THE UNIVERSITY OF HULL

Stock Markets, Financial Development and Economic Growth in Sub-Saharan Africa

---

A Thesis submitted for the Degree of Doctor of Philosophy in Economics at the University of Hull

By

Seif R. Muba

Bachelor of Accounting and Finance (Mzumbe University, Tanzania)

MSc. BA-Finance, Banking & Insurance (VU University, the Netherlands)

23rd September 2016

DEDICATION

To

My lovely daughter ***Fadya Seif Muba***

ACKNOWLEDGEMENT

First and foremost, I would like to thank the Almighty Allah (SWT) for His Continued Mercy and blessing that made it possible for me to complete this PhD project successfully. My heartfelt thanks goes to my sponsor, Mzumbe University for giving me this special opportunity to widen my knowledge in research. I would like to express my sincere gratitude to my supervisor Dr Raymond Swaray for the continuous guidance, advice, and support of my PhD study for his patience, inspiration, and immense knowledge. His tireless guidance motivated me in all the time of research and writing of this thesis. For sure, I could not have imagined having a better supervisor and advisor for my PhD project. I am enormously indebted to him, as I have learnt a lot from him; may the Almighty God bless him and his family. Besides my first supervisor, I would like to thank my second supervisor Dr Steve Trotter for his help and support during this PhD project. His insightful comments and encouragement have contributed a lot to this work. My sincere thanks also goes to Professor Andrew Abbott who provided me an opportunity to visit his office and having one to one discussions, which enthused me to widen my research skills from various perspectives.

My sincere appreciation goes to my mother, Rehema Mohammed and of course, my late father, Ramadhani Muba who passed away 16 years ago but he always pushed me to work hard, may his soul rest in perfect peace, amen. I would also like to thank my sisters and brothers for their continued prayers and support. I would like to register my special appreciation and heartfelt gratitude to my dearest wife, Fatuma Juma for her tremendous support, sacrifice, and prayers. My special thanks also goes to my only daughter Fadya. Certainly, there was times that I missed you, but that pushed me forward and gave me strength to work even harder. I am also grateful to the Hull University Business School (HUBS) for the support and research facilities through which, this project was able to be conducted successfully. Without their precious support, it would not be possible to complete this project.

Last but not the least; I would like to thank my colleagues; Dr G. Komba, J. Kiria, Dr C. Mbogela, and Dr A. Mwakibete, Dr L. Mbwilo, Dr R. Tweheyo, Dr B. Kisawike, and S. Mlekela, Fr. Kizito, Dr M. Alolo, Dr G. Nyamrunda and Mato Magobe. I thank you all for the stimulating discussions, for the sleepless nights we were working together before deadlines, and for all the fun we have had in the last five years. Many of you completed some months before me, I, therefore, used that situation as a motivation to wake up and work hard to attain the successful you have achieved. Here I am, thank you all.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ABSTRACT

In general, this study examines the Stock Market, Financial Development and Economic Growth in selected sub-Sahara African countries. Empirically, Chapter Two of the study used Generalised Method of Moment (GMM) dynamic instrumental variable approach to investigate financial development and economic growth nexus in the East African countries. Also, the study applied both Fixed Effect Estimation (FEM) techniques and Panel vector autoregressive (PVAR) to analyse the causal effects of equity market development on economic growth in eleven sub-Sahara African countries, in Chapter Three of this study. On the other hand, Chapter Four of this study measures the conditional variance (volatility) of the stock returns of Tanzanian stock market (Dar-es-Salaam Stock Exchange). For modelling stock market return volatility, we use both standard and asymmetric GARCH models to capture the volatility clustering and asymmetric features in the financial data of the companies selected.

To attain the objectives of all three empirical chapters highlighted above, this study had to consider various important and necessary tests; such as tests for unit root, to check if the expected variables were stationary, and tests for cointegration to check whether there was a long-run equilibrium relationship between variables under study in Chapter Two and Chapter Three. However, in Chapter Four (modelling volatility) we tested for an additional ARCH effects apart from stationarity (unit root) tests we have had. Specifically, this study found that there is causal relationship between financial development (when presented by indicator domestic credit to private sector) and economic growth in the East African countries (EAC). Also, we found that the domestic credit to private sector as an indicator for financial development has a role to play in economic growth of EAC.

Moreover, we find that there is unidirectional Granger causality, which flows from equity market development (using indicator market capitalization rate-MCR) to economic growth of the panel of 11 sub-Sahara African countries. We also declare that stock market development via MCR play a positive role in SSA economic growth. In addition, the study reveals that there is existence of leverage effects in Tanzanian stock market, therefore, the bad news (negative shocks) reflect an increase in the conditional variance (volatility) of DSE stock returns for the next period than the good news. However, we find that the volatility clustering exists in Tanzanian stock market returns.

CHAPTER 1: INTRODUCTION

1.1 Overview of Financial Markets in Sub-Saharan Africa

This study encompasses three empirical research studies that were conducted in Sub-Saharan Africa. The first study is on Financial Development and Economic Growth nexus in the East African countries. The second study is about the causal effect of Sub-Sahara African Equity Markets on Economic Growth of 11 countries: Kenya, Tanzania, Uganda, Botswana, Zambia, Zimbabwe, Nigeria, Ghana, Namibia, Swaziland, and Mauritius. The third one dealt with modelling stock market volatility in Tanzania, using various GARCH-type models. It can be seen that the three empirical studies included in this research, are all about Financial Markets (i.e. Capital Markets and Money Markets). The capital market is addressed in the study of stock market development (see Chapter Three) and stock market volatility (see Chapter Four). The Money Market is concerned in the study of 'Financial Development' into Chapter Two of this thesis.

Financial Markets are markets (not necessarily physical places) in which people (buyers and sellers) from different locations in the world transact financial securities (stocks and bonds), money (foreign currencies), derivatives and other commodities (such as agriculture products) at stated prices that are reflected by the forces of demand and supply of the market. The financial markets incorporate not only a very wide and persistent development, but also a delimited number of formal and informal institutions whose purpose is to facilitate the trade in financial assets (Bailey, 2005). In addition, especially in the financial sector, the Financial Markets are the places that investors/corporations might use to raise long-term capital (i.e. through a capital market) or short-term capital (i.e. through money markets). Most of the time, the financial markets are used to attract funds from different investors and allocate them into various corporations to finance their operations for growth purposes. Therefore, it can be seen that the term financial markets encompass all the said markets, which are present in the financial sector: capital markets (stock markets and bond markets), commodity markets, money markets, derivatives markets, future markets, insurance markets and foreign exchange markets.

Over the past few decades, the financial markets have been extremely active all over the world. This includes the financial markets of sub-Saharan Africa, which began to take off due to the increase of the pitch in the world financial markets. The trends and patterns of banking development as well as that of stock market development in Sub-Saharan Africa have now received attention. Financial market development in sub-Saharan Africa provides assurance and forward markets, which will minimise the high-risk environment of the countries, and add to the collection of liquid assets rather than illiquid assets in sub-Saharan African countries. Financial markets in sub-Saharan Africa will also reduce common price shocks and the negative impact of policy reforms. That is why the operation of financial intermediation is found to have a wide scope in the global financial markets (Collier & Gunning, 1997).

In global economic growth, it is said that the African continent has yet to play a big role, although the potential exists. However, some of the world fastest growing economies are found in Sub-Saharan Africa (IMF, 2008). The World Bank reports that between 1995 and 2013, the economy of Sub-Saharan Africa grew at 4.5% per annum on average. The region has positive medium-term prospects, with a projected increase in GDP growth to 5.4% in 2015 from 5.2% and 4.7% in 2014 and 2013 respectively. In 2013, SSA saw the increase of the investments, which was promoted by the volume of domestic demand. Moreover, during the same year, the net foreign direct investment (FDI) in SSA increased by 16% to reach US$43 billion. Nevertheless, despite the promising achievements stated above, Sub-Sahara African countries' economic growth is still uneven. Generally, many Sub-Sahara African countries face problems that limit investment, such as poor infrastructure, lack of a good business environment (poor and outdated business laws and regulations), difficulties in accessing financial capital, inflexible and complex tax policy, and instability and high rated risks caused by frequent conflicts.

According to the African Financial Markets Initiative 2014 yearly report[1], the increase in growth rate from 3.9% in 2014 to 4.5% in 2015 has made Africa the fastest growing continent in the world. Therefore, in order to maintain this growth, Africa (particularly Sub-Saharan Africa) needs to mobilize further financial markets that will provide the large-scale means of access to finance. Despite the fact that financial services are much required in sub-Saharan Africa, the financial systems still do not operate properly, since they are basic, simple and under-developed. This may be caused by these reasons; first, financial repression in sub-Saharan Africa and Africa as a whole; second, lack of financial integration of the informal

[1] See (AFMI, 2015) Accessed on 04th March 2016.

sector with the main financial systems of the countries; third, the high cost of processing financial intermediation in sub-Saharan Africa; fourth, some factors inherited from colonialism; fifth, the induced policies by the countries in Sub-Saharan Africa, and last, the common weak institutions in Sub-Saharan Africa (Adenikinju & Oyeranti, 1999).

The financial sector in Sub-Saharan Africa is characterised by two sectors, known as the formal and informal financial markets. The formal financial markets are both banks and non-bank financial intermediation that follow financial credits, rules and regulations of the particular country; while the informal financial markets are those that perform their operations without following countries' rules, regulations and controls. However, the most important and essential financial credit market in Sub-Saharan Africa is the informal market; as it is accessible, popular, oriented to basic needs, flexible and characterised by socio-cultural integration at both local and regional levels. However, in the formal financial market; the financial institutions are fragmented in various terms such as economic activities, institutions source of funding and asset holdings (Berger & Udell, 1998).

In Africa, and particularly Sub-Sahara Africa, the formal financial markets have grown from the last two decades. The major development in formal financial markets was brought by the creation of number of capital and money markets in Africa, which have seen number of African countries establishing stock markets to reach 29 active stock markets in 2014, from just 18 stock markets in 2002. Also the IMF (2008) reports that the market capitalization of African stock markets has more than doubled the figures from $113 in 1992 to $245 in 2002. Moreover, the growth of formal financial markets in Africa particularly Sub-Saharan Africa is certainly influenced by other institutional development such as banking sector. The increased international banks and cross-border banks (European Banks) and Pan-African Banks in Africa, between 2002 to 2014 have also shown the growth of formal financial sector in SSA[2]. The growth of informal financial markets in Africa is observed by the availability of significant efforts to discuss the regulatory system of the informal financial institutions/agents. They have been given licenses to operate, so as to be recognized by the laws in their respective countries; also, the increased numbers of informal financial operators indicate that services are still important and demanded, this has led to formal financial sectors beginning to focus their attention to linking up with them in most of Sub-Sahara African countries (Aryeetey, 2003).

[2] See a Report by European Investment Bank 'Recent Trends in Banking in Sub-Saharan Africa: From Financing to Investment' (2015)

However, both formal and informal financial markets have their own particular advantage and disadvantage features (see Table 1.1 below). Starting with formal financial markets; they are modern and can be attained by local and international financing institutions, and have access to other supporting institutions. These benefits cannot be found in informal financial markets. However, on the other side of the coin, the scope of coverage of formal financial markets is restricted to a small proportion of the population of a particular country. In contrast, with informal financial markets, the accessibility is high, the organizations are flexible, and they are adopted to the local level as highlighted earlier, something that is not found in the formal financial markets. Financial institutions in the formal financial market are segmented in accordance with prevailing economic activities, asset holdings and sources of funding (Adenikinju & Oyeranti, 1999). Good examples of these segmentations are (a) short-term loans are dealt by commercial banks, (b) residential and commercial constructions are funded by mortgage banks, and (c) long-term loans are provided by development banks.

Table 1.1: Characteristics of African's Formal and Informal Financial Markets

Formal Financial Market	**Informal Financial Markets**
High fixed, low variable cost	No fixed, but high variable costs
Highly structured	Relatively flexible
Controlled by legal systems	Uncontrolled by legal systems
High degree of security	Low degree of security
High in static efficiency	High in dynamic efficiency
Broad spatial resource base	Narrow spatial resource base
Well defined and Impersonal	Poorly defined and Personal
Emphasis on private property rights	Emphasis on communal property rights
Use of bank accounts and currency	Use of currency and physical goods
Complex organization and Large transactions	Simple organization and Small transactions
Profit-motivated in general and Economic focus	Security motivated and High social content in focus

Source: see Adenikinju and Oyeranti, 1999.

Referring to four Sub-Sahara African countries of Ghana, Malawi, Nigeria and Tanzania; Aryeetey et al. (1997) pointed out important features of the informal financial sector in Africa. These are; (a) the documentation involved in financial transactions is not legal, (b) first-hand information on the borrowers can be used as the basis of the lending decisions, (c) there is no

classification of risks, (d) the requirements for collateral security are more flexible, (e) the flow of finance from formal markets to informal markets is negligible, (f) savings mobility and profits reinvested are always limited by the sources of loanable funds, (g) interest rates are fluctuating, (h) rates of default and misbehaviour are very low, (i) the costs of screening, monitoring and contract enforcement make the costs of credit administration very low, (j) the ability to obtain credit from more than one institute can benefit informal clients, (k) since clients' ability to pay is pre-monitored by informal lenders, automatically the cost of funds is low as they do not monitor how funds will be used.

High concentration of the assets in the low end of the market and the occurrence of non-performing loans are the characteristics found in many African countries (Nissanke & Aryeetey, 2003). The banking system may face volatility increase and government policies be weakened (for instance, the behaviour of monetary policy) due to information asymmetry and implementation problems; and these problems may cause financial distress that will later result in adverse selection where banks attract unreasonably high risk and corporations that are not strong. The level of financial market development across Sub-Saharan African countries is characterized by a wide discrepancy.

For example, in their study of financial integration and economic growth in the region (Sub-Saharan Africa), Egbetunde and Akinlo (2014) found that both financial integration and financial development had significant but negative impact on economic growth. They further analysed that the significant and negative impact of both financial integration and financial development on economic growth in sub-Saharan Africa, indicates that the region's financial markets are not appropriately structured to be able to develop and promote economic growth of SSA. They indicate that government effectiveness as measured by institutional quality, also has significant but negative impact on the economic growth of sub-Saharan Africa.

In addition, they revealed that in SSA, institutional quality – government effectiveness has a low association with the economic growth; hence, ineffective government impede economic growth in many Sub-Sahara African countries. Using rule of law as measured by institutional quality to estimate its impact on economic growth (Egbetunde & Akinlo, 2014), they found that the rule of law is associated with a minimal economic growth in sub-Saharan Africa. They conclude that the region (SSA) has weak judicial systems and may not offer adequate protection of the property rights; this may discourage heavy investments in SSA from both local and foreign investors, resulting in lower contribution of financial markets to economic growth.

1.2 The Performance of Capital Markets in SSA

The basic function of the capital markets is the allocation of share equities or bonds (capital ownership) (Malkiel & Fama, 1970). They go further to explain that the capital market is a market whereby the resource allocations are decided by the agreed prices; meaning that the decisions on the production-investment can be made by the corporations/firms, and the investors can make their decisions on the capital ownership to trade under the assumption that the security prices always reflect the available market information. This is termed an 'efficient capital market'. The development of capital markets is vital to the growth of the world economy, since economic outputs are generated by the availability of capital.

The operation of capital markets in Africa and particularly Sub-Saharan Africa is very crucial for the economic development of the region. Also, it is important to individual and corporate investors, as who expect positive returns on their equities and bonds investments. Capital Markets can be segmented into Equity Markets, where stocks are traded, and Bond Markets, where bonds are traded. In this section, the discussion is confined to the performance of Bond Markets in selected Sub-Sahara African countries. The performance of Equity Markets in Sub-Sahara Africa is discussed in **Chapter Three** of this study (see section 3.3; Sub-Sahara African Stock Markets: Their Determinants Developments and Trends), so it is not considered in this section of the chapter.

For any Sub-Sahara African country to enter into sustainable development, which is motivated by efficient allocation of capital, it is essential to develop not only deep but also liquid bond markets. However, this type of capital market (bond markets) is said to be largely underdeveloped, thin, with non-existent of corporate bond markets in some SSA countries, while they are still in the establishment stage in other SSA countries (AFMI, 2015). African Financial Markets Initiative has indicated the critical factors for such underdevelopment of bond markets in Africa. These are the absence of both operating and institutional infrastructure, lack of adequate liquidity, narrow investor and issuer bases, and availability of short maturities and high borrowing costs.

