would decrease fragility index hence financial stability. However, the interaction between asset quality and exchange rate yields a positive coefficient and statistically insignificant effect on the dependent variables (β=0.003068 p=0.370>0.05). The positive coefficient implies that a unit increase in the interaction between asset quality and exchange rate would lead to an increase in fragility index hence financial instability of commercial banks in Kenya holding other variables constant.

4.7 Summary of Hypotheses Tests

Table 4.12 summarizes the hypotheses that were rejected and those that the researcher failed to reject as stated under study. When carrying out a research, the researcher is uncertain about the outcome hence the stating of the null hypothesis at the beginning of the study. The null hypothesis endeavors to demonstrate that a solitary variable is no different than its mean. It is presumed to be valid until statistical proof invalidates it for an alternative hypothesis.

Once the findings are out, the researcher can then reject or fail to reject the hypotheses as illustrated in Table 4.12.

Table 4.12: Summary of Hypotheses Tests

	Hypotheses	**Reject H_o/Fail to reject H_O**
H_{01}	Operational efficiency has no significant effect on financial stability of commercial banks in Kenya.	**Reject H_o**
H_{02}	Capital adequacy has no significant effect on financial stability of commercial banks in Kenya.	**Reject H_o**
H_{03}	Bank liquidity has no significant effect on financial stability of commercial banks in Kenya.	**Fail to reject H_O**
H_{04}	Profitability has no significant effect on financial stability of commercial banks in Kenya.	**Reject H_o**
H_{05}	Asset quality has no significant effect on financial stability of commercial banks in Kenya.	**Reject H_o**
H_{06}	Exchange rate has no significant moderating effect on the relationship between firm characteristics and financial stability of commercial banks in Kenya.	**Reject H_o**

Source: Researcher (2019)

4.8 Summary of the Key Findings

The study concisely found out that the previous year's financial stability had a positive impact on the current year's financial stability as measured by the fragility index. Operating efficiency and asset quality had a statistically significant positive effect on financial stability of commercial banks in Kenya. Capital adequacy and profitability had a statistically significant negative effect on financial stability of commercial banks

in Kenya. Bank liquidity had a statistically insignificant negative effect on financial stability of commercial banks in Kenya. Employed as an explanatory variable, the exchange rate had a statistically insignificant positiveeffect on financial stability of commercial banks in Kenya. However, when the exchange rate was applied as a moderator, it had a statistically significant positive effect on financial stability of commercial banks in Kenya. Table 4.13 presents the key findings.

Table 4.13: Summary of Key Findings

Variables	Objectives	Expected Sign	Outcome Sign	Effect
Independent; Operating Efficiency	To determine the effect of operational efficiency on financial stability of commercial banks in Kenya	Positive (+)	Positive (+)	Statistically Significant
Independent; Capital Adequacy	To establish the effect of capital adequacy on financial stability of commercial banks in Kenya.	Negative (-)	Negative (-)	Statistically Significant
Independent; Bank Liquidity	To determine the effect of bank liquidity on financial stability of commercial banks in Kenya.	Negative (-)	Negative (-)	Statistically Insignificant
Independent; Profitability	To establish the effect of profitability on financial stability of commercial banks in Kenya	Negative (-)	Negative (-)	Statistically Significant
Independent; Asset quality	To determine the effect of asset quality on financial stability of commercial banks in Kenya.	Positive (+)	Positive (+)	Statistically Significant
Moderator; Exchange Rate	To determine the moderating effect of exchange rate on the relationship between firm characteristics and financial stability of commercial banks in Kenya	Positive (+)	Positive (+)	Statistically Significant

Source: Researcher (2019)

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter documents the summary of the study from chapter one to chapter four, conclusions of the study as well, policy recommendations to commercial banks in Kenya and to CBK. The chapter also provides the contribution of this research feat to knowledge. Finally, it points out areas for further research to interested scholars.

5.2 Summary of Study

The CBK has traditionally adopted the CAMEL variables that are used as a gauge to ascertain the financial stability of commercial banks in Kenya. Nonetheless, the banking sector in Kenya has been experiencing challenging moments based on the collapse of some commercial banks and placement of others under receivership. The need to investigate the link between firm characteristics and financial stability of commercial banks in Kenya formed the inspiration to undertake this study. The general objective of the study was to investigate the effect of firm characteristics on financial stability in commercial banks in Kenya. The specific objectives of the study were to determine the effect of operational efficiency, capital adequacy, bank liquidity, profitability and asset quality on financial stability of commercial banks in Kenya. The study was supported by various theories: Agency Theory, Efficiency Structure Theory, Capital Buffer Theory, Liquidity Shift-ability Theory and Information Asymmetry. The study employed positivism research philosophy, utilizing causal research design. GMM model guided by dynamic panel regression and Whisman and Mcclelland model were employed in the study. The study carried out in 38 commercial banks in Kenya for a

period of eight years from 2011 to 2018. However, the study sampled 17 commercial banks for the analysis as per the fragility index.

The first specific objective was to determine the effect of operational efficiency on financial stability of commercial banks in Kenya. Using the GMM's model guided by dynamic regression, the study established that operating efficiency as measured by operating cost to operating income ratio has statistically significant positive effect on financial stability. The study established that an increase operating efficiency would lead to financial instability among commercial banks as depicted by fragility index. Alternatively, a decrease in operating efficiency would lead to financial instability among commercial banks as depicted by fragility index. On one hand, a lower ratio of the fragility index of up to and below 0.5 indicated a stable banking sector. On the other hand, a higher ratio above and beyond 0.5 the recommended threshold was indicative of a fragile commercial bank.

Secondly, the study sought to establish the effect of capital adequacy on financial stability of commercial banks in Kenya. Core capital to total deposit was employed as proxy to capital adequacy. From the findings, the study established that an increase in capital adequacy had a statistically significant negative effect on fragility index hence financial stability. The finding validates Buffer Capital Theory that increase in capital adequacy propels stability in the banking sector. From the trend analysis, it can be observed that some of the commercial banks under study were operating below the recommended threshold of capital adequacy ratio. This is a signal that some of the individual banks were experiencing bank runs, a liquidity hazard. Commercial banks with high capital are perceived to be more stable than their counterparts with lower capital base; in situations of insolvency then their customers were safe.

Thirdly, the study sought to determine the effect of bank liquidity on financial stability of commercial banks in Kenya. Total loan to total deposit was employed as measure of bank liquidity. The study determined that increase in total loan to deposit ratio had a statistically insignificant negative effect on fragility index hence financial stability. This implies that an increase in liquidity of commercial banks translates into the financial stability of the banking sector. However, the coefficient of bank liquidity was not different from zero since the p value was not less than 0.05.

Fourthly, the study sought to determine the effect of profitability on financial stability of commercial banks in Kenya. Profit before tax to total asset was employed as proxy to profitability. The study determined that an increase in profit before tax to total asset had statistically significant negative effect on fragility index hence financial stability. The finding indicates that an increase in profitability leads to stability within the banking sector at large. However, from trend analysis, some of the commercial banks reporting negative profits indicated that they were facing financial difficulties.The sole objective of any business is to make profits and remain competitive in the market. What some of the commercial banks have been experiencing over the study period is quite challenging, thus exposing the banking sector to vulnerability in case of an emerging financial crisis.

Fifthly, the study determined the effect of asset quality on financial stability of commercial banks in Kenya. Loan loss provision to operating income was employed as proxy to asset quality. The finding indicates that an increase in loan loss provision to income ratio would lead to an increase in fragility index hence financial instability. This implies that as asset quality increases, it leads to unstable banking sector since asset quality is associated with the rate of NPLs; thus, the provisions are created as

results of NPLs. High loan loss provision that absorbs operating income reflects a fragile banking sector. Credits structure a decent lump of bank's advantages. At the point when a credit become NPLs, a bank is required to make arrangements for outcome that they may not be reimbursed. The proportion in this manner quantifies how far the arrangements are secured by the banks operating income. On the off chance that the arrangements suck up the whole operating income, which means it is at 100% and over, the bank is in a difficult situation. Such a bank is probably going to be battling for endurance.

The sixth objective of the study was to determine the moderating effect of the exchange rate on the relationship between firm characteristics and financial stability of commercial banks in Kenya. When exchange rate was regressed as an explanatory variable together with the firm characteristics, it had a positive statistically insignificant effect of financial stability proxied by fragility index. However, when the exchange rate was used as a moderator, an interaction between the independent variables and exchange rate turned out insignificant except for exchange rate as an explanatory variable. Exchange rate emerged as a good moderator for the study based on the findings. Increase in exchange rate among commercial banks has an effect on their fragility index as a result of foreign exchange risk stemming from foreign liabilities and assets held by commercial banks.

5.3 Conclusions of the Study

The study concludes that operating efficiency as one of the firm’s characteristics has an impact on financial stability of commercial banks in Kenya. Operating efficiency had a statistically significant positive effect on financial stability of commercial banks in Kenya. The positive effect obtained from the findings implies that, an increase in

expenses being incurred on the commercial bank with less income coming through, would lead to financial instability of a commercial bank. The higher the operating efficiency the lower the stability of a commercial bank whiles the lower the operating efficiency the stabile the commercial bank is. On the other hand, a lower operating efficiency would imply that a commercial bank is receiving more income than what it is spending; this could turn out to be an ideal condition for financial stability of a commercial bank.

The study further concludes that capital adequacy as one of the firm's characteristics has an impact on financial stability of commercial banks in Kenya. Capital adequacy had a statistically significant negative effect on financial stability of commercial banks in Kenya. The negative effect obtained from the findings implies that, the more a commercial bank acquires capital than its counterparts the less fragile the bank will be hence financial stability. The lower the fragility index the stable the commercial bank is. On the other hand the higher the fragility index the unstable the commercial bank. Commercial banks that were operating below 8% threshold reflected a threat to the banking sector at large. It was a threat in the sense that in case of insolvency, customers would incur heavy losses. The insolvency would also affect other banks through the risk of contagion.

The study further concludes that profitability has an impact on financial stability of commercial banks in Kenya. Profitability had a statistically significant negative effect on financial stability of commercial banks in Kenya. The negative effect obtained from the findings implies that, an improvement in the bank's profitability would lead to a lower fragile sector thus financial stability. Nonetheless some of the commercial banks under study were reporting negative profits. Commercial banks whose going concerns

are at stake should adopt the economies of scope. Here, two commercial banks that share the same market clientele come together in form of mergers and acquisition. This would boost their synergy in terms of profitability, translating into financial stability of the banking sector in Kenya at large.

The study additionally concludes that asset quality as one of the firm characteristics has an impact on financial stability of commercial banks in Kenya. Asset quality had a statistically significant positive effect on financial stability of commercial banks in Kenya. The positive effect obtained from the findings implies that as asset quality increases this would lead to increase in fragility index hence financial instability of commercial banks. Increasing trend of asset quality in the banking sector leaves the financial system of the banking sector vulnerable to financial crisis. A higher rate of loan loss provision results from an equivalent high non-performing loan rates within the banking sector. By extension, it implies that banks would not make enough profits to sustain themselves. This sets the banking sector fragility to financial crisis. The study further concludes that an increase in asset quality measured by loan loss provision to operating income would lead to instability in banking sector.

5.4 Policy Implications

This section displays a number of policy recommendations obtained from study findings. Firstly, the results show that operating efficiency had a statistically significant effect on financial stability. This implies that the coefficient of operating efficiency is different from zero since the p value was less than 0.05. The study therefore recommends that commercial banks of Kenya should embrace advanced digitalization that will ensures smooth and efficient running of bank activities, and in so doing they should shorten customer engagement through simplified process. Reduced costs in

return lead to increased stability of the commercial banks. With improved operating efficiency, commercial banks can diversify their portfolios and compete with the outside markets. Commercial banks operating above the threshold of operating efficiency have higher costs to income ratio which is associated with fragility of the banking sector. The study further recommended that commercial banks can adopt internal economies of scale mechanisms that can minimize excess costs that attract inefficiency among commercial banks in Kenya.

Secondly, the study found out that capital adequacy had a statistically significant effect on financial stability. The study recommends that the Central Bank of Kenya should be on the lookout for the customer deposit fluctuations among individual commercial banks. This is because large fluctuations could indicate bank runs which in the long run are distractive to individual banks; the effect of the collapse can also be felt by other commercial banks in the sector. Bank runs normally occur due to insider information. The staff working at a particular bank sends out a signal to a few customers that a particular bank's going concern is at stake. News from the whistle blower is spread to other customers. Bank runs are thus of concern to CBK, a pointer that a particular bank could be experiencing difficult financial moments.

The study further recommends that commercial banks should adhere to the Basel III accord requirements that advocates for buffer capital of 2.5% this help to cushion the banks in case of a financial crisis. The study in addition recommends that commercial banks should adhere to the Banking Amendment Act (2012) that advocates for increase of minimum core capital to five billion Kenya shillings from one billion Kenya shillings to boost the financial stability of commercial banks in Kenya.

Thirdly, the study found out that profitability had a statistically significant effect on financial stability of commercial banks in Kenya. The study recommends that the CBK should be on the lookout for those commercial banks that keep reporting negative profits before tax. If a commercial bank were not making profits, then it would feed out from the market since the banking sector in Kenya is very competitive. Negative profits that can be seen from a commercial bank are a signal for its going concern; this would end up affecting the banking sector at large in case of collapse of such institution. This is because banks are interconnected: a collapse would definitely affect the banking sector at large. The study further recommends that commercial banks whose going concerns are at stake should adopt the economies of scope. Here, two commercial banks that share the same market clientele come together in form of mergers and acquisition. This would boost their synergy in terms of profitability, translating into financial stability of the banking sector in Kenya at large.

Fourthly, the study found out that asset quality had a statistically significant effect on financial stability of commercial banks in Kenya. From the finding on asset quality, the study recommends that commercial banks should conduct an in-depth analysis on the viability of customer projects and its riskiness as well as its chances of returns from the project. It is important to establish whether it would bring forth or it would lead to default from the customers due to lack of breakeven discrepancies. The CBK should also be on the lookout for those individual banks with high levels of NPLs. Such a signal of future difficulties would forewarn the entire banking sector in a future financial crisis, if it happens.

The study further recommends that since the loans granted to insider results to huge loss hence the commercial banks should set limits on advances to insiders, including

enormous investors, and related organizations ought to be set up. These cutoff points ought to restrict the measure of acknowledge stretched out as well as necessitate that the terms and states of such credits not be on more positive terms than credit reached out to correspondingly arrange external borrowers. In addition the study recommends that credit to one borrower or corporations should not exceed 15% or 20% of capital as practiced in developed counties, these will be significant in case of defaults.

Lastly, the study found out that the exchange rate when interacted with the explanatory variable is statistically significant and that the positive coefficient is different from zero. An increase in the exchange rate had an effect on financial stability of commercial banks in Kenya. Exchange rate increase would indirectly affect foreign liabilities held by commercial banks. By extension, the operating expense would increase due to the increase in the unaccounted costs due to increase in exchange rates. To deal with issues of exchange rate fluctuations, the study recommends that commercial banks in Kenya should adopt a unified exchange rate.

5.5 Contribution to Knowledge

This thesis has contributed to knowledge in various ways. Firstly, the use of fragility index in this study as a proxy to financial stability immensely contributes to the banking sector, in the sense that the fragility index was able to separate the fragile commercial banks from the stable counterparts. Out of the 38 commercial banks under study, fragility index identified 17 commercial banks that were fragile under the study period. Fragility index in this study has emerged to be a robust measure of early warning signal to financial healthiness of an institution. Going forward, fragile commercial banks should find a way towards merging to ensure they are financially

stable. The fragile commercial banks identified by the study have a common denominator.

Secondly, unlike other local studies, this thesis employed a unique methodology, the Generalized Method of Moments GMM model that was able to cater for endogenity bias and unobserved heterogeneity. It became evident that through the use of GMM, the findings had no autocorrelation and hetroscedasticity problems. This implies that the data is reliable, showing that the GMM model was important in addressing those anomalies in the data. This emerges as a great contribution to literature and a benchmark to other scholars to use in future.

Thirdly, this research has been able to use an interaction variable exchange rate with firm characteristics. Exchange rate has been used as the moderating variable, clarifying that exchange rate moderates the relationship between firm characteristics and financial stability of commercials banks in Kenya and not as an explanatory variable. Exchange rate turned out as a very good moderating variable.

Fourthly, academicians will appreciate the outcome of the study by forming a basis of conducting future studies in areas where some knowledge gaps were identified. Finally, policy makers will apply the needed agency as far as fragile banks are concerned. They will ensure that there is a sound and vibrant economy. This could assist towards achieving the Vision 2030 that advocates for well-functioning, efficient and stable financial system.

5.6 Suggestions for Further Research

Findings from the study have a unique touch on literature, unveiling the fragile commercial banks in Kenya and charting the way forward to ensure stability in the

banking sector. From the findings, bank liquidity as a firm characteristic turned out to be statistically insignificant on financial stability of commercial banks in Kenya. However, a number of studies cited in literature review indicated that bank liquidity has a significant effect on financial stability. This turns out to be a contradiction from the research findings hence can be termed as a research gap. Further studies should consider inclusion of other macro-economic variables namely Gross Domestic Product (GDP) and inflation that the current study did not capture as a moderating variable as bank operation are influenced by these macro variables which in turn affects the financial stability of commercial banks. The study on the other hand concentrated on CAMEL variables as firm characteristics. Nevertheless, there are other firm characteristics that the study did not capture. They provide a grey area for researchers to further explore in future research endeavours.

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APPENDICES

APPENDIX I: LIST OF COMMERCIAL BANKS IN KENYA

1. African Banking Corporation Ltd.
2. Bank of Africa Kenya Ltd.
3. Bank of Baroda (K) Ltd.
4. Bank of India
5. Barclays Bank of Kenya Ltd.
6. CFC Stanbic Bank Ltd.
7. Citibank N.A Kenya
8. Commercial Bank of Africa Ltd.
9. Consolidated Bank of Kenya Ltd.
10. Co-operative Bank of Kenya Ltd.
11. Credit Bank Ltd.
12. Development Bank of Kenya Ltd.
13. Diamond Trust Bank (K) Ltd. (Acquired Habib Bank Ltd)
14. Ecobank Kenya Ltd
15. Equatorial Commercial Bank Ltd (Spire bank Now)
16. Equity Bank Ltd.
17. Family Bank Ltd
18. Fidelity Commercial Bank Ltd
19. Fina Bank Ltd
20. First community Bank Limited Source
21. Guaranty Trust Bank Kenya
22. Guardian Bank Ltd
23. Gulf African Bank Limited
24. Habib Bank A.G Zurich
25. I & M Bank Ltd (Acquired Giro Commercial Bank Ltd)
26. Jamii Bora Bank Ltd.
27. Kenya Commercial Bank Ltd
28. Sidian Bank Ltd
29. Middle East Bank (K) Ltd
30. National Bank of Kenya Ltd
31. NIC Bank Ltd
32. Oriental Commercial Bank Ltd
33. Paramount Universal Bank Ltd
34. Prime Bank Ltd
35. Standard Chartered Bank (K)Ltd
36. Trans-National Bank Ltd
37. UBA Kenya Bank LTD
38. Victoria Commercial Bank Ltd
39. Dubai Bank Kenya Ltd.(Statutory Management)
40. Chase Bank (K) Ltd.(Statutory management)
41. Imperial Bank Ltd.(Statutory management

Source: Central Bank of Kenya, (2018)

APPENDIX II: LIST OF KENYAN BANKS THAT HAVE COLLAPSED

First Wave (1984-1989)	Second Wave (1993-1995)	Third Wave (2007-2015)	Fourth Wave (2015- 2018)
Union Bank	Bullion Bank	Kenya Finance corporation	Dubai Bank
Estate Finance Bank	Fortune Finance Bank	Trade Bank	Imperial Bank (Statutory management)
Estate Building society Bank	Trust Bank	Euro Bank	Chase Bank (Statutory management))
Business Finance Bank	City Finance Bank	Charter House Bank	M-Bank (Under Receivership)
Nationwide Finance Bank	Reliance Bank		
Kenya Savings and Mortgages bank	Prudential Bank		
Home Saving and Mortgages Bank			
Jimba Credit Cooperation Bank			
Mortgages Bank			

Source: Central bank of Kenya (2018)

APPENDIX (III): DOCUMENT REVIEW GUIDE

Data Entry Sheet……...