In Sub-Sahara Africa, South Africa, accounts for almost 96% of bond turnover, making it the largest bond market in Africa as a whole (AFMI, 2015). The bond markets in other parts of Sub-Saharan Africa are insignificant. For example, in 2005, the total value of bonds traded in South Africa was 8.04 bill $, though this was the lowest ever in 10 years from 2005 to 2014; while in the same year, only Nigeria traded above 1 bill $ (1.36), while the value of bonds

traded by other SSA countries was very low (with Kenya recording the lowest) (see Table 1.2). Moreover, in 2010, South Africa recorded the highest value ever of bonds traded in Sub-Saharan Africa with 27.18 billion US$, while Swaziland recorded the lowest value of bonds traded, at 0.06 billion US$. Evidence shows that in every year from 2005 to 2014, South Africa far outstripped all other Sub-Sahara African countries in bond markets (see Appendix 1a).

Table 1.2: Total Value of Bonds Traded (Billion US$)

Countries	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
S. Africa	8.04	9.00	8.22	14.59	18.90	27.18	25.41	20.79	16.54	14.01
Botswana	-	-	-	0.21	0.11	0.19	0.24	0.08	0.14	0.07
Ghana	0.47	1.10	1.88	0.52	0.69	2.37	2.49	3.21	3.35	1.32
Kenya	0.10	0.62	1.04	0.52	1.81	2.29	1.79	2.00	3.00	2.31
Mauritius	0.29	0.46	0.65	0.68	0.65	0.81	0.91	1.06	0.85	1.14
Namibia	0.24	0.15	0.03	0.10	0.08	0.15	0.30	0.30	0.17	0.35
Nigeria	1.36	3.49	4.80	4.17	5.06	8.40	5.58	6.15	6.04	5.93
Swaziland	-	-	-	-	-	0.06	0.06	-	0.04	0.03
Tanzania	0.18	0.18	0.24	0.20	0.29	0.51	0.36	0.54	0.46	0.56
Uganda	0.19	0.20	0.38	0.28	0.26	0.45	0.47	0.56	0.75	0.87
Zambia	0.17	0.28	0.26	0.23	0.15	0.24	0.41	0.35	0.43	0.44

Sources: African Financial Markets Database (AFMD)[3]; 2016

Table 1.3 below highlights the total values of bonds traded as a percentage of GDP from 2005 to 2014. It can be seen that from 2005 to 2014 the bond traded value (% of GDP) in Mauritius was far larger than those of most other selected countries in Sub-Saharan Africa, and slightly higher than in South Africa and Ghana (see also Appendix 1b). Mauritius might be seen to outperform South Africa because of its GDP figure, which is relatively higher than that of South Africa (see Appendix 3f). However, as shown in Table 1.3 below, other countries like Botswana (0.54 percent), Nigeria (1.04 percent), Swaziland (0.77 percent), Tanzania (1.14 percent) and Zambia (1.43 percent) in 2014 had very low numbers, showing that their bond traded values were small relative to the size of the economies of their respective countries (see Appendix 1b). This shows that the level of trading in many Sub-Sahara African bond markets is very small, making it difficult to contribute on the market size of African bond markets.

[3] See (AFMI, 2016) Accessed 04th March 2016.

Table 1.3: Total Value of Bonds Traded (% of GDP)

Countries	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
S. Africa	3.26	3.45	2.87	5.34	6.66	7.24	6.10	5.23	4.52	4.21
Botswana	-	-	-	1.83	1.10	1.38	1.56	0.54	0.93	0.54
Ghana	2.63	5.39	7.61	1.86	2.70	7.35	6.30	7.65	6.89	3.95
Kenya	0.52	2.75	3.80	1.69	5.91	5.76	4.39	4.03	5.50	3.19
Mauritius	4.55	6.87	8.28	7.06	7.31	8.32	8.10	9.27	7.14	8.04
Namibia	3.33	1.87	0.39	1.08	0.91	1.30	2.40	2.31	1.31	2.97
Nigeria	1.12	2.40	2.69	1.97	2.89	2.28	1.35	1.33	1.17	1.08
Swaziland	-	-	-	-	-	1.65	1.47	-	0.96	0.77
Tanzania	1.26	1.25	1.42	0.97	1.35	1.69	1.11	1.41	1.04	1.14
Uganda	1.85	1.82	2.81	1.68	1.56	2.29	2.15	2.31	2.95	3.33
Zambia	2.43	2.60	2.22	1.55	1.16	1.19	1.74	1.40	1.61	1.43

Sources: African Financial Markets Database (AFMD); 2016

1.3 The Derivatives and Commodity Markets in SSA

Derivatives Markets perform various functions; derivatives through future contract or options can be applied for hedging purposes; they can insure the management of financial risk as the investors are allowed to transfer financial risks; they can be applied for speculation, especially in betting on an asset's future prices, and derivatives can also be used for avoiding problems with exchange rates. Generally, derivatives markets can facilitate efficient allocations of capital, international mobility of capital, portfolio diversification, transferability of risks, price discovery, and distribution of public information (Ilyina, 2004; Adelegan, 2009). All those functions can be achieved using the common forms of derivatives, which are future contracts, forward contracts, swaps, options and credit derivative (a loan sold at discount price or true value to a speculator). Due to the risks associated with different forms of derivatives, the investor needs not only to have awareness of the expected risks, but also to understand the investments' impact on portfolio strategies.

Derivatives markets can be used as an Insurance to investors against unpredictable capital flows in many Sub-Sahara African countries; while the Commodity Markets can provide motivational and strategical factors for participants of the markets. However, Domanski and Heath (2007) insist that the physical features of the markets (for instance, levels of inventory and marginal production costs) are very important. Commodity Derivatives Markets to some extent experience lack of liquidity and they hold short selling in the spot market; these two factors sometimes affect the dynamics of the market significantly. Generally, the African

continent is characterized by very thin financial markets and limited access to financial capital. Thin financial markets can easily be destabilized by unpredictable international capital flows, and normally if there is a change in investors' perceptions, such markets will easily be shocked by financial crisis. Therefore, there is a need for African financial markets (especially in Sub-Saharan Africa) to adopt strong domestic policies, for greater efficiency.

The local derivatives markets in SSA need to be developed to the extent that they would be able to provide both more access to finance and different ways to manage financial risks that arise to the local and international investors. In South Africa, for instance, the derivatives market is heading in the direction of providing increased access to finance to investors, providing alternative means of financial risk management, and has increased the financial market deepening and it is in a position to meet any international challenge (such as financial crisis) (Adelegan, 2009). Having reduced exchange controls and introduced a currency futures market, it has seen the development of its financial market. Other countries in Sub-Sahara Africa can learn from South Africa by imposing proper regulations and attaining supervisory capacity, which will ensure an increase of liquidity for the development of their thin financial markets.

One of the benefits of having derivatives markets in SSA is that they can be used as a source of finance to investors, so as to act as an alternative to bank credit, which is widely used source of finance to local investors in many Sub-Sahara African countries (Adelegan, 2009). To make this possible in Sub-Saharan Africa, derivatives market listings can be established in regional integration like the regional commodity exchange in Rwanda and countries in a common market of East African community (East African Exchange-EAX)[4]. This will mean that all those small economies in SSA with fine domestic security markets can list into a regional derivatives/commodity market, which their derivative instruments would be traded. By doing this, the integrated countries will see a special co-operation amongst themselves, as well as the decrease in operational costs.

Commodity Markets are physical or virtual places where buyers and sellers meet for trading raw (primary) products, which can be categorized into hard commodities, i.e. mined or extracted natural resources (such as oil, gold, rubber, just to name a few), and soft commodities, which may either be agricultural outputs or livestock products (such as coffee, wheat, sugar, cotton, cow, pork, just to name a few). It is said that the volume of physical products in the

[4] Apart from Rwanda, other countries in a common market of East African Community are Kenya, Burundi, Tanzania, and Uganda and South Sudan (the new entry in the community in 2016).

commodity markets is small compared with the financial activities that take place in the markets. For example, in 2005 the number of derivatives transactions was about 30% higher than the available physical products in the markets (Domanski & Heath, 2007).

In the Commodity Markets, the financial investors consider the commodities to be assets, like equities and bonds in Capital Markets. Therefore, the financial investment in commodity transactions should be taken as an important element in today's commodity trade (Creti et al., 2013). In many developing countries (commodity-dependent countries, including Sub-Saharan Africa), reforms through structural adjustment programme were implemented in the 1980s under the supervision of the World Bank and IMF; the primary commodity markets were based on primary agricultural products, since those countries were heavily dependent much on the agricultural sector to earn foreign currencies (Lukanima & Swaray, 2014). However, the Commodity Markets for primary commodities in Sub-Saharan Africa (SSA) is unsystematic, poor, and small and only controls the supply forces of the market, unlike the developed countries in Europe and North America, which control the demand forces (Swaray, 2002).

Since many Sub-Sahara African countries depend on agricultural products as their main source of income, commodity futures (commodity Exchanges) should have been introduced in SSA for the purposes of managing seasonal risks. This is because of the nature of agricultural products, which might be affected by the dynamics of the seasons throughout the year. Commodity markets instruments (Futures and Options) can be used as a means of sharing risks among investors (buyers and sellers), and as a source of attaining price guarantee. To attain all these benefits of commodity markets, African continent and particularly Sub-Saharan Africa established the commodity exchanges (nine commodities exchanges exist across SSA)[5] like many other stock exchanges that were established during the reform of financial sectors. If international investors increase their interest in investing in such commodities markets, this will promote market liquidity, as the volume of the market will increase, and hence, financial deepening in SSA's financial markets (Adelegan, 2009).

In Africa, there are 11 commodities exchanges, which almost all of them are found in sub-Saharan Africa (except the two, from Egypt and Madagascar); these are Africa Mercantile Exchange (Kenya), Agricultural Commodity Exchange for Africa (Malawi), Auction Holding Commodity Exchange (Malawi), Abuja Securities and Commodity Exchange (Nigeria), Bourse Africa (Mauritius), Egyptian Commodities Exchange (Egypt), East Africa Exchange

[5] Table 1.4 below provides the commodities exchanges, their locations and the commodity types that are offered in these markets, which are found in SSA.

(Rwanda), Ethiopia Commodity Exchange (Ethiopia), and Mercantile Exchange of Madagascar (Madagascar) and South African Futures Exchange (South Africa). The main commodities that are traded in these commodities exchanges in Africa include agricultural products, energy products and metals (see Table 1.4). For example, the regional commodity exchange of East African exchange (EAX), which offers commodity trading, was established in 2013 for the purpose of strengthening the regional integration among members of East African Community, by developing a common financial sector in agriculture, mining and energy. Benefits of this commodity exchange are; it connects the deprived farmers from rural areas to the financial markets, it provides financial product development to its participants, and it facilitates commodity trades both regionally and globally[6].

Table 1.4: Commodities Exchanges in Africa

Exchange/Market	Country	Types of Commodities
Africa Mercantile Exchange	Kenya	Agricultural and Energy
Agricultural Commodity Exchange for Africa	Malawi	Agricultural products
Auction Holding Commodity Exchange	Malawi	Agricultural products
Abuja Securities and Commodity Exchange	Nigeria	Agricultural products
Bourse Africa	Mauritius	Metals and Forex
East Africa Exchange	Rwanda	Agricultural products
Egyptian Commodities Exchange	Egypt	Agricultural and Energy
Ethiopia Commodity Exchange	Ethiopia	Agricultural products
Mercantile Exchange of Madagascar	Madagascar	Agricultural, Metals & Energy
Nairobi Coffee Exchange	Kenya	Coffee
South African Futures Exchange	S. Africa	Agricultural products

Source: African Securities Exchanges Association (ASEA, 2014)

[6]for more information on East Africa exchange (EAX) that trades through auction, spot and forward contracts, one can see (EAX, 2016)

Lukanima and Swaray (2014) show that before the Word Bank and IMF introduced reforms in the 1980s, the commodity dependent countries (including many countries in SSA) were having problems in both balance of payments and external debts in the 1970s and 1980s. In Sub-Sahara African countries, as examples of agricultural dependent countries, the control of the commodity markets was under the Governments. Liberalisation policies were emphasized during the reforms, and therefore, the commodity markets transformed from ones that were controlled by the government into liberalised markets. The purpose of this transformation was to increase efficiency in commodity markets and promote economic growth as a whole. According to Domanski and Heath (2007) the introduction of trading activities among investors in the commodity markets, which have reached a high volume, shows that the market liquidity determinants should be similar to the determinants of the usual financial markets.

1.4 The Foreign Exchange Markets in SSA

Foreign Exchange Markets have unique features that distinguish them from other financial markets (Sarno & Taylor, 2001). First, they are decentralized financial markets and therefore the market size (trading volume or liquidity) is extremely large compared with other financial markets. According to Sarno and Taylor (2001) a decentralized financial market refers to a market whose participants (sellers, brokers and buyers) are not physically connected to each other, but telephones or computer networks are used to process the transactions between parties. Second, they can be centralized financial markets in which a publicly announced price facilitates trade, and where common trading opportunities are faced by all traders/participants in the market (foreign exchange auction markets)[7]. Third, a big part of the market size (trading volume/liquidity) in the Foreign Exchange Market is derived from trading with forward contracts. According to Sarno and Taylor (2001) the Foreign Exchange Market is said to be the largest and efficient financial market in the world (Sarno and Taylor, 2001). This is due to the fact that the liquidity (due to the greater volume of trading) of the Foreign Exchange Market is higher compared with other financial markets, as well as its global network formation, which links participants (buyers, sellers and intermediary) from different countries in the world.

Sub-Saharan Africa saw the introduction of two types of foreign exchange markets (decentralized markets and centralized markets)[8] in the 1980s and 1990s, with the sole purpose of eradicating the parallel market and achieving unification of multiple foreign exchange markets. According to Aron and Elbadawi (1994) the unification concept in Sub-Saharan

[7] See also (Aron & Elbadawi, 1994)
[8] See also (Sarno & Taylor, 2001)

Africa as far as foreign exchange is concerned, encompassed a substantial eradication of the parallel market[9] so that it would not be a major signal in SSA's economy. It was by then accepted that both the '*unification of multiple markets*' in exchange rates and the '*integration of the parallel market*' into the regular economy were to be the main policy purpose when reforming countries in the African continent. However, to achieve and sustain the unification of exchange rates, was found to be an attainable goal. Aron and Elbadawi (1994) suggest that to eradicate the parallel market fully might be impossible as SSA countries that wanted to unify the exchange rates were likely to maintain control of capital in the medium term, which would allow the parallel market to play a small role to meet portfolio demand.

The decentralized foreign exchange markets included all interbank markets in foreign currency, which in Sub-Saharan Africa involved Gambia, Ghana, Nigeria, Zaire (now known as DR Congo), Sierra Leone and Uganda. The centralized foreign exchange markets were known for the innovative use of auction markets in foreign exchange, which in Sub-Saharan Africa involved Ethiopia (1993-), Ghana (1986-1992), Guinea (1986-), Nigeria (1986-1994), Sierra Leone (1982-1983), and Zambia (1985-1987) and Uganda (1982-1985) (Aron & Elbadawi, 1994). The centralized auction markets in SSA were found to have more advantages compared with decentralized interbank markets, because of the availability of few commercial banks that were dominant in SSA at that time; danger of collusion, especially when there were inadequate sources of foreign exchange, the presence of macroeconomic imbalances among countries, and the basic nature of the banking system. All these made the unification of foreign exchange markets a strong success factor for SSA, whereby their main objective was as a transitional medium into what is known as a unified interbank market.

Recently, there have been several constraints on the deepening and widening of interbank foreign exchange markets in Sub-Saharan Africa. First, the bulk of foreign exchange transactions are still controlled by a few financial institutions (commercial banks), resulting in market concentration. Second, the depth and efficiency of the markets are limited by poor foreign exchange regulations. Third, the interbank rules require foreign exchange participants to trade only with customers rather than among themselves. Fourth, foreign exchange auction markets not only lack transparency but also are uncommon or rare. Fifth, the processing costs in formal markets are very high (this may contribute to the development of parallel markets) in some countries. Sixth, there is a lack of clarity on the main purposes of central bank

[9] The parallel market premium in many countries of SSA contained a major signal in the economy reflecting incredible policy, so as to influence both short-run and long-run economic decisions.

intervention in foreign exchange (such as in managing liquidity, ironing volatility for excess in the short-run and/or targeting the exchange rate) (Pattillo et al., 2006).

The central banks of SSA countries face a lot of problems from intervention policies in foreign exchange markets, because of a lack of deep, efficient and liquid foreign exchange markets in SSA. Although many of the countries in SSA have shifted to flexible exchange rate regimes, the outcomes have seen both volatility in short-run nominal exchange rate and patterns of market intervention from the central banks, which was found to be the norm in many of SSA countries. Such interventions restrict the transmission of market forces to official rates; they usually cause flexible exchange rate regimes to stay close to fixed rate regimes. Sub-Saharan Africa is a region with a large number of low-income countries, where inadequate and inefficient financial markets restrict domestic companies from hedging against temporary exchange rate exposure. This has been found to be the biggest impediment to a free-floating exchange rate system in most countries with low income (Montiel, 2011).

1.5 Objectives and Contributions of the Study

1.5.2 Objectives of the Study

The main objective of this study is reflected by its title, which is '*The Stock Market, Financial Development, and Economic Growth in Sub-Sahara African Countries*'. However, specifically the study was intended to attain the following objectives:

1. To examine the causal relationship between financial development and economic growth in East African Countries. To achieve this objective, the researcher applies the GMM-Dynamic Panel Data Approach (Arellano & Bover, 1995) as a research method. Data on GDP per capita growth is used to represent economic growth, and financial development is represented by the data on money supply (M2), domestic credit provided by the banking sector (DCPBS), and domestic credit to the private sector (DCPS) in five East African countries (Burundi, Kenya, Rwanda, Tanzania and Uganda).

2. To empirically determine the effects of Equity Market development on economic growth in 11 Sub-Sahara African countries. This objective is attained by using the Fixed Effects Model (FEM), while for the causal relationship between the two, the Panel Vector Autoregressive (PVAR) (Love & Zicchino, 2006) tests was used. The economic growth was represented by GDP per capita growth and Equity market

development was indicated by market capitalization percentage to GDP (MCR), stock traded value percentage to GDP (STR) and Stock traded-turnover ratio (TVR) to measure the size, liquidity and efficiency of the 11 Sub-Sahara African stock markets respectively.

3. To measure the volatility of Stock Return data for Dar-es-Salaam Stock Exchange (Tanzanian Stock Market). Both the Symmetric (simple GARCH) and Asymmetric GARCH formulations, which are the Exponential GARCH (EGARCH) model (Nelson; 1991), the GJR-GARCH model (Glosten et al; 1993) and the Power ARCH (PARCH) model (Ding et al; 1993) were applied to achieve this objective. The data used in this part comprises 2701 daily observations of Company Share Index from Dar-es-Salaam Stock Exchange in Tanzania.

1.5.3 Contributions of the Study

In studying financial development, equity market development and economic growth in Sub-Sahara African countries, the researcher considers each objective highlighted above to have its own contributions to the body of knowledge and the countries that were included in this study. Therefore, the following should be considered as the contributions of the study for each objective of the study:

***On the Financial Development and Economic Growth nexus in East African Countries (Burundi, Kenya, Rwanda, and Tanzania and Uganda)*:**

1. The findings of this study contribute to the body of knowledge by showing the results in the '**Regional Dataset**' of the conflicting debate of existence of a long-run relationship between financial development and economic growth in the East African Community (EAC)). Unlike previous studies (see Table 2.1) that included either one or more than one country from East Africa but not all together, this study provides new regional (East African countries) empirical evidence to the conflicting literature.
2. Table 2.1 shows that there have been various empirical studies conducted on the relationship between financial development and economic growth for Burundi, Kenya, Rwanda and Tanzania, but none has studied the case of Uganda. Therefore, this study fills this lacuna by including Uganda for the first time; whereby, it was found that there is unidirectional causal relationship flowing from financial development (only with the

use of DCPBS) to economic growth (GDP per capita growth) in the Eastern Africa (Burundi, Kenya, Rwanda, Tanzania and Uganda).

3. Another contribution of the study to the body of knowledge is the new empirical evidence to the conflicting debate that the study confirms the existence of homogenous causality between financial development and economic growth in East African countries. The study used an approach that assumes the presence of individual coefficients (Dumitrescu Hurlin, 2012)/not common coefficients across East African countries.
4. The findings of this study are also inform policy makers on the ongoing establishment of the integration of East African Security Exchanges (EASE) and that of an East African Monetary Policy (on the use of single currency and establishment of East African central bank) to understand the strength and weaknesses available in the financial sector development towards the economic growth of their region.

***On the Effect of Equity Markets on Economic Growth of the selected Sub-Sahara African countries (Kenya, Tanzania, Uganda, Botswana, Zambia, Zimbabwe, Nigeria, Ghana, Namibia, Swaziland, and Mauritius)*:**

1. The study contributes by including Tanzania and Uganda for the very first time in the ongoing debate, therefore, to fill the gap of their exclusion in previous studies (from old previous studies such as King and Levine (1993a) to very recent studies such as Pradhan et al., (2015)) (see **Table 3.2**). These two countries' exclusions from previous studies may have been due to their maturity stage and lack of enough data. Therefore, the study introduces new empirical evidence to the literature that, with the inclusion of Tanzania and Uganda, however, there is no long-run equilibrium relationship between equity market development and economic growth, the development of market capitalization of SSA stock markets play a positive role in economic growth of these 11 Sub-Sahara African countries.
2. Most of previous studies were based on either developed countries or/and big emerging economies, while little research has concentrated wholly on sub-Saharan Africa (see Table 3.2). This study considers the characteristics of sub-Saharan African stock markets: they are quite new in origin (see Table 3.1), many are still small in size (see Table 3.4) compared with other emerging stock markets, have inadequate or low equity listed in the stock markets (see Appendix 3a), they are thin in trade with low stock

traded value (see Table 3.5), and they are extremely illiquid with low turnover ratios compared with other emerging markets (see Table 3.6).

3. The study contributes to the body of knowledge by providing new empirical evidence based on panel VAR approach in Sub-Saharan Africa, with inclusion of Tanzania and Uganda for the first time. The existence of unidirectional granger causality between equity market development and economic growth, flowing from the stock market capitalization indicator to economic growth (GDP per capita growth) is found. This Panel data technique gives more informative data, compared to many previous studies that used either a cross-sectional approach (King and Levine, 1993a and 1993b; Levine and Zervo, 1996; Levine and Zervo, 1998) or time-series approach (Odhiambo, 2009, 2008; Shahbaz et al., 2008; Nowbutsing, 2009).

On Modelling Stock Market Volatility in Tanzania using GARCH-Type Models:

1. The study on measuring the volatility of Stock return data for Dar-es-Salaam Stock Exchange (Tanzanian Stock Market) contributes to the existing literature by providing new empirical evidence on the fit of conditional volatility models for a very thin, small and relatively new market (DSE-Tanzanian Stock Market), whose investors are isolated from global developed stock markets, such that they are unable to diversify their portfolios into international markets. Hence, the results of this study will give another insight into thin stock markets with very few listed companies to the investors and modellers who deal with international financial markets, and will as well add empirical evidence to the studies on modelling, measuring, and forecasting volatility in the financial markets.

2. This study also employs very current stock return series using daily observations for the period from 2nd January 2005 to 31st December 2014, unlike other previous studies that used either monthly or annual data to model and forecast stock market volatility. The stock return data are described as very recent data that will give a true picture of what has recently been happening in the volatility of stock returns in the DSE – Tanzanian stock market. Therefore, the results of this study will help the investors and market participants to be aware of the possible risks related to volatility of stock returns in DSE, and therefore to learn how to manage those risks associated with volatility.

1.6 Organization of the Thesis

The thesis is divided into five chapters, of which four report empirical research work. The first chapter is an introductory chapter (*chapter one*), which gives an overview of financial markets in Sub-Saharan Africa (SSA), the performance of capital markets (equity and bond markets) in Sub-Saharan Africa, the derivatives & commodity markets in SSA and the foreign exchange markets in SSA. The objectives of the study are highlighted into this chapter, followed by the contribution of the study, which ends the chapter.

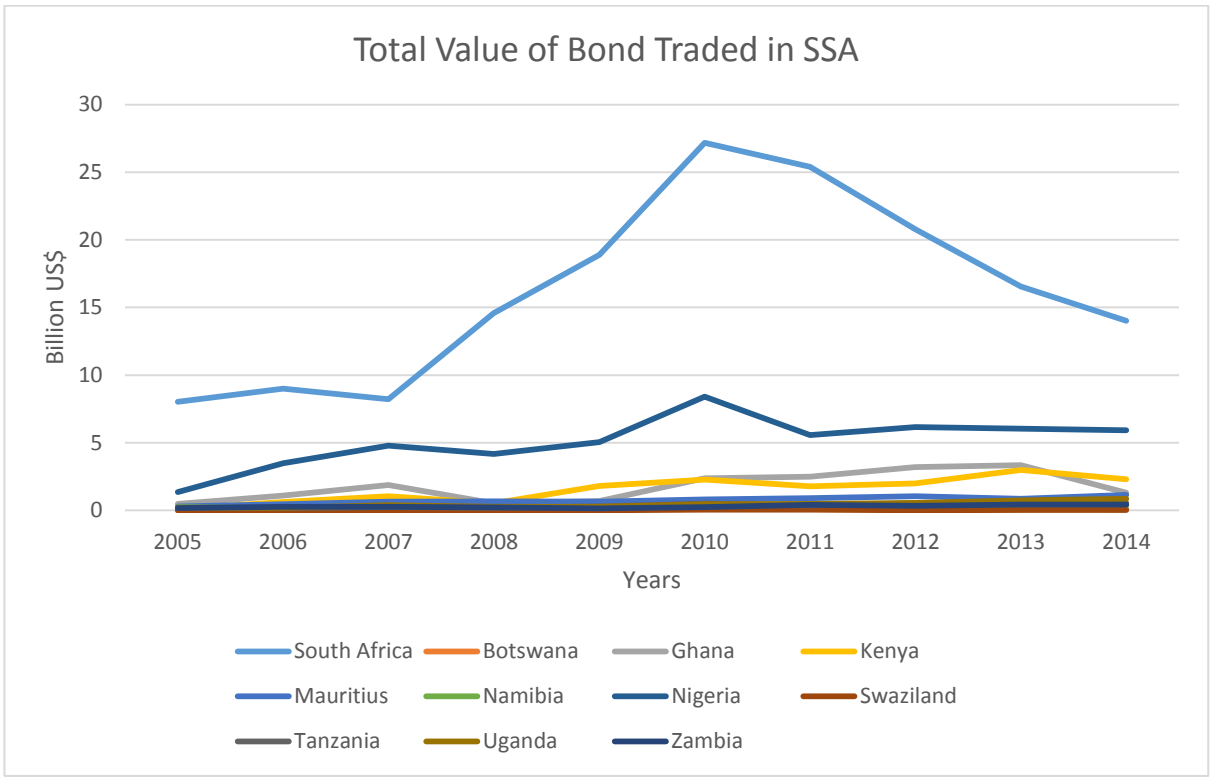
The empirical research work starts in the second chapter of the thesis (*Chapter Two*). The chapter examines financial development and economic growth nexus in East African countries. It also highlights the method used to estimate the results, which is the dynamic panel data estimation technique of Generalized Method of Moment (GMM) suggested by Arellano & Bover (1995) and Blundell and Bond (1998). In this study, the proxies for financial development that were used are; domestic credit provided by the banking sector, domestic credit to the private sector and money & quasi money (M2); while, the proxy for economic growth was GDP per capita.

Chapter Three of this thesis is another research work 'The Effect of Sub-Sahara African Equity Markets on Economic Growth: Empirical Evidence from Eleven Selected Countries'. In this chapter, the study considers whether, in a panel data of eleven selected countries in SSA, there is a long-run relationship between equity market development and economic growth, and if there is causal effect between the two. GDP per capita is used as a proxy for economic growth; while market capitalization, stock traded ratio, and turnover ratio are used as the proxies for stock market development. Unbalanced data for a maximum of 24 years and minimum of 11 years were collected from those eleven countries.

Chapter Four of this thesis is another empirical research that deals with 'Modelling Stock Market Return in Tanzania using the GARCH-Type Models'. In this empirical chapter, various asymmetric GARCH models are used to capture leverage effects, and the simple GARCH model is used to capture the symmetry (volatility clustering) in stock return series using daily and very recent observations for the period from 2nd January 2005 to 31st December 2014. Therefore, the results will have significant implications for investors in making rational decisions with their stock investment regarding the volatility trend of stock market returns. However, the conclusion, policy implication and limitations of the study are highlighted in chapter five of this thesis.

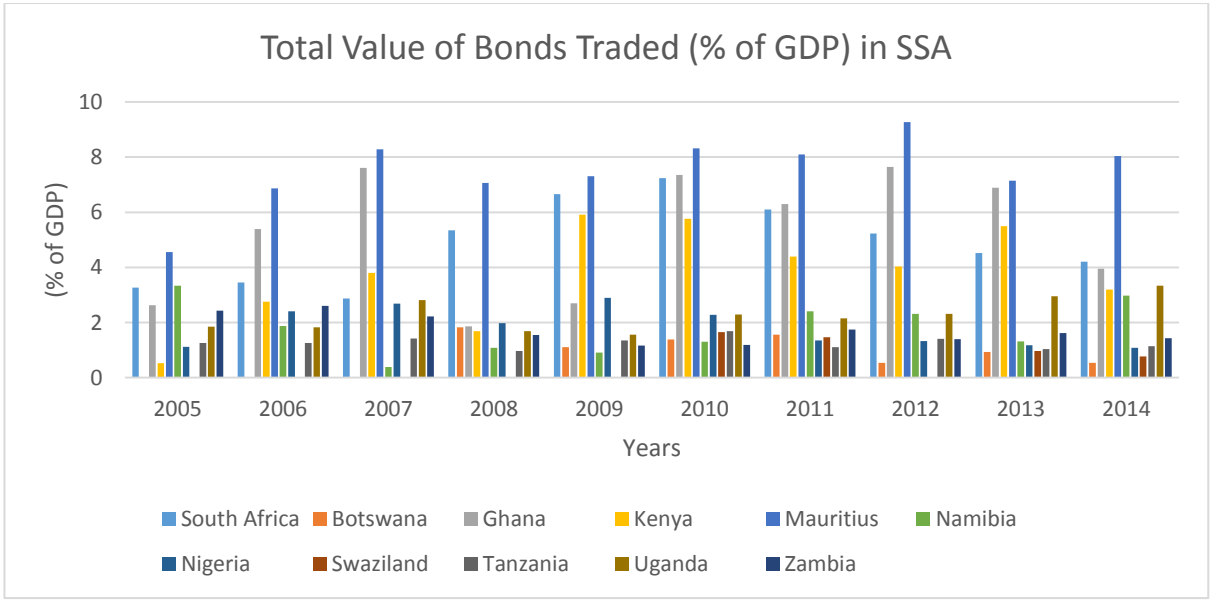
Appendix 1

Appendix 1a: Total Value of Bonds Traded (Billion US$) in SSA: From 2005 to 2014



Sources: African Financial Markets Initiatives (AFMI); 2013

Appendix 1b: Total Value of Bonds Traded (% of GDP) in SSA: From 2005 to 2014



Sources: African Financial Markets Initiatives (AFMI); 2013

CHAPTER 2: FINANCIAL DEVELOPMENT AND ECONOMIC GROWTH NEXUS IN EAST AFRICAN COUNTRIES: EVIDENCE FROM THE REGIONAL DATASET

2.1 Introduction

It has been almost a century since a relationship between financial development and economic growth brought into a debate. Theoretically, the history starts from the argument of Schumpeter (1912) as reported in the work of Enisan and Olufisayo (2009) that the savings of the society can be accessed through the firms that are selected by the financial intermediaries. In this view, Schumpeter was trying to show that if the financial intermediary is technologically innovative, then will be in a good position to accelerate the economic growth of a particular economy (Kwasnicki, 2007). In Schumpeterian Modelling, both technological innovation and economic growth can be facilitated by a well-developed financial intermediary that provides investors with financial services and resources available for investing in new products. Here Schumpeter shows that the financial sector is paramount for economic growth. If banks concentrate on identifying and financing investments that are productive, they will automatically be stimulating innovation and spur future economic growth. All the services given out by the banks are very important for technological innovation and future economic growth.

The Schumpeterian modelling was supported in most of previous studies of the 1990's, as most of the economists dedicated much of attention to study on the role of financial market development in economic growth. Most of these previous studies agreed that well managed financial intermediaries have a significant influence on economic growth (Levine, 1997; King and Levine, 1993b; Levine and Zervos, 1998). For instance, King and Levine (1993b) in their study argued that economic growth, capital accumulation and productivity improvement can be predicted by the level of financial intermediation. They added that the rate of technological innovation may be promoted by banks through selection of the entrepreneurs who have opportunities of establishing successful ventures.