Commercial Bank's Name…….

Financial Year	Gross NPLs	Bank Deposits	Total Loans	Foreign Liabilities	Operating expenses	Operating Income	Core Capital	Loan loss provision	PBT	Total assets	Exchange Rates
2011											
2012											
2013											
2014											
2015											
2016											
2017											
2018											

Source: Researcher (2019)

Appendix (IV): Document Review Guide; Data Abstraction Tool

Variable	Measurement	Formula	Data	Source; Financial Statement 2011 -2018
Operating Efficiency	Operating Cost/ Operating income	$\frac{\text{Operating Cost}}{\text{Operating Income}}$	Operating Costs	Statement of Comprehensive Income
			Operating Income	Statement of Comprehensive Income
Capital Adequacy	Core Capital/ Total Deposits liabilities	$\frac{\text{Core Capital}}{\text{Deposit Liabilities}}$	Core Capital	Other Disclosures
			Deposit Liabilities	Statement of financial Position
Bank Liquidity	Total loan/Total deposits	$\frac{\text{Total Loan}}{\text{Total Deposits}}$	Total Loan	Statement of Comprehensive Income
			Total Deposits	Statement of financial Position
Profitability	Profit Before Tax/Total Asset ratio	$\frac{\text{Profit Before Tax}}{\text{Total Asset}}$	Profit Before Tax	Statement of Comprehensive Income
			Total Asset	Statement of financial Position
Asset quality	Loans loss Provision/Operating Income	$\frac{\text{Loans Loss Provision}}{\text{Operating Income}}$	Loan loss Provision	Other Disclosures
			Operating Income	Statement Of Comprehensive Income
Exchange rate	USD- Ksh. Exchange rate	USD- Ksh. Exchange rate	USD- Ksh. Exchange rate	Central Bank of Kenya (CBK) Report on Exchange rates

Source: Researcher (2019)

Appendix (V) Graduate School Research Authorization

KENYATTA UNIVERSITY
GRADUATE SCHOOL

E-mail: dean-graduate@ku.ac.ke
Website: www.ku.ac.ke

P.O. Box 43844, 00100
NAIROBI, KENYA
Tel. 8710901 Ext. 57530

OUR REF: D86/CTY/PT/38480/16

Date: 28th May, 2019

The Director General,
National Commission for Science, Technology & Innovation,
P.O. Box 30623,
NAIROBI

Dear Sir/Madam,

RE: RESEARCH AUTHORIZATION FOR NATHAN W. WAFULA REG. NO. D86/CTY/PT/38480/16

I write to introduce **Wafula** who is a Postgraduate Student of this University. The student is registered for Ph.D. Degree programme in the **Department of Accounting & Finance in the School of Business.**

Wafula intends to conduct research for a Ph.D. thesis entitled,**"Firm Characteristics and Financial Stability of Commercial Banks in Kenya".**

Any assistance given will be highly appreciated.

Yours faithfully,

PROF. ELISHIBA KIMANI
DEAN, GRADUATE SCHOOL

RM/cao

Appendix (VI) Research Permit by NACOSTI

NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Telephone:+254-20-2213471,
2241349,3310571,2219420
Fax:+254-20-318245,318249
Email: dg@nacosti.go.ke
Website : www.nacosti.go.ke
When replying please quote

NACOSTI, Upper Kabete
Off Waiyaki Way
P.O. Box 30623-00100
NAIROBI-KENYA

Ref: No. **NACOSTI/P/19/83859/31136** Date: **27th June 2019**

Nathan Wamalwa Wafula
Kenyatta University
P.O. Box 43844-00100
NAIROBI.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on ***"Firm characteristics and financial stability of Commercial Banks in Kenya."*** I am pleased to inform you that you have been authorized to undertake research in **Nairobi County** for the period ending **24th June, 2020.**

You are advised to report to **the County Commissioner, and the County Director of Education, Nairobi County** before embarking on the research project.

Kindly note that, as an applicant who has been licensed under the Science, Technology and Innovation Act, 2013 to conduct research in Kenya, you shall deposit **a copy** of the final research report to the Commission within **one year** of completion. The soft copy of the same should be submitted through the Online Research Information System.

DR. ROY B. MUGHRA, PhD.
FOR: DIRECTOR-GENERAL/CEO

Copy to:

The County Commissioner
Nairobi County.

The County Director of Education
Nairobi County.

Appendix (VII) Research Permit by NACOSTI

THIS IS TO CERTIFY THAT:
MR. NATHAN WAMALWA WAFULA
of KENYATTA UNIVERSITY, 0-50205
WEBUYE,has been permitted to conduct
research in *Nairobi County*

on the topic: *FIRM CHARACTERISTICS AND FINANCIAL STABILITY OF COMMERCIAL BANKS IN KENYA*

for the period ending:
24th June,2020

.....
Applicant's Signature

Permit No : NACOSTI/P/19/83859/31136
Date Of Issue : 27th June,2019
Fee Recieved :Ksh 2000

.....
Director General
National Commission for Science, Technology & Innovation

Appendix VIII: Testing For Autocorrelation

Table A. 1: Autocorrelation Test For Fragility Index

```
Arellano-Bond dynamic panel-data estimation  Number of obs         =        88
Group variable: Banks                        Number of groups      =        16
Time variable: Years
                                             Obs per group:    min =         3
                                                               avg =       5.5
                                                               max =         6

Number of instruments =     28               Wald chi2(7)          =    240.32
                                             Prob > chi2           =    0.0000
Two-step results
                                        (Std. Err. adjusted for clustering on Banks)
```

FragilityIndex2	Coef.	WC-Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
FragilityIndex2 L1.	.5540419	.292299	1.90	0.058	-.0188536	1.126937
OperatingEfficiency2	-.3704057	.2597791	-1.43	0.154	-.8795634	.1387521
CapitalAdequacy2	.1537672	.0576658	2.67	0.008	.0407442	.2667902
BankLiquidity2	-.0384879	.0508237	-0.76	0.449	-.1381004	.0611247
Profitability2	-.0403968	.0604387	-0.67	0.504	-.1588545	.0780608
AssetQuality2	.1224788	.0554898	2.21	0.027	.0137208	.2312368
ExchangeRates2	.475046	.3303613	1.44	0.150	-.1724503	1.122542
_cons	-1.988916	1.384188	-1.44	0.151	-4.701874	.7240418

```
Instruments for differenced equation
        GMM-type: L(2/.).FragilityIndex2
        Standard: D.OperatingEfficiency2 D.CapitalAdequacy2 D.BankLiquidity2
                  D.Profitability2 D.AssetQuality2 D.ExchangeRates2
Instruments for level equation
        Standard: _cons

. estat abond

Arellano-Bond test for zero autocorrelation in first-differenced errors
```

Order	z	Prob > z
1	-1.5645	0.1177
2	.04859	0.9612

```
  H0: no autocorrelation
```

Source: Researcher (2019)

Appendix IX (a): Testing for Fixed and Random Effects

Table A. 2 : Fixed Effect Test Results for Fragility Index

```
Fixed-effects (within) regression               Number of obs      =       126
Group variable: Banks                           Number of groups   =        17

R-sq:  within  = 0.5699                         Obs per group: min =         3
       between = 0.0559                                        avg =       7.4
       overall = 0.2855                                        max =         8

                                                F(6,103)           =     22.75
corr(u_i, Xb)  = -0.0115                        Prob > F           =    0.0000
```

FragilityIndex	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
OperatingEfficiency2	.1318926	.4214155	0.31	0.755	-.7038857	.9676708
CapitalAdequacy2	-.1825975	.1813794	-1.01	0.316	-.5423208	.1771257
BankLiquidity2	-.1131818	.1539079	-0.74	0.464	-.4184217	.1920581
Profitability2	.1883397	.1244456	1.51	0.133	-.0584688	.4351481
AssetQuality2	.3413771	.1007142	3.39	0.001	.1416343	.54112
ExchangeRates2	4.762135	.7250069	6.57	0.000	3.324255	6.200016
_cons	-19.38026	3.549008	-5.46	0.000	-26.41888	-12.34164
sigma_u	.65907702					
sigma_e	.44876316					
rho	.6832375	(fraction of variance due to u_i)				

```
F test that all u_i=0:     F(16, 103) =    12.62            Prob > F = 0.0000

. estimate store fe
```

Source Researcher (2019)

Table A.2: Random Effect Results for Fragility Index

```
Random-effects GLS regression                   Number of obs      =       126
Group variable: Banks                           Number of groups   =        17

R-sq:  within  = 0.5659                         Obs per group: min =         3
       between = 0.1721                                        avg =       7.4
       overall = 0.3374                                        max =         8

                                                Wald chi2(6)       =    134.22
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000
```