Patrick (1966), provides two hypotheses on the relationship between financial development and economic growth, which are 'Supply-leading hypotheses' and 'Demand-following-hypotheses', showing that there are economies where it is financial development that spurs economic growth and the reverse is true in other economies. Patrick's (1966) hypothesis argues that the direction of causal relationship between financial development and economic growth

changes in relation to development. He went further to ascertain that financial development has an ability to induce real innovation for investment before the sustained economic growth gets an acceleration, and when economic growth starts accelerating, the stimulus of supply leading gradually becomes less and less important, and the financial response of demand-following becomes dominant. Thereafter, many theoretical and empirical conflicting views have been expressed by various economists on the relationship between financial development and economic growth.

Empirically, four conflicting results have been drawn (Odhiambo, 2011b): first, supply-leading results whereby it is financial development that spurs economic growth; second, demand-following results whereby it is economic growth that promotes financial development (Patrick, 1966); third, financial development and economic growth have a bi-directional relationship and lastly, there is no causal relationship between financial development and economic growth[10]. In Africa, many studies have been conducted and yet produced conflicting ideas on the direction of the causal relationship between financial development and economic growth (Khalifa Al-Yousif, 2002; Ghirmay, 2004; Odhiambo, 2007; Abu-Bader & Abu-Qarn, 2008b; Odhiambo, 2008; Wolde-Rufael, 2009; Ahmed, 2010; Odhiambo, 2011a; 2011b).

For example, Ahmed (2010) in his empirical investigation found a supply-leading result that there is two-way causality ending to economic growth from financial development in 15 sub-Saharan Africa. Odhiambo (2011), with the use of South Africa as a case study found a bi-directional causal relationship between bank-based financial development and economic growth, although he concluded that it is stock market development that drives the development of the financial sector in South Africa. In his study, Ghirmay (2004) contributed to the supply-leading results as he found that in eight out of thirteen countries in sub-Saharan Africa, it is financial development that leads to economic growth. That financial development causes economic growth (supply-leading result) was also evidenced in a study conducted in Egypt, Tunisia and Morocco (Abu-Bader & Abu-Qarn, 2008b). In a study of 10 sub-Saharan African countries, Akinlo and Egbetunde (2010) found that the Congo Republic, Central African Republic, Nigeria and Gabon conformed to the supply-leading hypotheses; while economic growth led to financial development (demand-following) only in Zambia and for Swaziland,

[10] According to Odhiambo (2011a); this means that neither financial development nor economic growth causes the other one to happen; hence there is no causality between the two factors.

Sierra Leone, South Africa, Chad and Kenya, that the relationship between financial development and economic growth is bi-directional.

Another recently conflicting result came from the study of Wolde-Rufael (2009), who found that Kenya does not fit in either the supply-leading or demand-driven hypotheses, since both financial development and economic growth depend on each other. However, surprisingly, in the end Wolde-Rufael (2009) concluded that it is financial development that promotes economic growth in Kenya; and that in order to accelerate economic growth, Kenya has to work on its financial sector policies. However, another study conducted in Kenya using co-integration and error-correction techniques (Odhiambo, 2008) was found that there is a unidirectional causal relationship that flows from economic growth to financial development.

Kenya also was found to have a bi-directional relationship between financial development and economic growth in the studies of (Ahmed, 2010; Akinlo & Egbetunde, 2010), which further confuses the picture from the Kenyan perspective as does another study whereby in ten included countries, Kenya was the only one from Africa (Christopoulos & Tsionas, 2004). A study conducted recently in Kenya but with the use of an econometric technique, the Autoregressive Distributed Lag (ARDL) bounds testing approach, it was found that there is bi-directional relationship between financial development and economic growth in Kenya. (Onuonga, 2014).

The relationship between financial development and economic growth in Tanzania has been found to be unidirectional (Odhiambo, 2011a), whereby, financial development follows economic growth. In a study of three sub-Saharan African economies Kenya, Tanzania and South Africa, further conflicting results were produced, as it was found that Kenya and South Africa confirmed to the demand-following hypotheses (from economic growth to financial development), while Tanzania showed a supply-leading response (from financial development to economic growth) (Odhiambo, 2007). However, the causal relation between financial development and economic growth was found to be bidirectional for Tanzania in other studies (Khalifa Al-Yousif, 2002; Ghirmay, 2004).

In a recent study by Egbetunde and Akinlo (2014), they used a Dynamic panel – GMM approach to examine the financial integration and economic growth in 21 SSA countries (Burundi and Kenya were included); they revealed negative but significant impact of financial development on economic growth in selected SSA. While, empirically, there are two-way granger causality (bi-directional) between the financial development and economic growth in

Rwanda (Ghirmay, 2004; Ahmed, 2010), there is no empirical study on this relationship for the case of Uganda (see Table 2.1 below).

Table 2.1: Summary of the Previous Studies that Included Some of East African Countries

Author(s)	**Countries selected**	**Proxies for Economic growth and Financial development**	**Methodology**	**Results**
Khalifa Al-Yousif (2002)	30 developing countries (including *Tanzania* and *Kenya*)	Growth=growth rate of per capita real GDP; Financial development=currency ratio and M2/nominal GDP	Granger-causality test within Error Correlation Model	Different results in different countries though bi-directional results found to be strong both in time series and panel technique.
Ghirmany (2004)	13 countries in SSA (including *Kenya*, *Tanzania* and *Rwanda*)	Economic growth=real GDP; Financial development= credits to private sectors by financial sectors	Vector autoregression (VAR) framework based on cointegration and error correction technique	In 8 countries supply-leading, in 9 countries demand-leading and bi-directional causal relation in 6 countries (Kenya, Tanzania and Rwanda)
Christopoulos and Tsionas (2004)	10 developing countries (including *Kenya*)	Growth=quantity of output; financial depth=ratio of total bank deposits liabilities to nominal GDP and share of investment	Panel unit-root test, panel co integration analysis, dynamic panel data estimation for a panel-based vector error correction model	There is a single equilibrium relation between financial depth and economic growth; and found uni-directional relationship from financial depth to economic growth.
Odhiambo (2007)	*Kenya*, *Tanzania* and South Africa	Economic growth=real per capita income (y/N); and Financial development=ratio of broad money (M2/GDP), currency ratio and bank credits to private sector (DCP/GDP).	Cointegration analysis and Error correction model based on Granger causality test	Bi-directional causality in Kenya, economic growth promotes financial development in S.Africa and converse inTanzania
Odhiambo (2008)	Kenya	*M2/GDP*= financial depth variable and *y/N*-per capita income = economic growth variable	Dynamic Granger causality test based on error-correction model	Uni-directional causal relationship from economic growth to financial development.
Wolde-Rufael (2009)	Kenya	Economic growth=real GDP per capita; Financial development=Money supply (M2), Liquid liability (M3), Domestic bank credit to private sector and Domestic credit provided by banking sector	Quadvariate vector autoregressive (VAR) model	Except for M2 but all other proxies for financial development evidenced a two-way Granger causality with economic growth. Though they concluded that FD

				promotes economic growth
Ahmed (2010)	15 SSA countries (including *Kenya* and *Rwanda*)	Financial development=the ratio of private credit to income (PCY) and the ratio of domestic credit to income (DOM); economic growth=GDP per capita	Panel Unit root test cointegration test and Granger causality tests based on error correction-using Dynamic panel data framework and time series analyses	The causality relationship found to run from financial development to economic growth.
Akinlo and Egbetunde (2010)	10 sub-Saharan Africa (including *Kenya*)	Economic growth=per capita real output, Financial development=Ratio of broad money (M2)/GDP.	Multivariate cointegration analysis and Vector Error Correction Model (VECM)	Supply-leading and Demand-leading results found in other countries, but bi-directional results found in Kenya.
Odhiambo (2011)	Tanzania	Economic growth=real per capita income (y/N); Financial depth= liquid liability (M3/GDP)	ARDL-Bound testing procedures and dynamic Granger causality test	unidirectional causal relationship from Economic growth to financial depth.
Egbetunde and Akinlo (2014)	21 sub-Saharan Africa (including Kenya & Burundi)	Economic growth=Real GDP, Financial development=domestic credit provided by banking sectors	Dynamic panel-GMM approach	Financial development possesses a negative relation with economic growth in SSA,
Onuonga (2014)	Kenya.	Economic growth=Real GDP per capita, Financial development=ratio of M2 to GDP, ratio of domestic credit to private sector	ARDL-Bound testing approaches	Both Supply-leading and Demand-leading results were found in Kenya.

Source: Researcher's own Collections from Previous Studies Reviewed (2015)

Considering the empirical conflicts on the causal relationship between financial development and economic growth highlighted in Table 2.1 above, and the absence of this kind of study for the case of Uganda, this study contributes to the empirical literature by including Uganda for the first time, and at the same time sheds light on the conflicting results shown in Kenya[11] and Tanzania by re-examining the causal relationship between financial development and economic growth. The study is conducted in 5 East African countries found located sub-Saharan Africa (Kenya, Tanzania, Uganda, Rwanda and Burundi) with annual observations from 1988 to 2010. Similar to the empirical works presented by previous studies (Levine et al., 2000; Rachdi & Mbarek, 2011), also this study uses the GMM system approach. The study uses this dynamic instrumental variable modelling approach in order to control for any biases situating within the panel countries; such as endogeneity bias, simultaneity bias and missing

[11] See Odhiambo (2007 & 2008); Wolde-Rufael (2009); Akinlo & Egbedtunde (2010) and Ahmed (2010)

variable bias. Since because our data may involve both *country-specific effects* and *time effects*, which may be correlated with covariates and result in errors and biases; therefore, the study estimates the model in a dynamic manner that will also remove all country specific effects and time effects, which will as well help to control for possible errors and biases.

We find a strong evidence that there is long-run equilibrium relationship between financial development and economic growth (see Table 2.5) in East African countries included in this study. We used domestic credit to private sector (DCPS), domestic credit provided by banking sector (DCPBS) and money supply (M2) to explain the financial development, and GDP per capita Growth to explain the economic growth. However, when we analyse the results using the GMM approaches (see Table 2.8), the results we obtain show positive relation (with DCPS), negative relation (with DCPBS) and no relation (with M2) between financial development and economic growth (GDP per capita Growth). Therefore, our results are in consistency with previous studies that favour positive relation (Demirguc-Kunt and Levine, 1996; Levine and Zervo, 1996; King and Levine, 1993a, b; Beck and Levine, 2004) and those favour negative relation (Naceur and Ghazouani, 2007).

2.1.1 Motivation for Studying East African Countries

The countries Tanzania, Kenya, Uganda, and Rwanda and Burundi were selected because they are together formulating Regional Integration in East Africa, which is known as the East African Community (EAC). Before 15th April 2016, the East African Community was the Regional integration of the governments of only five countries, but later on the community saw the entrance of the Republic of South Sudan, bringing the number of countries that form the community to six. Regarding the important reasons for the selection of the original five countries of the EAC, people in these selected countries share history, speak one language (Swahili) apart from their own official and mother languages, share culture, and their infrastructures are closely connected. For these reasons, the East African countries are a unique example of integration and regional co-operation in sub-Saharan Africa. The new treaty for the re-organization of the East African Community came into effect on 7th July 2000 after being signed on 30th November 1999 by the three founder states, Tanzania, Kenya and Uganda; but in 18th June 2007, Burundi and Rwanda joined the EAC and from 1st July 2007 were full

members[12]. On 15th April 2016, the treaty of Accession of the Republic of South Sudan into the East African Community was signed in Dar-es-Salaam, Tanzania[13].

The main purpose of this study is to come up with new outlook on the conflicting debate on the causal relationship between financial development and economic growth using a regional dataset (Vaona, 2008). There are studies on the same matter for the case of Tanzania, Kenya and Rwanda and Burundi (see Table 2.1 above); but there is no such study for the case of Uganda. Therefore, this study combines all those five countries that together form the East African Community to examine the causal relationship between proxies for financial development and that of economic growth of the region. The findings of this study contribute to the body of knowledge through presenting results from the regional dataset of the EAC, unlike previous studies that used a group of countries or single country to study the causal relationship between financial development and economic growth.

The East African Community countries (at that time three countries, Kenya, Tanzania and Uganda) wanted to establish an integration of the stock exchanges of the respective countries. It is said that only the Uganda security exchange had already harmonized its rules and regulations to look like those of Nairobi Stock Exchange (Irving, 2005). On 30th November 2013, the East African Community laid the ground for a monetary union in 10 years to allow the Partner states to converge their respective currencies into the usage of a single currency (the East African Shilling). In achieving this, the EAC countries plan to harmonise (1) monetary and fiscal policies (2) financial, payments and settlement systems (3) financial accounting and reporting practices (4) policies and standards on statistical information and lastly, to establish the central bank of EAC partner states. This can add to the importance of studying financial development and economic growth in these countries, as it would allow the policy makers on the monetary union and integrated East African stock exchange to understand the interactions between the financial sectors' development of these countries and economic growth.

The present chapter addresses the causal relationship between financial development and economic growth for five East African countries, over the period 1988 to 2010. In section 2.2, we present an overview of financial sector development in the selected countries. Theoretical and empirical review of the relationship between financial development and economic growth

[12] For more information on EAC see http://www.eac.int/treaty/index.php. Cited on 28th May 2012
[13] One can see http://www.eac.int/news concerning the accession of the Republic of South Sudan into EAC. Accessed on 22nd April 2016.

are provided in section 2.3. Section 2.4 displays the data and data descriptions, while the Dynamic Panel Data Estimation Technique used as the methodology of the study is given in section 2.5. Summary descriptive statistics are provided in section 2.6, while Empirical results are presented in section 2.7. Discussion and Conclusion are reported in section 2.8 of this chapter.

2.2 An Overview of Financial Sector Development in East African Countries

In sub-Saharan Africa, the financial sector is relatively underdeveloped and not expanded when compared with the financial sector in other parts of the world (Wolde-Rufael, 2009; Akinlo & Egbetunde, 2010). For example, all five sub-Sahara African countries selected are left behind in all proxies of financial development, compared to the other regions of the world (see Table 2.2 below) except for the interest rate spread. The interest rate spread, which in this case stands as a proxy for financial intermediaries' efficiency, is relatively higher than that of the other regions; while no data was found for Burundi, Kenyan and Rwandan were found to have single digit figures as can be seen in Table 2.2.

Table 2.2: Financial Depth and Efficiency in East African Countries

	Domestic credit provided by banking sector (% of GDP)	Domestic credit to private sector (% of GDP)	Money and quasi money (M2) as % of GDP	Interest rate spread (lending rate minus deposit rate, %)
Burundi	34.5	22.3	29.1	
Kenya	38.4	25.9	37.2	7.8
Rwanda	8.0	11.2	16.2	8.0
Tanzania	11.6	10.2	23.2	10.5
Uganda	8.6	8.6	17.9	10.9
World	162.1	132.0	103.8	6.6
East Asia & Pacific	210.7	142.5	156.6	5.5
Latin America & Caribbean	49.4	26.3	37.8	7.6
Middle East & North Africa	44.5	41.7	55.7	4.2
South Asia	56.4	37.7	57.5	6.2

Source: World Bank, World Development Indicators and Global Development Finance (2012)

The financial sector development in all 5 selected countries (Tanzania, Kenya, Burundi, Rwanda and Uganda) could be different from one country to another at different times. In 1980s the East African Community Countries (at that time, Kenya, Tanzania and Uganda) faced many economic problems; high rates of inflation, decline of economic growth, decrease of income per capita to low rates, increase of external debt to high rates and decrease of savings to low rates, just to mention the few. To overcome all those economic problems, structural

adjustment reform was developed with the assistance of both the World Bank and the International Monetary Fund (IMF). The structural adjustment reforms were intended to minimize the direct participation of the countries' governments in major economic issues. This led to the establishment of privatization in the three countries, so as to enable the governments to withdraw from the ownership of many sectors. Also the reforms saw those countries begin the reinforcement of market functions in the formation and allocation of economic resources.

The reforms in the financial sector were the main feature of the structural adjustments reforms in Tanzania, Kenya and Uganda. It took five years for them to be completed (from 1988 to 1992). The financial sector reforms in East African Countries started in Kenya in 1988, while Tanzania started them in 1991 and the process was completed by Uganda in 1992. With the purposes of improving the domestic savings mobility by financial sectors, enhancing the instruments of monetary policies to be effective and fostering financial sector competition for their own efficiency; the financial sector reforms in these countries were important for economic development. These reforms were introduced in different phases, but the crucial one was financial sector liberalization whereby market forces were allowed to decide the determinants of the rates of interest and credit allocation, not the government decisions as was the case before.

2.2.1 Kenyan Financial Sector Development

To concur with financial sector liberalization from January 1988 to July 1991 Kenya liberalized its interest rate; before liberalization the country was characterized by financial repression that saw credit controls in the selected sectors and fixed interest rates (Ngugi, 2001). Moreover, strong supervision was imposed to the private sector, since its decisions (for example on credit allocations) had to reflect the benefits of all interested groups in the public, not as it was during the era of financial repression, when credit groups were selected by the government.

Generally, the financial sector in Kenya is deemed to be well developed and diversified with many financial institutions, compared to other countries in the East African Community (Odhiambo, 2008). Kenya's commercial banks reached 55 in 1999 but decreased to 41 by 2007, while Kenya's non-bank financial institutions reached 16 in 1999 but decreased to two by 2007. Also during 1999 the country had four building societies and 44 foreign exchange bureaus, which increased to 89 foreign exchange bureaus by 2007; and the two mortgage finance firms, a number that remained static until 2007 (Odhiambo 2007). In April 1997, Kenya saw the amendment of its Central Bank regulations, to give back monetary autonomy to the Central

Bank. Also the Central Bank put into practice various reforms such as that of institutional and monetary policy. The purpose was to increase competition in the financial system so as to increase efficiency; and at the same time to give power to the roles of regulation and supervision of financial sectors.

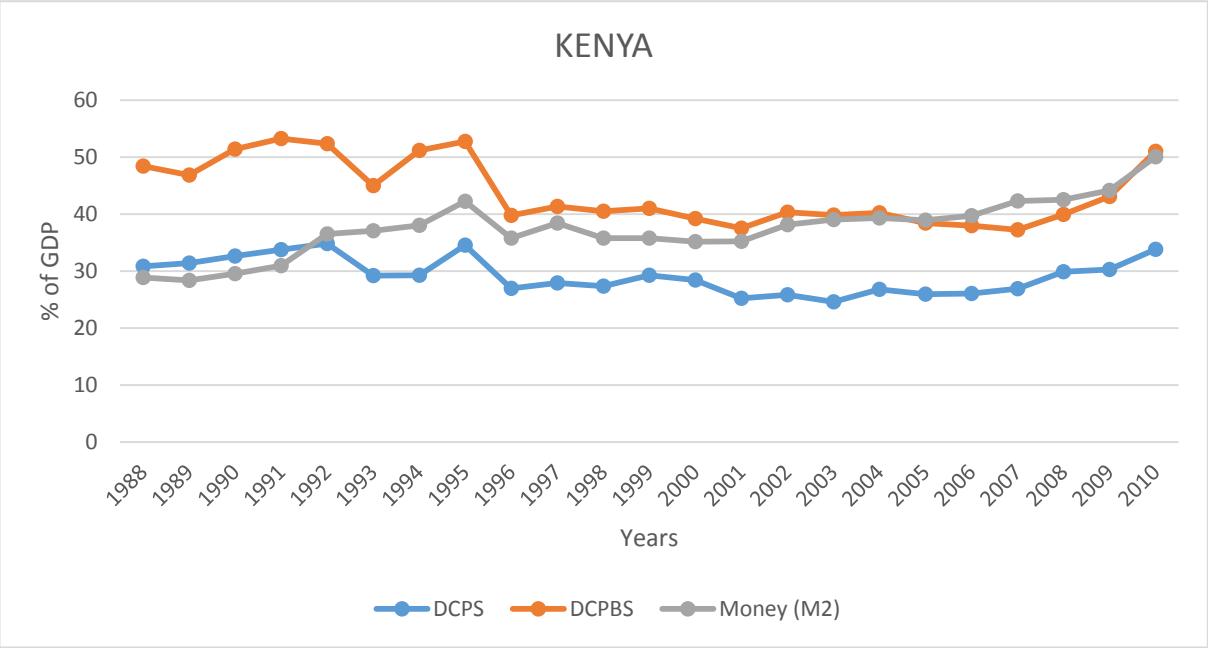
Figure 2.1 below shows the financial sector development in Kenya using three selected indicators highlighted in this chapter. The domestic credit provided by the banking sector, which shows the amount of funds channelled to the different sectors of economy by the banking sector (WorldBank, 2012) is one of the selected indicators for financial sector development. The figure indicates that credit by banking sector dramatically increased by 15% from 38% of GDP in 1988 to 53% of GDP in 2010. Therefore, the steady growth of this proxy of financial development shows that funds are distributed to different sectors of the Kenyan economy, which might have a positive effect on economic growth. When all five East African countries are taken together, Kenya stands as the leading country on distributing funds to the different sectors of economy from the DCPBS (see Figure 2.6)

The domestic credit to the private sector (DCPS) is another indicator of the financial sector development selected in this chapter. Generally, it indicates the funds given out to the private sector. DCPS shows constant fluctuation, reflecting instability of its contribution to economic growth. For example, in 1988, 1992 and 1994 the DCPS in Kenya was 27.5%, 29% and 24% of GDP respectively. It reached 30% of GDP in 1995 before coming down in 1997 and then rose again to reach 33% of GDP in 2005. However, in 2006 it dropped to 29% of GDP before it rose again to reach a peak of 35% in 2008, but in 2009 and 2010 the DCPS was 34% and 33% of GDP respectively. Also, when all five East African countries are taken together, Kenya leads other countries by far on domestic credit to the private sector (see Figure 2.7)

Money and quasi money (M2) as a percentage of GDP is another indicator of financial sector development that was selected for this chapter. M2 shows the money supply or money circulation into the economy. In 1988, 1991 and 1993 the money supply (M2) was 39%, 37% and 32% of GDP respectively, showing a decreasing rate in 6 years from 1988. It then increased to reach 40% of GDP in 1995, before declining to reach 35% of GDP in 2000. From there the M2 fluctuated to reach the lowest point in the previous 20 years of 27% of GDP in 2003 and the highest point ever of 45.5% of GDP in 2005. In 2007 the M2 was just 28% of the GDP, which later increased to 38% of GDP in 2009, before it dropped to 29% of GDP in 2010. The story is also the same here as in other indicators (DCPBS and DCPS) that when all five East

African countries are taken together, Kenya takes the lead in money circulation to the economy, so it contributes much more to economic growth than in other countries (see Figure 2.8).

Figure 2.1: Kenyan Financial Sector Development



Source: World Bank, World Development Indicators and Global Development Finance (2012)

2.2.2 Tanzanian Financial Sector Development

In Tanzania, in order to sustain its economic growth, in 1992 the banking sector embarked on financial liberalization plan. Financial resources mobilization, increase of financial market competition and attracting the quality and efficiency credit allocation were all accomplished under the financial liberalization plan. Due to financial liberalisation, there was an increase of the total assets from $1.7 billion in 1999 to $2.7 billion in 2004; on increase of 60%, evidencing the booming of the Tanzanian banking sector. However, the financial market (stock market based) is still basic with a slender and informal contractual saving institutions and a very small stock market (Dar-es- Salaam Stock Exchange). In 1996, Tanzania formulated the Dar-es-salaam Stock Exchange (DSE) which officially came into operation in 1998. Apart from that formation, money intermediaries (for example, foreign exchange bureaus, discount houses and merchant banks) and stock market intermediaries (for example stock dealers and stock brokers) have not yet expanded to the required and expected level (Odhiambo, 2007).

Although the financial market in Tanzania is dominated by banking sector, the sector is rather small and insufficient compared to that of Kenya. In the 1990s, Tanzania, like other countries in Sub-Saharan Africa, entered into financial reform; but before that the banking sector in

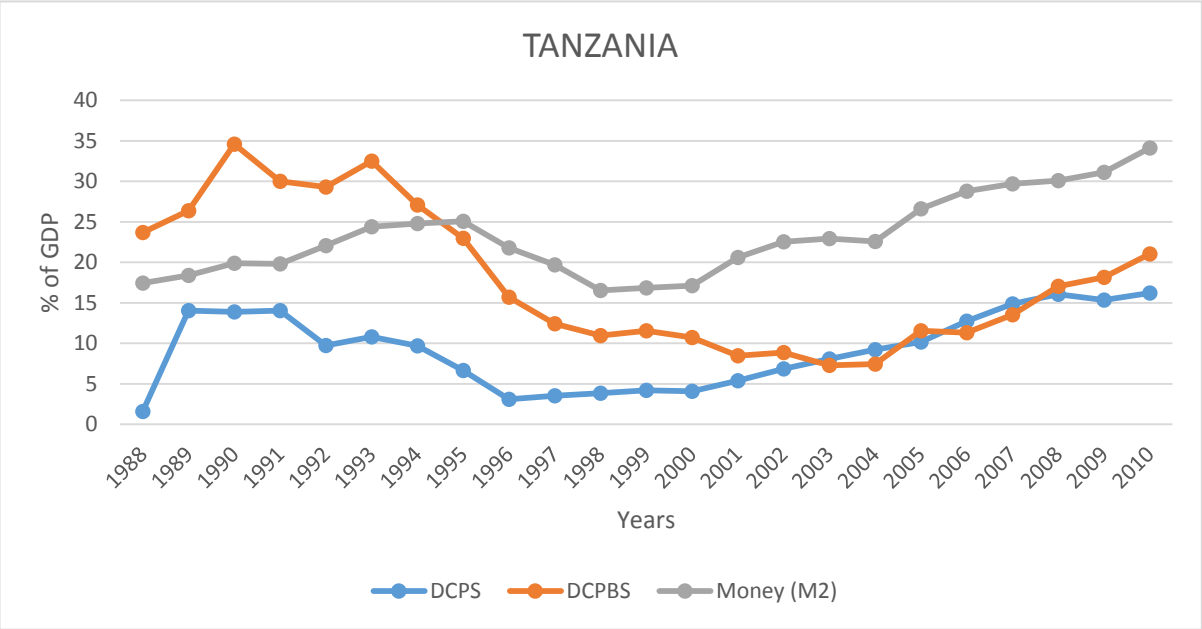
Tanzania was dominated by the state owned banks. For instance, according to Odhiambo (2007) the National Bank of Commerce (NBC) increased its business operations in many areas of Tanzania in 1980. Its goal was to attract almost every citizen of the country and to foster domestic savings of the country. By the end of 1990, the National Bank of Commerce (NBC) had 25 offices all over the regions, offices in all districts of mainland Tanzania, 182 branches and 220 agencies all over the country. However, the financial reforms saw an increase in the numbers of commercial banks to 22, non-bank financial firms to three, and foreign exchange bureaus to 102 (80 in mainland Tanzania and 22 in Zanzibar) between 1991 to 2005.

Tanzanian financial sector development is presented in Figure 2.2 below. The financial sector development is also represented by the indicators, domestic credit provided by banking sector, domestic credit to private sector and money supply-M2 (WorldBank, 2012). The domestic credit provided by banking sector percentage of GDP shown in Figure 2.2 represents the amount of funds channelled by banking sector to the different sectors of the economy. In 1988, the credit by the banking sector was 23% of GDP, and increased to its highest point, 35% of GDP, in 1990. It was 32% of GDP in 1993, but from there declined steadily until it reached 8% of GDP in 2004, the weakest point for 20 years. It started to rise again in 2005, when it was 11%, to reach 21% in 2010, though it has not yet reached the peaks it reached in the beginning of the 1990s.

Domestic credit to private sector (DCPS), which stands for funds provided to private sectors in the economy, can also be seen in Figure 2.2 below. The DCPS in 1988 recorded just 2% of GDP, the lowest point for the last 20 years, but surprisingly in 1989 it increased sharply to 14% of GDP to record 12% increase in only one year. In 1992, 1993 and 1994, the credit to private sector in Tanzania accounted for 10%, 11% and 10% of GDP respectively. It then declined from 1994 to reach 3.5% of GDP in 1996, before starting to rise again with steady increase from 4% in 1997 to 16% of GDP in 2008 (another 12% increase in only one year); while in 2009 and 2010 it was 15% and 16.5% respectively.

As for money and quasi money (M2), which stands for money supply into the economy, in Tanzania, this indicator of financial sector development shows that it rose from 15% of GDP in 1988 to reach 22% of GDP in 1995, and from there dropped down to reach 15% again between 1999 and 2000. However, from 2001, M2 dramatically increased to reach the highest point for 20 years (30.5% of GDP) in 2010 (see Figure 2.2 below).

Figure 2.2: Tanzanian Financial Sector Development



Source: World Bank, World Development Indicators and Global Development Finance (2012)

2.2.3 Ugandan Financial Sector Development

In Uganda the financial sector has also passed through different stages, as did the neighbouring states of Kenya and Tanzania. In 1966 the Bank of Uganda was established under the Bank of Uganda Act with the function of formulating and implementing monetary policy for the purpose of attaining economic stability, participating in development programmes and promoting economic growth. Until about the late 1980s, the financial sector in Uganda was small and even fragile. This was before the reform, when government intervention was a norm in many SSA countries; in Uganda, the interest rate was controlled, credits were given by government direction, inflation was high and real interest rates were negative. There were only two dominant banks that controlled two-third of Ugandan commercial banking. However, they became insolvent and in order to continue their operations, they needed a big push from the Bank of Uganda (Pattillo et al., 2006).

In 1992, the financial sector reform began in Uganda with the initial objectives of removing interest rate controls, reducing barriers to the entrance of new banks, restricting credit direction to lenders, and liberalisation as a whole. Immediately after implementing these objective measures in the financial sector, Uganda saw single-digit inflation in the country, a fall in nominal interest rates and both stability and a positive sign in real interest rates. Despite the positive feedback from financial sector reform, the Ugandan financial system continued to be weak, as many of the granted loans were nonperforming, basic financial services were not

available in rural areas and the intermediation margin continued to be high. To overcome these weaknesses, in the mid-1990s, Uganda shifted the objectives of the reform to institutional building, whereby the legal and regulatory framework was developed further. The focus here was to attain market discipline, to allow competition among private banking sectors, and make the Bank of Uganda act as a substantial supervisor of the banking industry. Moreover, the government of Uganda decided to sell its share ownership to the commercial banks, and established the mechanism for bad debt resolution.

In 1994, Uganda saw the initiation of the capital markets through the Capital Markets Development Committee (CMDC) under the supervision of the bank of Uganda. The CMDC agreed on the introduction of the Capital Markets Authority in 1996 and licensed the Uganda Security Exchange (Bank of Uganda Act 2000). In the 2000s, many important changes were made in the Ugandan financial sector; for example, in 2003 the Micro Finance Deposit-taking Institutions Act was enacted. The Act imposed some restrictions on certain transactions and dealings by micro finance deposit-taking institutions. Also, in 2002, the Uganda Commercial Bank (UCB) with more than 80% of the country network was acquired by Stanbic Bank of South Africa. The acquisition has enhanced service quality and outreach to rural areas, and helped in reaching efficiency throughout the banking sector. According to Pattillo et al. (2006), banks in Uganda are able to diversify their asset portfolios using loans that are granted to private sectors instead of using only government securities, and they have increased the number of people with bank accounts.

In 2004, Uganda enacted the Financial Institution Act, which addresses licensing, shareholding in financial institutions, prohibition and restriction, the requirements of the capital, corrective actions and supervision and corporate governance. The Foreign Exchange Act came into existence in 2004, providing for the authority of the Bank of Uganda, as well the licensing and restrictions on conducting the business of foreign exchange. In 2005 the Financial Institutions (Credit Reference Bureaus) Regulations entered into force. The regulations apply to all credit reference bureaus that were licensed by the Financial Institution Act of 2004. In Uganda there were 25 licensed commercial banks, with over 455 branches operating all over the country, as of April 2012.