FragilityIndex	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
OperatingEfficiency2	.2512869	.3556995	0.71	0.480	-.4458712	.9484451
CapitalAdequacy2	-.1818691	.17694	-1.03	0.304	-.5286651	.164927
BankLiquidity2	-.0479555	.1475055	-0.33	0.745	-.337061	.24115
Profitability2	.2932805	.1129691	2.60	0.009	.0718651	.5146959
AssetQuality2	.3248076	.0966599	3.36	0.001	.1353577	.5142575
ExchangeRates2	4.887621	.7150313	6.84	0.000	3.486185	6.289057
_cons	-19.53498	3.4921	-5.59	0.000	-26.37937	-12.69059
sigma_u	.5450397					
sigma_e	.44876316					
rho	.59597615	(fraction of variance due to u_i)				

```
. estimate store re
```

Source: Researcher (2019)

Appendix IX (a): Data Extracted From the financial Statements and Applied in the Analysis

Banks	Years	Fragility Index	Operating Efficiency	Capital Adequacy	Bank Liquidity	Profitability	Asset Quality	Exch. Rate
1	2011	2.1	0.504869497	0.182720032	0.906458458	0.048318056	0.148931707	88.73
1	2012	2.1	0.468712408	0.188484651	0.553167213	0.05180986	0.132027509	84.39
1	2013	2.2	0.427479002	0.214596165	0.803134735	0.054888158	0.103840207	86.21
1	2014	2.1	0.473167685	0.208870822	0.930077687	0.059320528	0.141455146	88.07
1	2015	2.6	0.476996528	0.161417753	0.93301953	0.050123893	0.203732639	98.71
1	2016	3.3	0.510483982	0.187921044	0.965423625	0.056424805	0.256445071	101.52
1	2017	4.1	0.54965411	0.163507238	0.93525595	0.049442975	0.310596374	103.39
1	2018	4.1	0.500795292	0.185018385	0.877647267	0.05048068	0.212167966	101.08
2	2011	1.3	0.658716104	0.154885954	0.420596685	0.045099897	0.211842833	88.73
2	2012	1.4	0.594450328	0.181269143	0.736867324	0.047950797	0.103283203	84.39
2	2013	1.6	0.611405547	0.183795258	0.513773344	0.04677246	0.085922753	86.21
2	2014	1.7	0.601236378	0.170735042	0.826603347	0.044271266	0.066280033	88.07
2	2015	1.8	0.586428823	0.162343313	0.79782382	0.041446032	0.105119314	98.71
2	2016	2.1	0.560508156	0.202203305	0.94002243	0.051497437	0.094291775	101.52
2	2017	2.8	0.586970668	0.206113473	0.883725654	0.043105295	0.152067274	103.39
2	2018	3.6	0.56707185	0.181476397	0.801789612	0.043070955	0.236370201	101.08
3	2011	1.1	0.524718263	0.163663836	0.452604825	0.071708373	0.042643421	88.73
3	2012	1.1	0.496172429	0.210462911	0.867285403	0.07441076	0.062182343	84.39
3	2013	1.4	0.489814763	0.219262334	0.557581674	0.076546848	0.074878281	86.21
3	2014	1.7	0.477129647	0.201091035	0.952670814	0.072576105	0.083696873	88.07
3	2015	2.4	0.499340296	0.201071617	0.967805084	0.065590676	0.06185567	98.7
3	2016	3.5	0.5473839	0.184920707	0.797586014	0.059981725	0.107644616	101.52
3	2017	3.1	0.516290569	0.19818348	0.742202121	0.056805823	0.104657741	103.39
3	2018	2.6	0.506137082	0.163525768	0.627843055	0.055602051	0.102689784	101.08
4	2011	0.6	0.490872086	0.115448444	0.436107682	0.050046379	0.026088565	88.73
4	2012	0.7	0.450555741	0.153872976	0.367703256	0.058922826	0.029337404	84.39

4	2013	0.8	0.439675125	0.166953206	0.339379201	0.06038345	0.063502083	86.21
4	2014	1.3	0.449873048	0.178772606	0.795335507	0.064230403	0.159767639	88.07
4	2015	1.5	0.642356129	0.190637503	0.704480059	0.03832897	0.189821457	98.71
4	2016	1.6	0.53260591	0.184517642	0.693403879	0.051000104	0.179964117	101.52
4	2017	1.8	0.641375669	0.166993986	0.65341764	0.033353792	0.256768987	103.39
4	2018	2.1	0.587279815	0.158098661	0.651473132	0.040162843	0.242708634	101.08
5	2011	0.5	0.49533872	0.137673158	0.490873653	0.041937816	0.125854568	88.73
5	2012	0.4	0.460302785	0.1659058	0.850320668	0.049411715	0.063446204	84.39
5	2013	0.5	0.434362934	0.177673847	0.537326389	0.048766384	0.098760415	86.21
5	2014	0.7	0.423663773	0.217960024	0.93335293	0.044674732	0.097578803	88.07
5	2015	0.9	0.468629962	0.200834275	1.013343656	0.036947232	0.15523085	98.71
5	2016	1.2	0.47392129	0.174391654	0.831482036	0.036358572	0.236071598	101.52
5	2017	1.6	0.513222505	0.185563005	0.823456835	0.030464822	0.415547536	103.39
5	2018	1.6	0.463271927	0.193808569	0.824928783	0.032907543	0.242150388	101.08
6	2011	0.8	0.543890956	0.233585869	0.651992239	0.071802995	0.187182018	88.73
6	2012	0.8	0.525233372	0.205409129	0.712848494	0.070339597	0.115008751	84.39
6	2013	0.8	0.573045378	0.210412779	0.593211114	0.05758659	0.104401705	86.21
6	2014	1.1	0.614415994	0.186631998	0.724664387	0.054387882	0.156120659	88.07
6	2015	1.1	0.646359792	0.187580765	0.788295731	0.050067799	0.170319108	98.71
6	2016	1.4	0.665320124	0.191320555	0.888340931	0.040231524	0.16507967	101.52
6	2017	1.5	0.66402525	0.208155924	0.9515638	0.036829823	0.187059298	103.39
6	2018	2.1	0.684567769	0.18259237	0.856993621	0.031503372	0.279316969	101.08
7	2011	1.2	0.497390236	0.130233228	0.424582593	0.037631247	0.200337734	88.73
7	2012	1.1	0.54104809	0.12140607	0.755444022	0.039798519	0.169394747	84.39
7	2013	1.5	0.510957703	0.114052729	0.492208192	0.035745744	0.176199869	86.21
7	2014	1.3	0.573154616	0.112976886	0.759796004	0.025721095	0.244949972	88.07
7	2015	1.9	0.532121121	0.115283743	0.726013174	0.031372806	0.255766774	98.71
7	2016	1.7	0.56374605	0.118165971	0.651885581	0.036006601	0.199827636	101.52
7	2017	2.2	0.588083644	0.114330243	0.600062788	0.031321207	0.225551418	103.39
7	2018	2.2	0.579348286	0.128613371	0.553582968	0.034228945	0.286288616	101.08

8	2011	0.6	0.610894661	0.217533477	0.605142081	0.032245591	0.049633306	88.73
8	2012	0.6	0.629364178	0.22521915	0.888425026	0.035328165	0.062304854	84.39
8	2013	2.1	0.506819725	0.227546287	0.585003344	0.041030657	0.059001419	86.21
8	2014	1.3	0.501896858	0.250254294	0.878261805	0.043134692	0.065382336	88.07
8	2015	1.1	0.512157696	0.237153172	0.948713485	0.035638389	0.11726865	98.71
8	2016	1.3	0.578711454	0.235100254	0.964154352	0.033724591	0.159691095	101.52
8	2017	1.8	0.571863198	0.21285676	0.885196296	0.023386854	0.170163659	103.39
8	2018	2.2	0.5839599	0.16793573	0.744779324	0.042105162	0.288551568	101.08
9	2011	0.4	0.302031603	0.184760466	1.139452796	0.061415029	0.078705794	88.73
9	2012	0.5	0.337947427	0.18071298	0.988497867	0.048699738	0.099972036	84.39
9	2013	0.5	0.300995824	0.197331329	1.047386367	0.065838138	0.100760253	86.21
9	2014	0.7	0.279755849	0.219326719	1.045627115	0.054479639	0.089097999	88.07
9	2015	1.1	0.421022663	0.22551835	0.998430111	0.068774265	0.055916183	98.71
9	2016	0.6	0.489111582	0.208219109	0.87979216	0.064606742	0.142464829	101.52
9	2017	2.2	0.561898954	0.22432813	0.956190089	0.022848228	0.247689637	103.39
9	2018	4.2	0.529903842	0.199483702	0.813222906	0.098898081	0.34569445	101.08
10	2011	0.7	0.43302969	0.151432073	0.49733099	0.046221171	0.267712551	88.73
10	2012	1.1	0.418532506	0.162251827	0.396189941	0.042359392	0.213514972	84.39
10	2013	0.9	0.429648241	0.167481837	0.365222411	0.046237502	0.223727332	86.21
10	2014	1.3	0.407656341	0.204637108	1.065078209	0.044358692	0.22423534	88.07
10	2015	1.5	0.48968778	0.205061531	1.059987808	0.039933147	0.194750143	98.71
10	2016	1.7	0.619038794	0.245449798	1.088073732	0.036614828	0.292068199	101.52
10	2017	2.1	0.625050208	0.211793721	0.907307695	0.029437238	0.32956219	103.39
10	2018	1.9	0.579399778	0.214050864	0.91833686	0.029225761	0.441274546	101.08
11	2011	0.2	0.317311609	0.147506857	0.298962429	0.039426719	0.215885947	88.73
11	2012	0.2	0.324280503	0.146865718	0.495193059	0.036130738	0.145520876	84.39
11	2013	0.2	0.245481928	0.177042291	0.334957136	0.048152705	0.125301205	86.21
11	2014	0.3	0.257984581	0.191524762	0.59573157	0.043506336	0.136288546	88.07
11	2015	0.4	0.385869565	0.211245253	0.609552419	0.036463375	0.252470356	98.71
11	2016	0.5	0.277218494	0.20818818	0.58712273	0.046751179	0.256152125	101.52