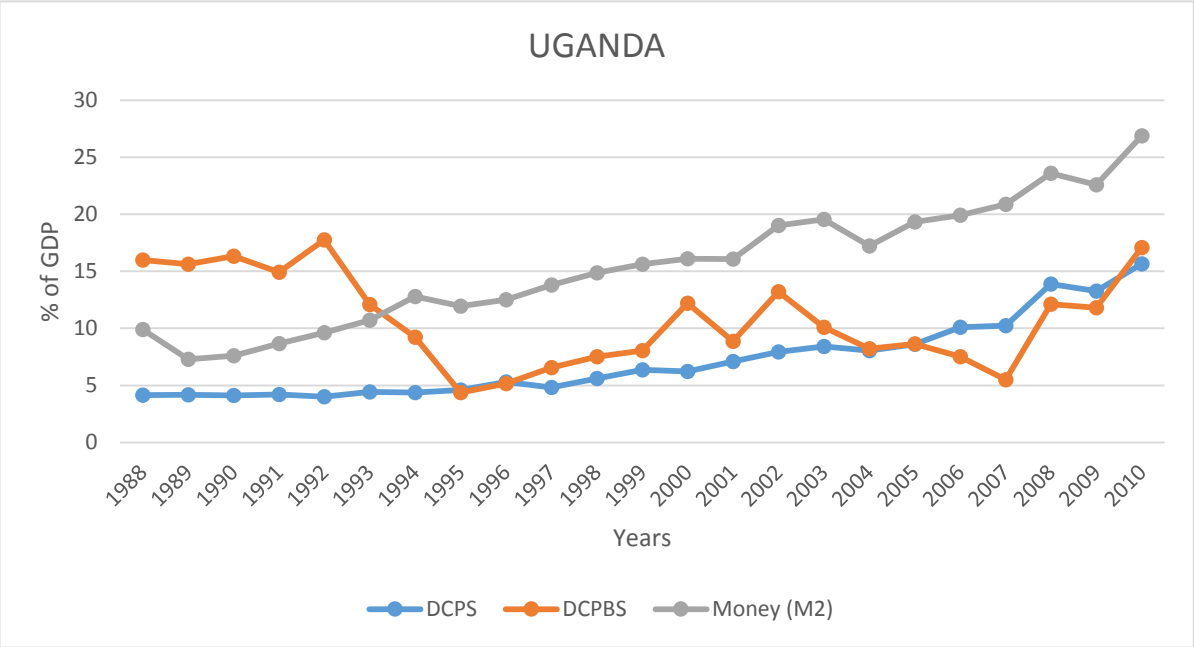
The Ugandan financial sector development is presented in Figure 2.3 below. The indicators for the financial sector development are domestic credit provided by banking sector, domestic credit to private sector, and money supply (WorldBank, 2012). As can be seen in Figure 2.3 the domestic credit provided by banking sector (DCPBS) percentage of GDP shows that in

1992, it was at a 15 year high, at 17.5% of GDP. It, however, decreased to reach its lowest point, 4% of GDP, in 1995. Then it increased again to reach 12.5% of GDP in 2000, while in 2001 and 2002 it recorded only 8% and 13% respectively. DCPBS continued to show instability in the following years as it felt again to 5% in 2007, before it rose once again to 12% of GDP between 2008 and 2009. In 2010, the DCPBS reached a 17% of GDP, returning to the 1992 level. Uganda is behind the other four East African countries on the distribution of funds/credits from the banking sector in relation to GDP (see Figure 2.6). This shows that the contribution of the domestic credit provided by banking sector to the economy of Uganda is rather less than in the other four countries in the East African Community.

The domestic credit to private sector (DCPS) percentage of GDP is another indicator for financial sector development in Uganda as shown in Figure 2.3 below. One can notice that since 1992, the domestic credit to private sector increased dramatically up to 2010; for example, in 1992 it recorded just 4% of GDP but in 2010 it was around 16% of GDP. This shows that since 1992 (4% of GDP) the contribution of domestic credit to the private sector to the economy of Uganda increased up to 2010 (16% of GDP). However, it lays behind the other East African countries when all five East African countries included in this study are compared. This shows that the contribution of domestic credit to the private sector to the economy of Uganda is rather less than it is for Kenya, Burundi, Tanzania and Rwanda (see Figure 2.7).

Money and quasi money supply (M2) is another indicator for financial development, which is presented in Figure 2.3 below, for the case of Uganda. It shows that the money supply in Uganda increased from 1989, when it was only 6% of GDP (the lowest point) to reach 23% of GDP (the highest point) in 2010. The dramatic increase of this indicator (M2) for financial development in Uganda shows the extent to which it contributed to the economy (GDP) of Uganda. However, the money supply in Uganda has not achieved the same rate of contribution to the economy of the country as it has to the economies of the other countries in East Africa (see Figure 2.8).

Figure 2.3: Ugandan Financial Sector Development



Source: World Bank, World Development Indicators and Global Development Finance (2012)

2.2.4 Burundi Financial Sector Development

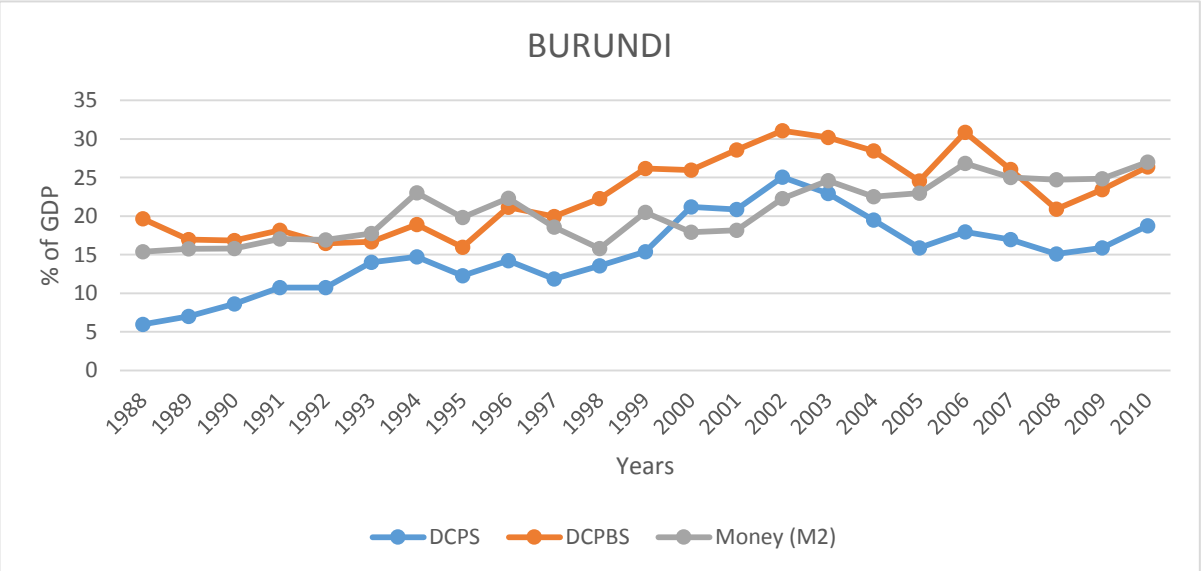
In Burundi, the financial sector development using the indicators domestic credit provided by banking sector, domestic credit to private sector, and money & quasi money supply have also passed through different stages (see Figure 2.4 below). The domestic credit provided by banking sector (DCPBS), which captures the amount of credit channelled to the different sectors of the economy through the banking sector, shows that it fell from 20% in 1988 to about 16% of GDP in 1995. However, it started to rise in 1996 until 2004 when it reached 39% of GDP, and later in 2005 it dropped again to 34% of GDP. DCPBS reached the highest point in its history when it peaked at 41% of the GDP in 2006. It is noteworthy that from 1996 to 2010, the DCPBS in Burundi was always after Kenya's when all five East African countries included in this study are taken together for comparison purpose (see Figure 2.6). This shows that Burundi is following Kenya on the distribution of funds to different sectors of the economy from the banking sector in the East African countries.

On the other hand, the domestic credit to private sector (DCPS), which stands for financial resources (such as loans, non-equity securities bought, and accounts receivable and trade credits) given to private sectors in Burundi shows a steady increase from 6% of GDP in 1988 to 15% of GDP in 1994. It fell to 12% of GDP in 1995, but again in 1998 started to rise until it reached 31% of GDP in 2002 a peak for the last 20 years. The DCPS then rapidly dropped by 10% level, between 2002 and 2008, when it reached 21% of GDP, though it rose again to

account for 26% of GDP in 2010 (see Figure 2.4 below). The DCPS in Burundi come second after Kenya in its contribution towards GDP, when all five East African countries included in this study are taken together for comparison purpose (see Figure 2.7). This indicates that Burundi is the second best after Kenya on the distribution of funds/credits to the private sectors; however, the indicator is the lowest contributor to the GDP of Burundi, when all three indicators' contributions are compared.

Another indicator of financial development used in this chapter is money and quasi money supply (M2), which stands for the total of currency circulated outside banks, non-central government demand deposits, and the deposits of foreign currency by resident sectors and not that of the central government, and time and savings deposits. It can be seen in Figure 2.4 below that in 1988, the money supply (M2) recorded only 14% of GDP, but the percentage increased to 20.6% of GDP in 1996. It then decreased to 16% in 1998, before it increased again in 1999 to reach 20% of GDP. It then fluctuated to 17.9% and 22.3% in 2000 and 2002 respectively, before it reached 24.6% of GDP in 2003. In 2006, the money circulated in Burundi's economy accounted for 26.8% of GDP and then fell slightly to 25%, 24.7% and 24.8% of GDP in 2007, 2008 and 2009 respectively. However, in 2010, the money supply indicator rose again to record the best percentage ever of 27% of GDP since 1998. It is noteworthy that on the issue of circulating money (so that it contributes to the economy of the country), Burundi was always left behind by only Kenya and Tanzania among East African Community partner states (see Figure **2.8**).

Figure 2.4: Burundi Financial Sector Development



Source: World Bank, World Development Indicators and Global Development Finance (2012)

2.2.5 Rwandan Financial Sector Development

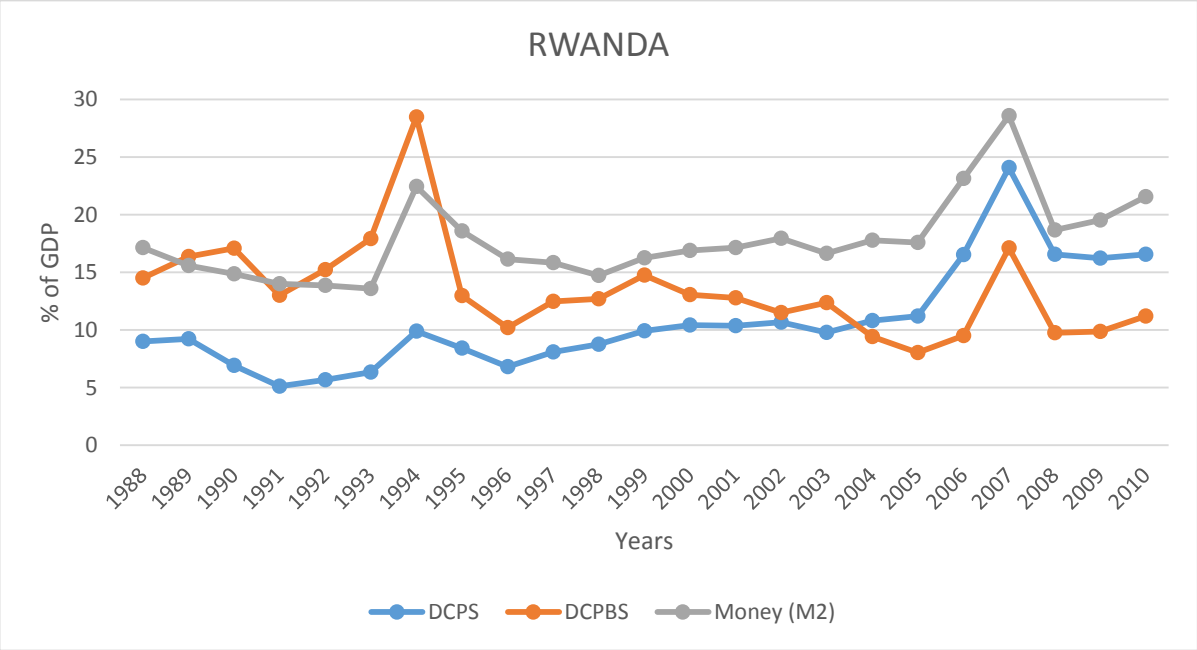
The financial sector development in Rwanda can be seen in Figure 2.5 below with the use of the indicators domestic credit provided by banking sector, domestic credit to private sector, and money & quasi money supply, all of them as percentages of GDP (WorldBank, 2012). The domestic credit provided by banking sector (DCPBS) has been falling in recent years compared to previous years. For example, in 1988, 1990 and 1991 DCPBS accounted for 15%, 17% and 13 % of GDP respectively. It increased however, to a peak of 28% of GDP in 1994, but, suddenly decreased by 18% to reach 10% of GDP in 1996. It fluctuated between 10% and 14% of GDP from 1997 to 2004, before it dropped down even more to reach 8% of GDP in 2005. Surprisingly, it rose steeply to reach 17.10% of GDP in 2007 before it dramatically decreased to 9.8% of GDP in 2008. DCPBS was left behind by other indicators in Rwanda, in terms of their percentage contributions in the economy of the country, from 2004 to 2010 (see Figure 2.5 below).

The domestic credit to private sector (DCPS) percentage of GDP is another indicator that explains the financial sector development in Rwanda as shown in Figure 2.5 below. It indicates a steady decrease from 9% of GDP in 1988 to 5% of GDP in 1991, before it rose again to 5.7%, 6.3% and 10% of GDP in 1992, 1993 and 1994 respectively. The indicator accounted for 6.8% of GDP in 1996, and since then it maintained a steady increase for 6 years (from1996 to 2002) to reach 11.5% of GDP in 2002. In 2003, the domestic credit to private sector fell again to account for 10% of GDP before it started to rise again to reach its best point (from 1988 to 2010) of 24% of GDP in 2007. However, it massively dropped to account for only 16.6%, 16.2% and 16.6% of GDP in 2008, 2009 and 2010 respectively. When all three indicators of financial development are taken into consideration, it seems that in Rwanda the domestic credit/funds distributed to the private sectors of the economy were left behind by other two indicators from 1988 to 2004, but it came to be the second best after money supply from 2004 to 2010 (see Figure 2.5 below). However, on the issue of distributing funds to the private sector (to contribute to the economy of the country), Rwanda was left behind by only Kenya and Burundi from 1994 to 2006, and it was the second best in 2007 and 2008, among East African Community partner states (see Figure 2.7).

Money and quasi money (M2) is another indicator that was selected to explain the financial development of Rwanda, which is also presented in Figure 2.5 below. The indicator money supply dropped from 16.5% of GDP in 1988 to 13.5% of GDP in 1993. It then increased to account for 22.4% of GDP in 1994, and fell down again in the following years of 1995, 1996,

1997 and 1998 to record 18.6%, 16.2%, and 15.8% and 14.7% of GDP respectively. The money in circulation, as a measure of financial development, started to accelerate again in 1999, 2000, 2001 and 2002 to account for 16.3%, 17%, and 17.2% and 18% of Rwandan GDP respectively. In 2006 and 2007, the money supply indicator recorded a dramatic increase of its contribution to the economy in Rwanda, as it accounted for 23% and 29% of GDP respectively. The record of year 2007 (29% of GDP) was the highest for money circulated in relation to the GDP of the country, when compared to other years from 1988 to 2010. It can be seen that from 1995 to 2010, money supply led the other indicators of financial development in their contribution to the economy (see Figure 2.5 below).

Figure 2.5: Rwanda Financial Sector Development



Source: World Bank, World Development Indicators and Global Development Finance (2012)

2.3 Financial Development and Economic Growth

2.3.1 Theoretical Review

Much attention by traditional economists was paid to the relationship between financial development and economic growth. A good example is a work of Schumpeter 1912 and 1934 as reported by Kwasnick (2003). In Schumpeterian Modelling, both technological innovation and economic growth can be facilitated by a well-developed financial intermediary that provides investors with financial services and resources available for investing in new products. Here Schumpeter shows that the financial sector is paramount for economic growth. If banks concentrate on identifying and financing investments that are productive, they will automatically be stimulating innovation and spur future economic growth. All the services given out by the banks are very important for technological innovation and future economic growth.

The idea of Schumpeter was supported in many studies of the 1990's, as economists dedicated much of attention to study on the role of financial market development in economic growth. Most of these studies agreed that well managed financial intermediaries have a significant influence on economic growth (King & Levine, 1993b; Levine, 1997; Levine & Zervos, 1998). For instance, King and Levine (1993b) in their study argued that economic growth, capital accumulation and productivity improvement can be predicted by the level of financial intermediation. They added that the rate of technological innovation may be promoted by banks through selection of the entrepreneurs who have opportunities of establishing successful ventures.

Theoretically, the relationship between financial development and economic growth can be categorized into two phenomena, which are '*Supply-leading phenomenon'* and *'Demand-following-phenomenon'*, indicating that there are economies where it is financial development that spurs economic growth and the reverse is true in other economies (Patrick, 1966). In his study, he argues that the direction of causal relationship between financial development and economic growth changes in relation to development. According to Patrick (1966) financial development can induce the real innovation for investment before the sustained economic growth takes off, however, when economic growth starts to accelerate, the supply leading incentives becomes less and less important gradually; therefore, the demand-following financial response becomes important and dominant. However, according to Patrick (1996)

the *demand-following phenomenon* is brought by lack of financial growth, which is a demonstration of lack of demand for financial services in the economy. Thus, when the real sector of the economy grows, the demands for different new financial services occur, and these will be met rather passively from the financial sector. On the *supply-leading phenomenon*, he declares that it is financial sector that leads and encourages the growth of real sector, and it is done by allocating the scarce resources from small individual savers to large firm investors, with regards to the relative rate of return (see also Odhiambo, 2007).