11	2017	0.6	0.229103112	0.221943702	0.601917677	0.052563142	0.235661989	103.39
11	2018	1.6	0.250363266	0.196531905	0.478599031	0.050644642	0.237285673	101.08
12	2011	0.3	0.686465683	0.168805528	0.213377873	0.035593097	0.109557409	88.73
12	2012	0.4	0.849145861	0.174340019	0.209794169	0.01707989	0.202759527	84.39
12	2013	0.6	0.789199432	0.132216994	0.151829331	0.019233888	0.208195168	86.21
12	2014	0.9	0.761792934	0.099015872	0.651869651	0.018980182	0.71962426	88.07
12	2015	1.1	1.177937447	0.088252273	0.657039255	-0.013440281	0.342244294	98.71
12	2016	2.1	0.985300831	0.102533444	0.70122942	0.001407301	0.553090477	101.52
12	2017	1.9	0.91839207	0.037051532	0.720860129	0.006730822	1.322907489	103.39
12	2018	2.1	0.923284314	0.021083821	0.682200699	0.005106693	1.700490196	101.08
13	2011	0.3	0.418081053	0.112288723	0.357361804	0.03072332	0.154139245	88.73
13	2012	0.3	0.566045381	0.262072722	0.27697467	0.026712376	0.192058347	84.39
13	2013	0.3	0.44356261	0.122060056	0.252537782	0.038272578	0.132569077	86.21
13	2014	0.3	0.41774398	0.149304784	0.778730398	0.041844204	0.094803549	88.07
13	2015	0.3	0.425182886	0.164396236	0.819264538	0.039891694	0.061848814	98.71
13	2016	0.4	0.485802333	0.19812875	0.817044646	0.035752548	0.084085406	101.52
13	2017	0.5	0.57373868	0.19417948	0.690869603	0.025864099	0.126994394	103.39
13	2018	1.2	0.55084928	0.270403091	0.549626871	0.021190655	0.204902172	101.08
14	2011	0.2	0.861125863	0.13971274	0.378357583	0.020113837	0.243494424	88.73
14	2012	0.3	0.820081006	0.187535526	0.979131141	0.027206713	0.332125346	84.39
14	2013	0.3	0.643757159	0.162675141	0.465542395	0.040412864	0.1360252	86.21
14	2014	0.4	0.669568509	0.21522465	0.838602646	0.04235355	0.163764825	88.07
14	2015	0.5	0.686760074	0.180596515	0.924184215	0.035509299	0.161398936	98.7
14	2016	0.6	0.929539898	0.288862634	1.28963422	0.009116834	0.256723716	101.52
14	2017	0.8	1.21155034	0.228402741	0.989520295	-0.01985489	0.361025324	103.39
14	2018	0.7	0.93795243	0.220494656	0.852303384	0.006277089	0.281873246	101.08
15	2011	0.3	0.938539043	0.159785102	0.36909936	0.004446731	0.325440806	88.73
15	2012	0.2	2.742045455	0.203678696	0.696181607	-0.048283025	0.571590909	84.39
15	2013	0.3	1.753214942	0.200347126	0.415466845	-0.033354106	0.445192897	86.21
15	2014	0.5	1.229953917	0.279454933	0.745171956	-0.010863413	0.311059908	88.07

15	2015	0.5	0.969246032	0.265142891	0.902063812	0.001773895	0.224206349	98.71
15	2016	0.8	3.244755245	0.215918608	0.849685164	-0.061306341	1.2004662	101.52
15	2017	2.1	1.488087134	0.196264249	0.491141327	-0.026825801	1.010551396	103.39
15	2018	2.1	0.950807899	0.23834	0.612175118	0.002497062	0.318850987	101.08
16	2011	0.2	0.709033613	0.142082882	0.356624698	0.014328127	0.020483193	88.73
16	2012	0.2	0.732180515	0.101623932	0.672706553	0.012990727	0.036271615	84.39
16	2013	0.3	0.67875	0.13072945	0.437751769	0.019512936	0.0384375	86.21
16	2014	0.4	0.937346437	0.122901317	0.789869952	0.00327911	0.145884521	88.07
16	2015	1.1	1.396132597	0.131096357	0.772565689	-0.020698614	0.641160221	98.71
16	2016	0.7	1.004247412	0.152404082	1.022758282	-0.000285735	0.892752854	101.52
16	2017	1.1	0.989825581	0.156657798	1.063885722	0.000645864	1.069186047	103.39
16	2018	0.9	1.187292818	0.168614302	1.159949539	0.004278641	0.781207133	101.08
17	2011	0.2	0.554997718	0.199261005	1.35070151	0.030526711	0.176175262	88.73
17	2012	0.2	0.594242015	0.181948798	1.318965517	0.022169788	0.172289699	84.39
17	2013	0.3	0.575428771	0.15067718	1.328554721	0.025943749	0.183059153	86.21
17	2014	0.3	0.635977337	0.134081152	1.253122836	0.02124283	0.230594901	88.07
17	2015	0.4	0.592444862	0.193229565	1.265780176	0.025243791	0.232989207	98.71
17	2016	0.6	0.665741383	0.223267638	1.427560541	0.021223471	0.300254453	101.52
17	2017	0.7	0.882405745	0.224896333	1.345366832	0.006325752	0.517354877	103.39
17	2018	0.9	1.144318597	0.198646246	1.279613377	-0.006919748	0.7665327	101.08

Source: Researcher (2019)

Appendix IX (b): Data Extracted From the Financial Statements and Applied in the Analysis. Fragility Index Data.

Banks	Years	Credit Risk	Liquidity Risk	Foreign Exchange Risk	Fragility Index
1	2011	1.031260283	1.793141296	1.62513954	2.1
1	2012	1.744488319	1.955572087	0.445635186	2.1
1	2013	1.818525831	2.122893241	0.596338468	2.2
1	2014	1.517110892	2.605063538	0.018530922	2.1
1	2015	2.491280026	3.468669968	-0.091984818	2.6
1	2016	3.979269497	3.942181517	0.440276848	3.3
1	2017	4.941592629	4.597965804	0.576021433	4.1
1	2018	4.255511681	5.02763482	0.529359232	4.1
2	2011	0.174564001	0.970328545	0.719580263	1.3
2	2012	0.338269167	1.208895339	0.530922081	1.4
2	2013	0.321816387	1.36144784	1.017637866	1.6
2	2014	0.630964133	1.905851362	0.552355436	1.7
2	2015	0.665021389	2.481450767	0.358115651	1.8
2	2016	1.17242514	2.361716139	0.482473766	2.1
2	2017	2.396676538	2.712578356	1.157177942	2.8
2	2018	4.081112208	2.934376448	1.809109176	3.6
3	2011	-0.173741362	0.715066221	0.408126814	1.1
3	2012	-0.021224087	0.940827825	1.062067426	1.1
3	2013	0.664856861	1.16328447	0.314132619	1.4
3	2014	0.546561369	1.700285373	0.95177495	1.7
3	2015	0.441757157	2.120600502	2.649252065	2.4
3	2016	1.860809477	2.609758775	4.079705291	3.5
3	2017	1.745804541	2.87278958	2.693011833	3.1
3	2018	2.12520566	3.396204785	0.41929002	2.6
4	2011	-0.512668641	0.721761506	-0.42196919	0.6
4	2012	-0.323461665	0.94374253	-0.510158518	0.7
4	2013	-0.049193814	1.116856509	-0.52221478	0.8
4	2014	1.086706153	1.204468402	-0.521098459	1.3
4	2015	1.735932873	1.357618478	-0.509935253	1.5
4	2016	1.791872326	1.560306349	-0.487608841	1.6
4	2017	2.216847647	1.831861753	-0.535833891	1.8

4	2018	2.881375452	1.965218664	-0.524224157	2.1
5	2011	-0.573379401	-0.041074173	0.09533378	0.5
5	2012	-0.528956894	0.114210103	-0.431569547	0.4
5	2013	-0.508390918	0.262591771	-0.333779862	0.5
5	2014	-0.48502797	0.474645723	0.043089975	0.7
5	2015	-0.080783152	0.773640821	-0.140209868	0.9
5	2016	0.225896677	1.308336789	0.047778522	1.2
5	2017	1.275748602	1.552830557	0.08506363	1.6
5	2018	1.133267522	1.742957145	0.027908015	1.6
6	2011	0.21964462	0.744737677	-0.497878991	0.8
6	2012	-0.061697927	0.911912486	-0.519982139	0.8
6	2013	-0.093287266	1.07297739	-0.526680063	0.8
6	2014	0.066962817	1.387533842	-0.51082831	1.1
6	2015	0.19562356	1.53272031	-0.50055816	1.1
6	2016	1.205166173	1.650954901	-0.50814914	1.4
6	2017	1.393221454	1.501317105	-0.441393168	1.5
6	2018	1.606284962	1.763274714	0.686983702	2.1
7	2011	-0.682296808	0.132430059	0.027908015	1.2
7	2012	-0.682296808	0.205565989	0.686983702	1.1
7	2013	-0.290720632	0.339679017	2.52601027	1.5
7	2014	-0.062026983	0.717371155	1.432685867	1.3
7	2015	0.094768016	1.03881802	2.499665104	1.9
7	2016	0.543435341	1.19584624	1.36459031	1.7
7	2017	0.600691017	1.405375741	2.718910471	2.2
7	2018	0.843040474	1.626710408	2.282875642	2.2
8	2011	-0.682296808	0.132527623	0.09533378	0.6
8	2012	-0.682296808	0.152357375	2.282875642	0.6
8	2013	-0.344356696	0.397180419	3.818932797	2.1
8	2014	-0.127838105	0.47688968	1.534717571	1.3
8	2015	0.116979269	0.560891729	1.36459031	1.1
8	2016	0.47153669	0.728651918	1.161643224	1.3
8	2017	1.022046726	1.095990146	1.264791248	1.8
8	2018	2.059394538	1.64363765	0.933020764	2.2
9	2011	-0.517110892	-0.075562819	0.018530922	0.4
9	2012	-0.55774926	0.030488549	-0.091984818	0.5
9	2013	-0.507897335	0.138466792	0.440276848	0.5