Banks that mitigate the corporate governance problem through reducing monitoring costs will automatically minimize credit rationing and thus promote economic growth (Bencivenga & Smith, 1993). A financial system that allows the agents to hold risky projects in a diversified portfolio will stimulate society to move to projects with higher expected returns (Greenwood & Jovanovic, 1990) and therefore accelerate economic growth. That is the reason why financial intermediaries and stock markets give a way for trading, pooling and risk diversification (Naceur & Ghazouani, 2007). They looked at both financial intermediaries and stock markets and added that the one with encouragement of savings mobility through giving attractive instruments and saving means can strongly affect economic development. In their study they found that there is a positive correlation between the level of banking development (measured as the ratio of bank loans to GDP) and the level of economic growth.

According to theoretical review above, a well-operating financial system is important for sustained economic growth. Hence, considerable debate still exists on the availability of the relationship between financial development and economic growth. This study contributes to the historical debate concerning the importance of financial system on economic growth, by examining the empirical relationship between financial development and economic growth in five East African countries; Burundi, Kenya, Rwanda, Tanzania and Uganda. The study draws from different theoretical literature that the functioning of financial markets affects technological innovation and savings mobilization. Thus, by modifying these services into quality ones, the functioning of financial development can alter the rate of economic growth in East African countries. Also, our findings are in agreement with the previous theoretical studies that were consistent with *supply leading phenomenon* (Levine, 1997; King and Levine, 1993b; Levine and Zervos, 1998) since we find that it is financial development via Domestic Credit Provided by Banking Sector that homogenously causes economic growth (GDP per capita growth) in five East African countries.

2.3.2 Empirical Review

Besides generating the theoretical evidence on importance of the financial system on economic growth, this study also provides empirical evidence regarding the existing debate on the relationship between financial development and economic growth. Since that the financial system touches both stock markets and financial intermediaries, we first consider their importance on economic growth. There is a direct relationship between countries with well-developed stock markets and countries with well-developed financial intermediaries; and those with weak stock market and weak financial intermediaries (Demirgüç-Kunt & Levine, 1996). Thus, a country with a well-developed stock market has well-developed financial intermediaries and vice versa is true. This shows that stock market development and other contents of financial intermediaries are directly related. This can be evidenced by the study of Demirgüç-Kunt and Levine (1996), which shows that stock markets and banks are not substitute sources of corporate finance; rather, the quantity of the bank loans tends to increase due to stock market development.

In a study of Falahaty and Hook (2013), which used both fully modified ordinary least squares (FMOLS) and dynamic ordinary least squares (DOLS) methods to reveal the relationship between financial development and economic growth; the researchers concluded that the impact is more effective on the development of stock market sector rather than on banking sector development in MENA countries. Thus, they finally suggested the improvement of the banking sector development in order to facilitate the economic growth of MENA countries. In his study, Capasso (2006) shows that in countries where economies are relatively poor, financial intermediation is scarce and there is simple and basic financial instruments; therefore it can be said that even stock markets are completely absent. However, he went on to claim that with economic development, financial intermediation grows and financial instruments become more complex in the market; therefore, stock markets emerge in such a particular economy. However, the expansion of both banks and stock markets in the economy significantly affects the economic growth of countries (Levine & Zervos, 1998; Beck & Levine, 2004). After controlling stock market development, the association between bank development and economic growth in their study, was found to be negative (Naceur & Ghazouani, 2007).

There are economists who think that it is economic growth which promotes financial development (Gurley & Shaw, 1955). The expansion of economy tends to demand more financial services and new financial instruments. Then, the financial sector will adjust itself as per the financial needs available in the economy; therefore, it will fit those financial needs of

the society. In this scenario, financial development is a result of the increase in economic development. This argument agrees with that of Chick (1983) who argued that the extent to which economic growth causes financial development depends on how advanced financial intermediation is.

On the other hand, financial development and economic growth can influence each other in the development process of the countries. That means, in all stages of countries development, both the financial sector and the real sector interact with each other. There is a positive influence between financial development and economic growth in the development process (Arestis & Demetriades, 1997). To put it clearly, in all stages of development in a particular society, there is not only a way direction between the financial sector and real sector, which stand for financial development and economic development respectively. However, the possibility of a relationship between financial development and economic growth has raised a question about the role of the financial sector in an economy's development; as it has been argued by Aryeetey (2003) that, there has been a very little motivation for finance to react to the requirements of the real sector, due to the unchanging structures of economies.

Despite the fact that the financial sector should react to the requirements of the real sector, Aryeetey (2003), observed that there is no expansion in the real sector and it has been characterized by unstable performance. Therefore, in order for the financial sector to react to the demands of the unstably performing real sector, in the past few decades a lot has been done in African financial markets. For instance, banking institutions have been restructured, other money market institutions have been formulated, African capital markets integrated with other foreign markets have been developed, the participation of microfinance institutions has been increased in mobilizing savings and credits, informal finance has been growing significantly, bank ownership has been extended to private sector ownership, and microfinance and non-banking financial institutions have been increased rapidly, just to mention a few. According to Aryeetey (2003) the improvement in technology and the introduction of a few new products in Africa is a result of an increase for the private sector banking ownership in African economies.

Therefore, with regard to theoretical and empirical works on the causal relationship between financial development and economic growth discussed above, this chapter is intended to

contribute to the existing literature using the linear dynamic panel data approach[14] (Arellano & Bover, 1995; Blundell & Bond, 1998) to answer the following questions:-

- *Is there a long-run relationship between the proxies of both financial development and economic growth in East African countries*?
- *Does financial development play any role in economic growth of East African countries?*
- *What is the direction of causality relationship that exist between financial development and economic growth in East African countries? Is it a supply-leading or demand-following (for unidirectional) or bi-directional relation*?

2.4 Data and Data Sources

To examine the relationship between financial development and economic growth, we need indicators of financial development and a measure of economic growth. This study uses the Domestic credit provided by banking sector (DCPBS), the Domestic credit to private sector (DCPS), money supply (M2) to indicate financial development; economic growth is indicated by GDP per capita growth (annual %), and additional variables are Government consumption expenditure (GVT consumption) percentage of GDP, inflation-consumer price (IFR) annual percentage and foreign direct investment (FDI) percentage of GDP. The data were all collected from 1988 to 2010 to account for 22 years' data period. The data were collected from the World Bank, World Development Indicators and Global Development Finance online (2012). We also collected some data that were missing in the World Development Indicators for some of the selected countries from the East African Community Statistics Portal on Economy and Finance Indicators[15] (EAC, 2013). We transformed our data set into logarithmic form in order to normalize the data, to reduce the highly skewed (see Appendix 2a) into less skewed distribution, to make the pattern more visible (see Appendix 2b), which will help to make a relationship between the dependent and independent variables more clear, hence, to improve the interpretability. The sample data for DCPBS, DCPS, M2 and GDP per capita growth can be seen in Figure 2.6, Figure 2.7, Figure 2.8 and Figure 2.9 below respectively.

[14] It is an approach that the lags of dependent variable are included in the right-hand side of the model as covariates and as well it contains fixed/random unobserved panel-level effects, which are correlated with the lagged dependent variables that result to inconsistence of the standard estimators. For more information on linear dynamic panel data approach; see Arellano and Bond (1991), Arellano and Bover (1995) and Blundell and Bond (1998).

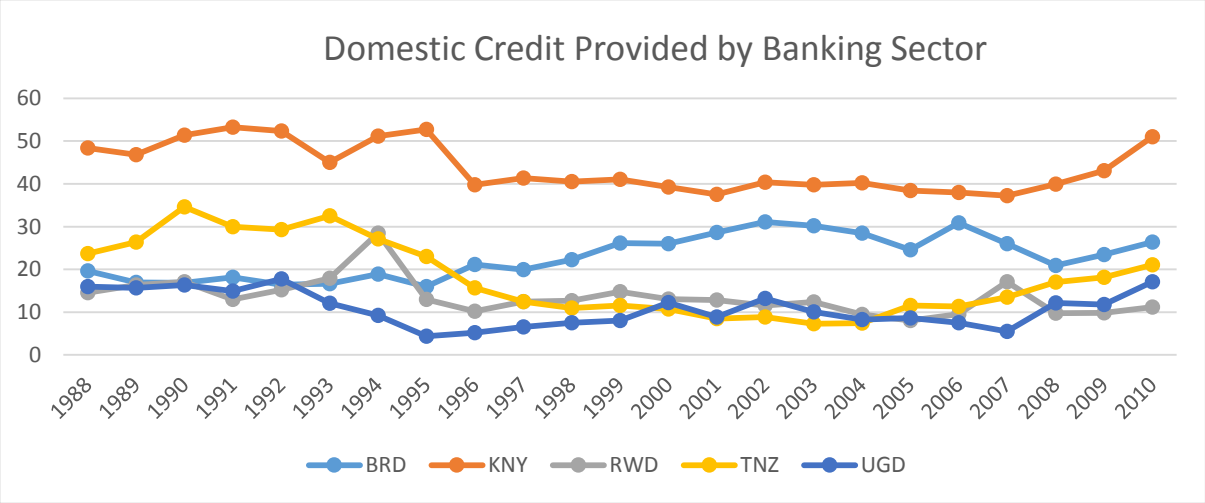
[15] See http://www.eac.int/statistics/index for more information on economy and finance indicators for East African Countries.

2.4.1 The Proxies for Financial Development

In this study the proxies for financial development are domestic credit provided by the banking sector (Yartey, 2007), domestic credit to private sector (Ahmed, 2010) and broad money or money and quasi money (M2) (Yartey, 2007; 2008). We exclude liquid liabilities (M3) (Odhiambo, 2011a), which has been used as an additional measure of financial development in other studies (Wolde-Rufael, 2009; Akinlo & Egbetunde, 2010; Hassan et al., 2011). However, unlike other empirical studies that used only one proxy of financial development when investigating its relationship with economic growth (Christopoulos & Tsionas, 2004), in order to give a robustness lacking in single measure of financial development studies, this study uses three proxies for financial development.

Domestic credit provided by the banking sector *(DCPBS)* consists of all credit to different sectors, but without including credit to the central government. According to the World Bank's World Development Indicators (Metadata) the banking sector stands for monetary authorities, deposit money banks (such as commercial banks), and other banking institutions where the availability of data is reliable (even institutions that reject transferable deposits but accept time and savings deposits). As per the World Bank development indicators (2012) the term other banking institutions refers to institutions that offer savings and mortgage loans and associations for building and loans. When DCPBS is found to be high, then the degree of dependence in the banking sector for financing is high (Hassan et al., 2011); or in other words it indicates that financial development is high because banks are in a position to perform all important financial functions, as provided in the study of Levine (1997).

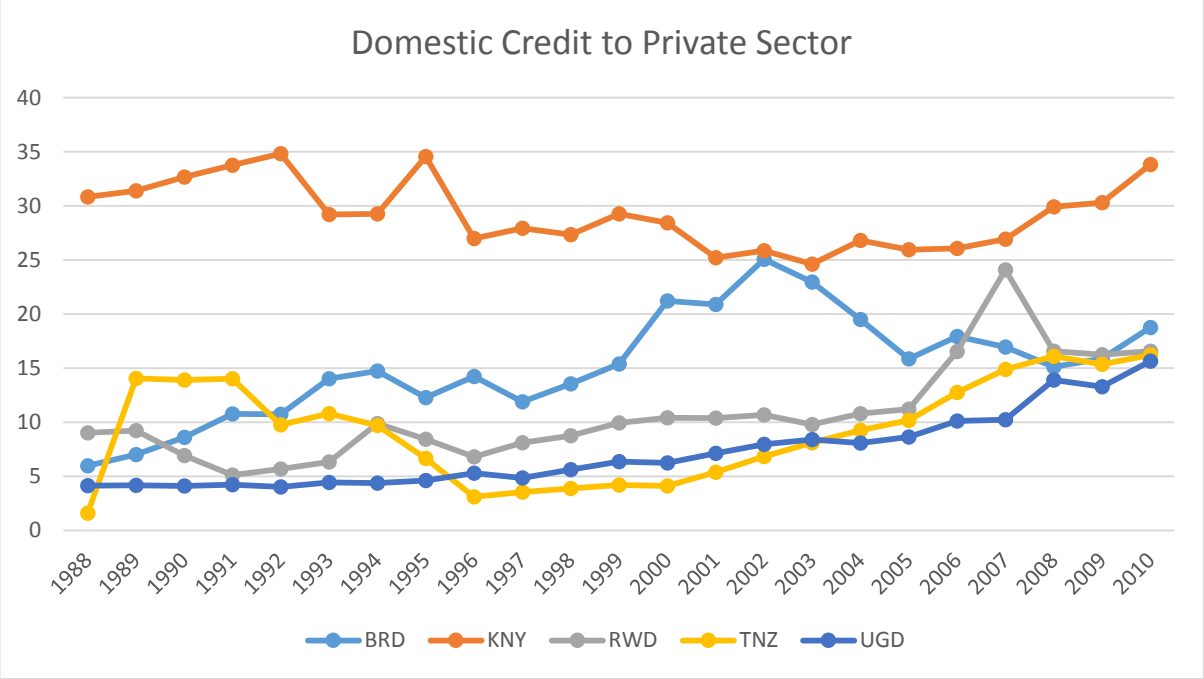
Figure 2.6: Domestic Credit Provided by Banking Sector (DCPBS) in EAC



Source: World Bank, World Development Indicators and Global Development Finance (2012)

Domestic credit to private sector *(DCPS)* is another proxy for financial development in this study. DCPS is taken as a measure of financial development because of the weakness DCPBS; that banks are not supposed to authorize loans to priority sectors and/or required to hold government securities (Hassan et al., 2011). By definition, DCPS may refer to financial resources (such as loans, non-equity securities bought, and accounts receivable given to private sectors and trade credits) for which, in the end, a claim for repayment will be established. These claims for repayment may involve credit to the public sector in some countries (World Bank 2012). According to Hassan, et al. (2011), a high rate of DCPS to GDP shows the availability of both a higher rate of domestic investments and higher level of financial system development. Conducting more research on borrowers' firms, exercising corporate control, risk management control, facilitating transactions and enabling mobility of savings are the important functions of financial systems where financial credits are allocated to the private sector (Levine, 2005).

Figure 2.7: Domestic Credit to Private Sector (DCPS) in EAC



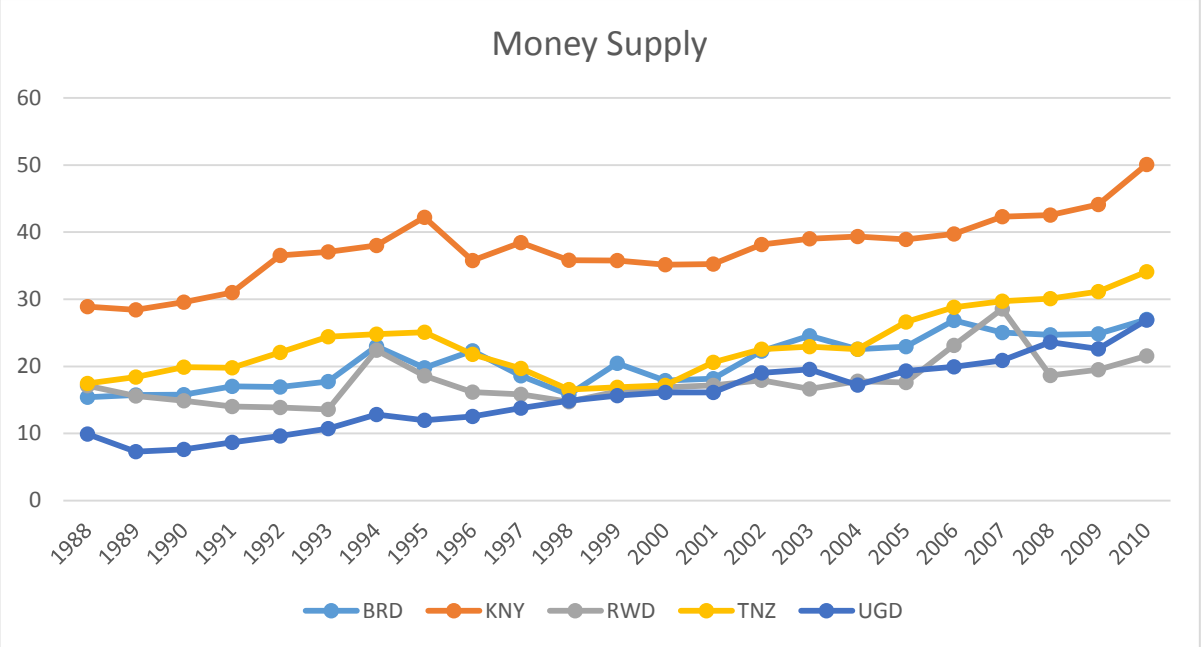
Source: World Bank, World Development Indicators and Global Development Finance (2012)

Money and quasi money *(broad money or M2)* is another proxy for financial development in this study. M2 usually includes the total of currency circulated outside banks, none-central government demand deposits, and the deposits of foreign currency by resident sectors and not that of the central government, and time and savings deposits. The study uses M2, although it possesses some weaknesses that make it a poor measure of financial development in economies with underdeveloped financial sectors (Hassan et al., 2011). This is due to the fact that the data

for M3 (liquid liabilities for the banking system in the economy) as a measure for financial development used in many empirical studies (Wolde-Rufael, 2009; Akinlo & Egbetunde, 2010; Hassan et al., 2011; Odhiambo, 2011b) was unavailable in some of the countries selected for long periods of time.