9	2014	-0.342053307	0.293238859	0.09533378	0.7
9	2015	0.15218822	0.503987902	-0.082161197	1.1
9	2016	0.669463639	0.675784775	-0.189327975	0.6
9	2017	2.224744982	0.849545111	0.864925207	2.2
9	2018	2.571405067	1.294446206	6.538736325	4.2
10	2011	-0.23461665	-0.013805215	0.367046216	0.7
10	2012	-0.154327081	0.174711578	1.011832998	1.1
10	2013	0.153998026	0.257274568	0.339361465	0.9
10	2014	0.299769661	0.351923218	1.161643224	1.3
10	2015	1.488647581	0.510353911	0.620674258	1.5
10	2016	1.398979928	0.491011976	1.241348515	1.7
10	2017	1.500164528	0.822227371	1.995757982	2.1
10	2018	1.830042777	0.895399888	1.086403215	1.9
11	2011	-0.575518263	-0.400948804	-0.543201608	0.2
11	2012	-0.58621257	-0.301934194	-0.513507479	0.2
11	2013	-0.583909181	-0.259311203	-0.454342487	0.2
11	2014	-0.507074696	-0.176309178	-0.502344273	0.3
11	2015	-0.293353077	-0.124527427	-0.479124805	0.4
11	2016	-0.124218493	0.021146857	-0.493413708	0.5
11	2017	-0.243665679	0.120307812	-0.122795267	0.6
11	2018	-0.040144784	0.47340179	2.269926323	1.6
12	2011	-0.485357025	-0.078197029	-0.376869837	0.3
12	2012	-0.31260283	-0.096941389	-0.329091315	0.4
12	2013	0.010694307	0.181138564	-0.449430676	0.6
12	2014	0.508390918	0.503890339	-0.401652154	0.9
12	2015	1.252879237	0.582014195	-0.423532038	1.1
12	2016	4.251398486	0.423315203	-0.286447868	2.1
12	2017	3.868213228	0.382984951	-0.418173699	1.9
12	2018	4.493912471	0.440047318	-0.527573119	2.1
13	2011	-0.554129648	-0.417912632	-0.17928109	0.3
13	2012	-0.554787759	-0.322263958	-0.352534048	0.3
13	2013	-0.566469233	-0.275348179	-0.342040634	0.3
13	2014	-0.57272129	-0.220956609	-0.332886805	0.3
13	2015	-0.519578809	-0.150515866	-0.459031034	0.3
13	2016	-0.37709773	-0.170430986	-0.373967403	0.4
13	2017	-0.311780191	-0.068111417	-0.082161197	0.5

13	2018	-0.21816387	0.101014659	1.569993302	1.2
14	2011	-0.382033564	-0.508500207	-0.552132172	0.2
14	2012	-0.226061204	-0.469645601	-0.415271266	0.3
14	2013	-0.301085884	-0.347874338	-0.370395177	0.3
14	2014	-0.213886147	-0.192955926	-0.526456798	0.4
14	2015	-0.103981573	-0.004987927	-0.511721366	0.5
14	2016	0.471865745	-0.264238152	-0.515963385	0.6
14	2017	0.87709773	-0.191651016	-0.417503907	0.8
14	2018	0.656630471	-0.17782141	-0.476222371	0.7
15	2011	-0.281671603	-0.567989463	-0.252511721	0.3
15	2012	-0.370516617	-0.508122149	-0.420852869	0.2
15	2013	-0.321487331	-0.460852704	-0.288233981	0.3
15	2014	-0.27739388	-0.375338423	0.103817816	0.5
15	2015	-0.280190852	-0.352240299	0.028801072	0.5
15	2016	0.1994077	-0.376850655	0.718463943	0.8
15	2017	0.681145114	-0.237249689	3.610404108	2.1
15	2018	-0.157124054	-0.224310349	4.577361018	2.1
16	2011	-0.61994077	-0.477499451	-0.29738781	0.2
16	2012	-0.569595262	-0.34195956	-0.355659745	0.2
16	2013	-0.461335966	-0.321959072	-0.368609065	0.3
16	2014	-0.285455742	-0.164223518	-0.25787006	0.4
16	2015	0.920862126	-0.121624918	0.163429337	1.1
16	2016	1.093616321	-0.323105442	-0.473543202	0.7
16	2017	1.056926621	-0.384985	0.669792364	1.1
16	2018	1.402270484	-0.402668358	-0.331100692	0.9
17	2011	-0.422342876	-0.542281519	-0.553918285	0.2
17	2012	-0.298782494	-0.489914388	-0.553025229	0.2
17	2013	-0.154327081	-0.446754799	-0.550122795	0.3
17	2014	0.002632445	-0.329703163	-0.341147578	0.3
17	2015	-0.008061862	-0.259177053	-0.421299397	0.4
17	2016	0.336623889	-0.304690358	-0.187095334	0.6
17	2017	0.668805528	-0.320044391	-0.38513061	0.7
17	2018	1.511516946	-0.344813288	-0.480017861	0.9

Source: Researcher (2019)

Appendix X: Trend Analysis of Fragility Index Against the Sub Indicators

This section presents the trend analysis of credit risk, liquidity risk and foreign exchange risk against the fragility index. Figure A.1 shows the credit risk trend against the fragility index for 17 commercial banks from the year 2011 to 2018. The trend line indicates that credit risk indicator has been on an increasing and thus the increase of fragility index.

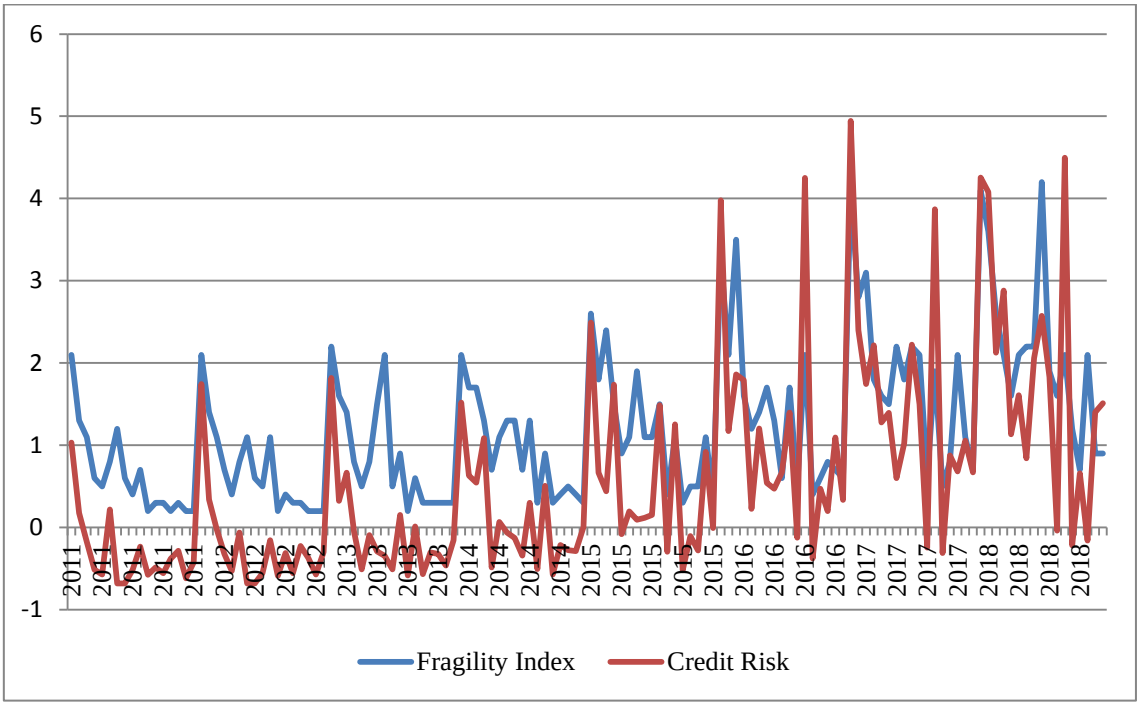

Figure A. 1: Trend for Credit Risk against the Fragility Index from 2011 to 2018

Source: Researcher (2019)

Figure A.2 shows the liquidity risk trend against the fragility index for 17 commercial banks from the year 2011 to 2018. The trend line indicates that liquidity indicator has been on an increasing decreasing trend and thus the increase of fragility index.

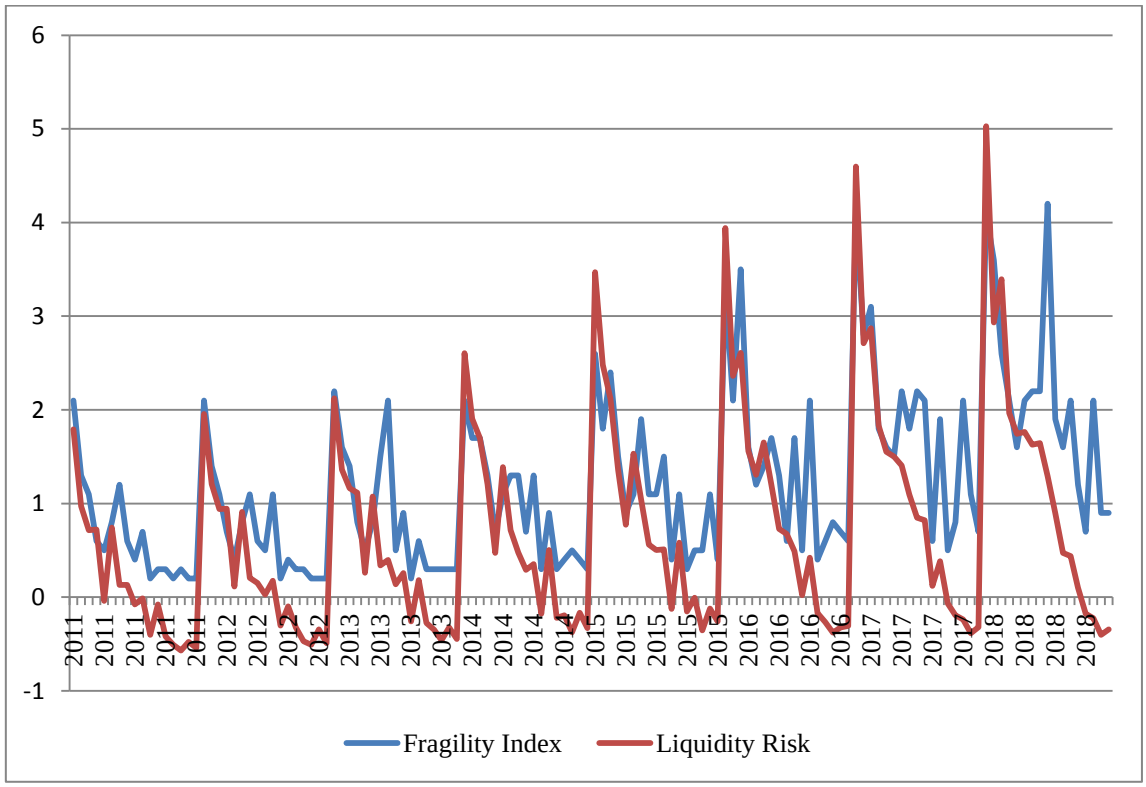

Figure A. 2: Trend for Liquidity Risk against the Fragility Index from 2011 to 2018

Source: Researcher (2019)

Figure A.3 shows the foreign exchange risk trend against the fragility index for 17 commercial banks from the year 2011 to 2018. The trend line indicates that foreign exchange risk indicator has been on an increasing trend and thus the increase of fragility index.

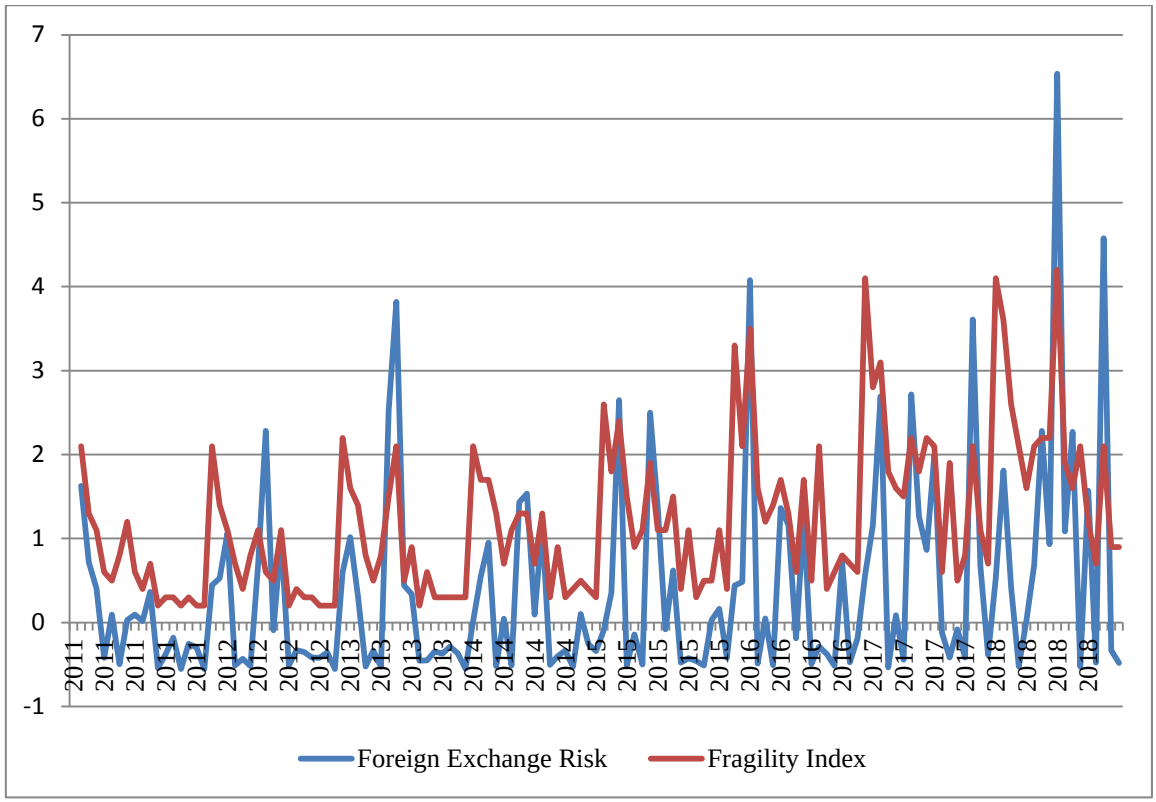

Figure A. 3 : Trend for Foreign Exchange Risk against the Fragility Index from 2011 to 2018

Source: Researcher (2019)

Figure A.4 shows the operating efficiency trend against the fragility index for 17 commercial banks from the year 2011 to 2018.

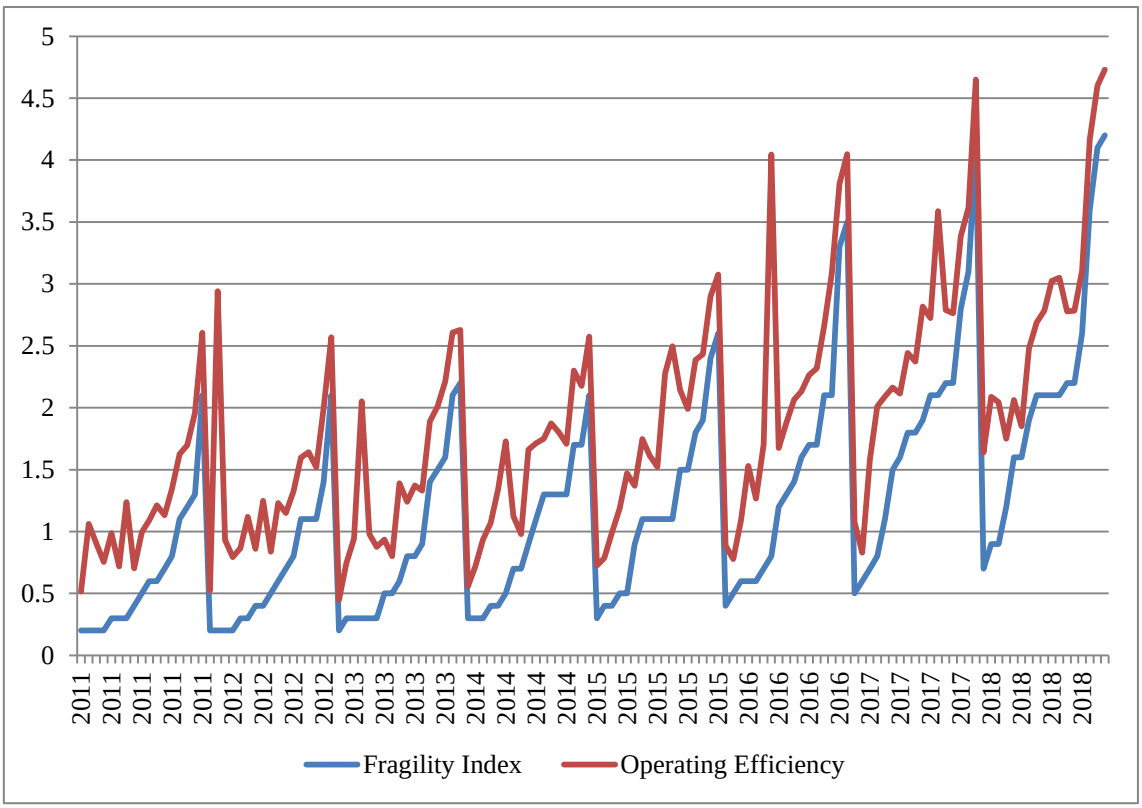

Figure A. 4: Trend for Operating Efficiency against the Fragility Index from 2011 to 2018

Source: Researcher (2019)

Figure A.5 shows the capital adequacy trend against the fragility index for 17 commercial banks from the year 2011 to 2018. The trends line shows the movement of capital adequacy vis-à-vis the fragility index as the proxy to the dependent variables.

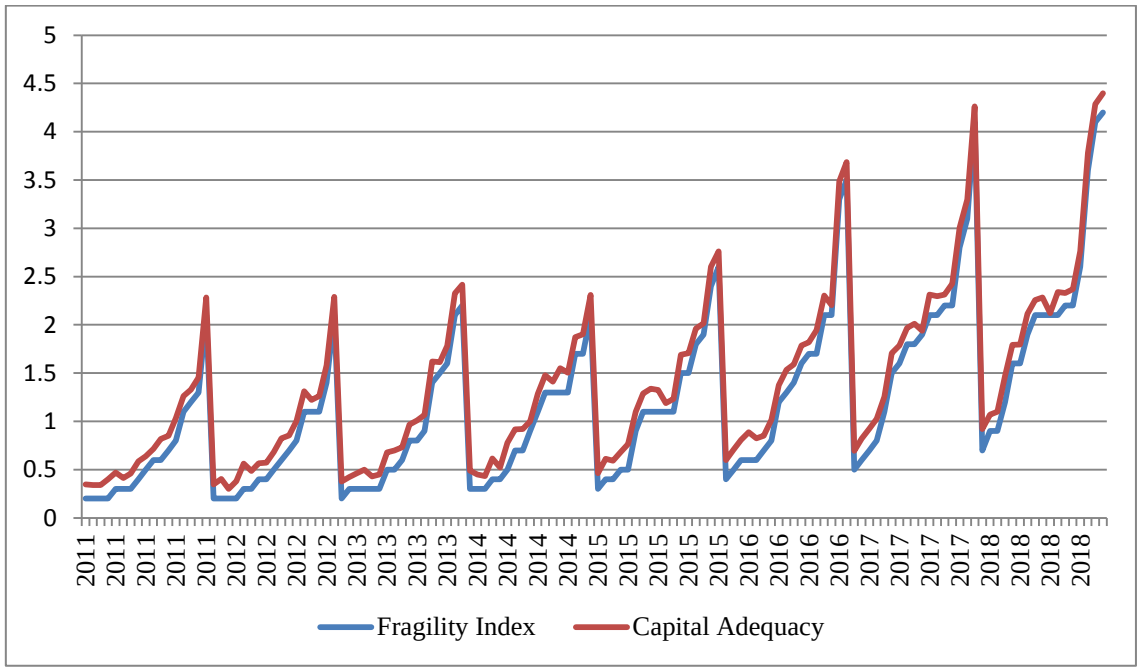

Figure A. 5: Trend for Capital Adequacy against the Fragility Index from 2011 to 2018

Source: Researcher (2019)

Figure A.6 shows the bank liquidity trend against the fragility index for 17 commercial banks from the year 2011 to 2018.

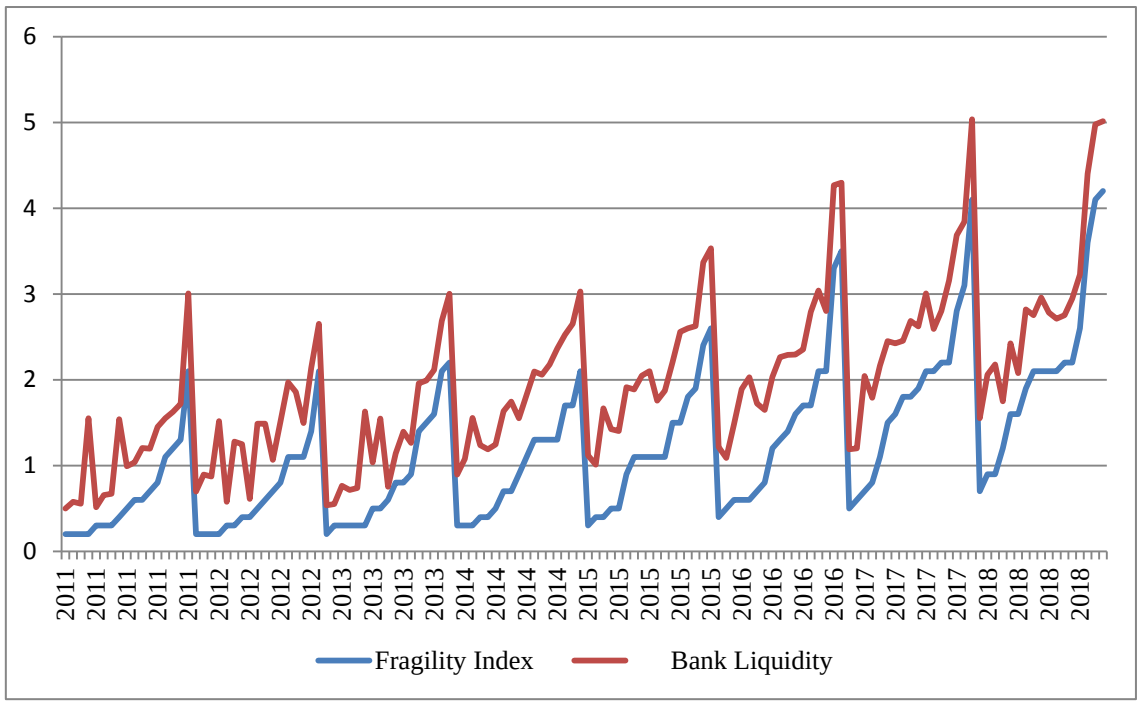

Figure A. 6: Trend for Bank Liquidity against the Fragility Index from 2011 to 2018

Source: Researcher (2019)

Figure A.7 shows the profitability trend against the fragility index for 17 commercial banks from the year 2011 to 2018.

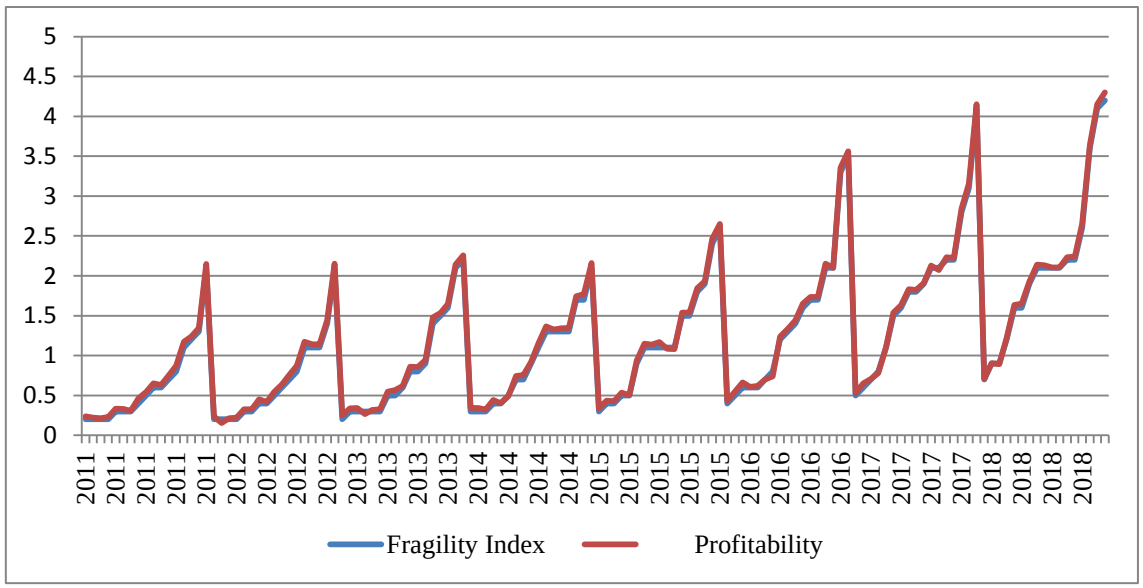

Figure A. 7: Trend for Profitability against the Fragility Index from 2011 to 2018

Source: Researcher (2019)

Figure A.8 shows the asset quality trend against the fragility index for 17 commercial banks from the year 2011 to 2018.

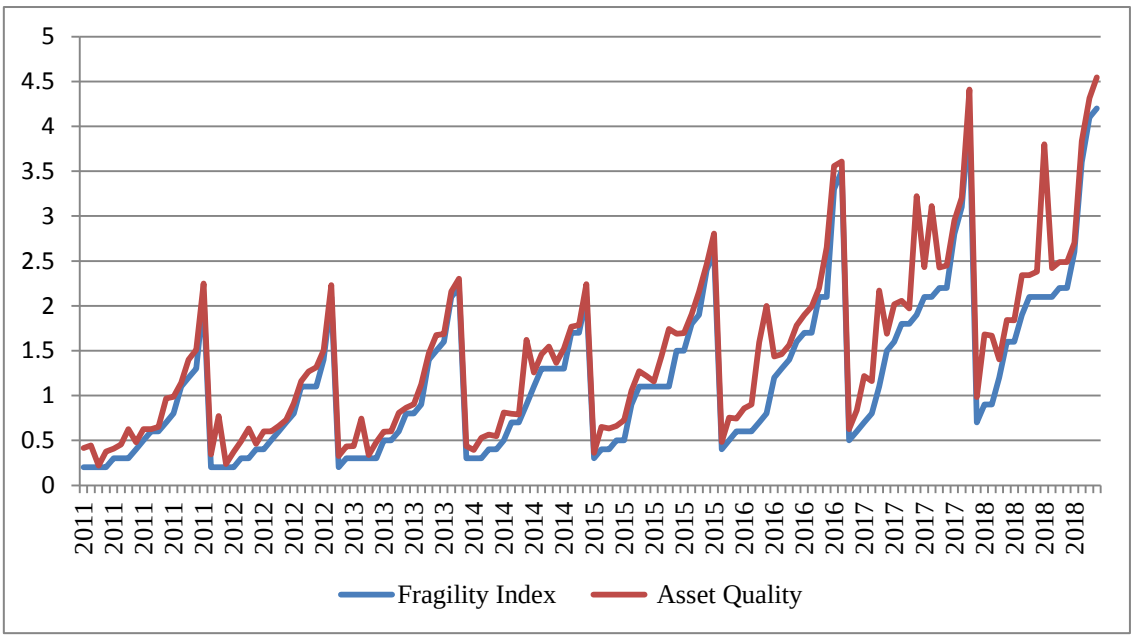

Figure A. 8: Trend for Asset Quality against the Fragility Index from 2011 to 2018

Source: Researcher (2019)