Despite the fact that M3 was found to be unavailable in some of the selected countries, Levine and Zervos (1998) showed that it has weaknesses as it is only financial depth that is measured by the indicator M3/GDP. They argued that M3/GDP does not show whether exactly the concerned liabilities are those from banks, countries' central banks or from other financial intermediaries. They then suggested the use of bank credit as an indicator to measure financial development. That is why in this study we use Domestic credit provided by banking sector (% of GDP) as one of the measures of financial development.

Figure 2.8: Money Supply (M2) in EAC



Source: World Bank, World Development Indicators and Global Development Finance (2012)

2.4.2 Additional Variables in the Model

Any country's economic growth might be influenced by other variables that are excluded from the model, causing biased results on the causal link between financial development and economic growth. Therefore, to avoid simultaneous biasness (Gujarati, 1995) in the results of our regression model, we include the three additional variables: FDI (% of GDP), Government consumption expenditure (% of GDP) and Inflation, consumer price (annual %) as control variables. Having them in our regression model as additional variables may bring more

accurate results on the causal link between financial development and economic growth of the panel countries.

Foreign Direct Investments-net inflows stand for investment net inflows to obtain a management interest in a business enterprise that is functioning in an economy other than that of the investor. FDI-net inflow includes equity capital, earnings reinvested, short term-capital and other long-term capital as can be seen in balance of payments. The source continues to explain that FDI-net inflow (% of GDP) indicates net inflows from foreign investors in the stated economy, which at last is divided by GDP. The study includes Foreign Direct Investments (FDI) as an additional variable to explain economic growth because it has been found that FDI is a crucial tool for the mobility of technology, and when compared with domestic investments, it contributes fairly highly to economic growth (Borensztein et al., 1998). FDI is also found to have positive impact on economic growth in many previous studies (Zhang, 2001b; Zhang, 2001a; Mencinger, 2003; Nowbutsing, 2009; Nazir et al., 2010), while other studies found that there is a positive relation between FDI and economic growth, although countries with well-developed financial markets achieve more from FDI (Alfaro et al., 2004).

General government final consumption expenditure *(% of GDP)* is one of the additional variables included in this study. According to World Bank World Development Indicators (metadata), general government final consumption expenditure refers to all current expenditures by the government for buying commodities including employees' compensations. The source continues to define it (Gvt cons exp) by adding that it also involves most of the defence and security expenditure of a nation. We include it as one of our explanatory variables since we believe that it has big impact on the growth of the economy of every state. There are recent studies that also used government consumption as one of the controlling variables (Levine & Zervos, 1996; Bangake & Eggoh, 2011; Rachdi & Mbarek, 2011); for example in their study Bangake and Eggoh (2011) found that government consumption expenditure was statistically significant with a positive coefficient against economic growth.

Inflation-consumer prices *(annual %)* is also one of the control variables added in this study to explain the dependent variable economic growth. In this study, inflation as measured by the consumer index stands for percentage change in the cost of acquisition of a basket of commodities (goods and services) to the average consumer on a yearly basis (World Bank World Development Indicators-Metadata). We include inflation rate (inflation-consumer price) in our regression model because we believe that in one way or another it might affect the

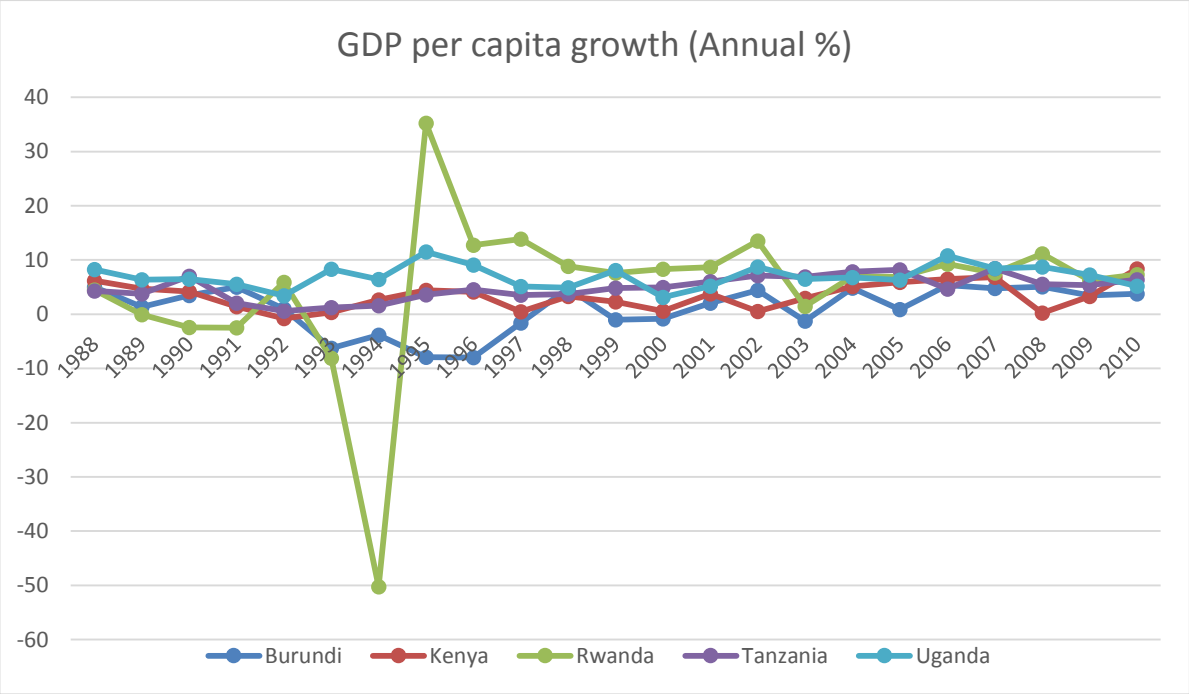
economic growth of the countries; inflation rate is also used as a control variable in some previous studies (Levine & Zervos, 1996).

2.4.3 Measurement for Economic Growth

In this study the measure of economic growth is *GDP per capita growth (annual %)* of the selected countries. The GDP per capita growth was used in many of previous empirical studies to measure economic growth (Pradhan et al. 2015; Ahmed and Wahid, 2011; Beck and Levine, 2004; Rousseau and Wachtel, 2000; Levine and Zervos, 1996; Atje and Jovanovic, 1993); therefore, we also use GDP per capita growth to measure the economic growth of the East African countries. One can see the data of GDP per capita growth and their trends in 5 selected East African countries from 1988 to 2010 in Figure 2.9 below. While, other East African countries' GDP per capita growth have been fluctuating in lower rate, the one for Rwanda and Burundi fluctuated in high rate from 1991 to 2003 and 1991 to 1998 respectively. For example, in Rwanda, the GDP per capita growth accounted for -50 percent in 1994 and of a sudden it accounted for 35 percent in the following year 1995, and keep decreasing in the following year 1996 to account only 12 percent (see Figure 2.9). The GDP per capita growth in Burundi have also accounted for negative percentage rate for five consecutive years between 1992 and 1997.

This massive fluctuation of the GDP per capita growth in Burundi and Rwanda, especially in 1990s was caused by the countries' civil wars, which resulted to mass killing of people and therefore no production towards contribution of economic growth. The remaining countries Kenya, Tanzania and Uganda, their GDP per capita growth from 1988 to 2010 have been positively fluctuated between 3.4% to 11.5% for Uganda, 0.5% to 8.4% for Kenya and 0.6% to 8.2% for Tanzania. However, the Ugandan GDP per capita growth has been increasing at a lower rate from 3.2% (2000) to 10.8% (2006), before sloped gently to 5.2% in 2010, compared with Kenya (1% in 2002 to 7.5% in 2007) and Tanzania with 0.6% (1992) to 8.2% (2005). It can be seen from the Figure 2.9 below that the GDP per capita growth of Tanzania has been steady growing from 1992 to 2005, compared with other East African countries which have seen fluctuations on their GDP per capita growth (annual %), the verdict is that until 2010 the GDP per capita growth was led by Kenya (8.4%), followed by Rwanda (7.3%), Tanzania (6.4%), and Uganda (5.2%) and Burundi (3.8%). Therefore, this study is intended to find out if these changes (of the GDP per capita growth) have contributed to or been associated with the selected indicators of financial development in the said countries.

Figure 2.9: GDP per capita growth (Annual %) for EAC



Source: World Bank, World Development Indicators and Global Development Finance (2012)

2.5 Dynamic Panel Data Estimation Techniques

The use of the panel data approach in estimating the relationship between various macroeconomic variables across countries has been common in many recent studies. The panel data approach usually allows the control of unobserved or/and missing variables through country-specific effects that are also identified by the use of panel data. This study adopts the dynamic panel data approach to examine the relationship between financial development and economic growth in five East African countries. It is an approach in which the lagged dependent variables are included in the right-hand side of the model as other independent variables. The dynamic panel model contains fixed/random unobserved panel-level effects, which are correlated with the lagged dependent variables that cause inconsistency of the standard estimators' results. A consistent generalized Method of Moment (GMM) estimator was then derived by Arellano and Bond (1991) in order to control for any possible errors and biases (inconsistency) of the standard estimators' results.

Since our study is a dynamic panel data approach, the data may involve both country-specific effects and time effects that may be correlated with covariates and result in errors and biases; we are, therefore, required to estimate the model in a dynamic manner that will also remove all country specific effects and time effects, which will as well help this study to control for possible errors and biases, hence to avoid inconsistency of the standard estimators' results.

This study uses the GMM of Arellano & Bover (1995) and Blundell and Bond (1998) due to the fact that they argued against the estimators of Arellano and Bond (1991) by indicating one more assumption that when instrumental variables are measured at first differences, they are not correlated with fixed effect.

2.5.1 GMM System Approach

GMM is a dynamic instrumental variable modelling approach whereby the lags of the dependent variable (economic growth) and the differences of explanatory variables (proxies of financial development and additional variables) are used together as instruments to control for any bias (endogeneity bias, simultaneity bias and missing variable bias) introduced, hence to avoid inconsistency of the standard estimator's results. The GMM approach by Arellano & Bover (1995) and Blundell and Bond (1998) is built in two equations, the original equation and the transformed equation which is known as the "System Generalized Method of Moments". Both one-step and two-step GMM estimators were derived by Arellano and Bond (1991) with the use of moment conditions whereby the instruments for the differenced equation are lagged levels of both dependent variables and predetermined variables.

The lagged level-instruments estimator (Arellano & Bond, 1991) is said to be weak since the AR process seems to be too persistent; or the panel-level effect (v_i) variance over the idiosyncratic error (ε_{it}) variance ratio seems to be too large (Blundell & Bond, 1998). A system estimator for the level equation applies the moment conditions whereby the lagged differences are utilized as instruments, as an addition to the moment conditions whereby the lagged levels used as instruments in the differenced equation (Arellano & Bover, 1995; Blundell and Bond, 1998). It has been said that it is crucial to use instruments in the dynamic panel data, simply because there may be correlation between the lagged dependent variable ($\Delta y_{i,2}$) and lagged error terms ($\Delta\varepsilon_{it}$) (Adjasi & Biekpe, 2006). According to Blundell and Bond (1998) the additional moment conditions become valid where all i held the assumption that the initial condition $E[v_i \Delta y_{i,2}] = 0$. Both Arellano & Bover (1995) and Blundell & Bond (1998) assume the estimator that applies additional moment conditions with no autocorrelation in the idiosyncratic errors (ε_{it}).

Therefore, with the reason that the method assumes the theoretical relations between the estimators satisfies the 'orthogonality conditions', which denote that the correlations between the instrumental variables and explanatory variables is close to zero, meaning that the differenced instrumental variables are not correlated with fixed individual effects. Another

reason is that the Arellano & Bover (1995) and Blundell & Bond (1998) approaches have a better small sample data (the case with our data): The empirical model used in this study to examine the interactions between financial development and economic growth of five countries, Burundi, Kenya, Rwanda, and Tanzania and Uganda, which together form the East African community is based on Levine et al. (2000), Adjasi and Biekpe (2006), Rachdi and Mbarek (2011) and Egbetunde and Akinlo (2014). The system GMM representation of the data-generating structure can be seen here under: -

$$y_{it} = \alpha y_{i,t-1} + x'_{it}\beta + \varepsilon_{it} \quad (2.1)$$

$$\varepsilon_{it} = \mu_i + v_{it}$$

$$E[\mu_i] = E[v_{it}] = E[\mu_i v_{it}] = 0$$

Our equation 2.1 above has two orthogonal components, which are the cross-section fixed effects, μ_i, and the idiosyncratic shocks, v_{it}. Whereby, y represents the dependent variable and x's represents the explanatory variables in the collected data; we can therefore rewrite our equation 2.1 above to include our selected variables in this study as follows: -

$$GDP_{it} = \sum_{j=1}^{p} \alpha_j GDP_{it-j} + \beta_1 DCPBS_{it} + \beta_2 DCPS_{it} + \beta_3 M2_{it} + \beta_4 GVT_{it} + \beta_5 FDI_{it}$$

$$+\beta_6 INF_{it} + \mu_i + v_{it} \quad (2.2)$$

Where: $i = 1,..., N$; $t = 1,..., T_i$

- GDP represent the *GDP growth (annual %)* which is a measure of economic growth. The $\alpha_1,..., \alpha_p$ are *p* parameters to be estimated in the lagged dependent variable GDP_{it-j}
- DCPBS stands for explanatory variable *domestic credit provided by banking sector*, estimated by coefficient β_1.
- DCPS represent explanatory variable *domestic credit provided to private sector*, estimated by coefficient β_2.
- M2 stands for explanatory variable *money and quasi money supply*, estimated by coefficient β_3.
- GVT denotes *general government final consumption expenditure*, estimated by coefficient β_4

- FDI indicates explanatory variable *foreign direct investment*, estimated by coefficient β_5.
- INF stands for additional variable *inflation-consumer price* (annual %), estimated by coefficient β_6.
- μ_i represents the panel-level effects (fixed effect which may be correlated with covariates DCPBS, DCPS, M2, GVT, and FDI and INF).
- v_{it} is the idiosyncratic error term.

2.5.2 Panel Unit Root testing for selected Variables

The unit root in panel data is just the combination of information from both time series and cross-sectional dimensions; with the purpose of making the existence of unit roots more direct and precise by considering the cross-sectional aspect, most importantly in the circumstances where the data for time series are not long but data of that kind might be found from a unit of cross-section, for example in this study, East African countries (Banerjee, 1999). The panel unit root test is said to be more powerful in examining the stationarity of the variables to be used in a study compared to the unit root test of individual cross-section or time series data (Christopoulos & Tsionas, 2004; Baltagi et al., 2007). In other words, the use of panel data unit root tests instead of unit root tests based on time series should be considered as a way of increasing the power of the unit root test (Maddala & Wu, 1999).

There are different methods for computing panel data unit root tests, which differ with the assumptions on the null hypothesis to be given and how they remove the autocorrelation; the tests are Im-Pesaran-Shin test, Levin-Lin-Chu test (Levin et al., 2002; Im et al., 2003), Fisher-type tests that use both augmented Dickey-Fuller (ADF) and Philips-Perron (PP) tests (Maddala and Wu 1999), the Breitung test (Breitung, 1999), the Hadri test (Hadri, 2000) and the Choi test (Choi 2001). Thus, before we proceed to the panel cointegration, we first have to look whether all of our variables are stationary and integrated to the same order. To achieve that, this study uses the Levin-Lin- Chu method (Levin et al. 2002) and Breitung unit root method (Breitung, 1999).

We use these methods because our data are balanced, and these methods are suitable for balanced panel rather than unbalanced panel data. These two methods, both the Levin-Lin-Chu and Breitung tests assume the common (the same autoregressive parameters in all panels under the alternative hypothesis of stationarity) unit root process on their null hypothesis. The other method that is also suitable for balanced panel data is the Hadri test, though we do not use the

method because it is designed for a panel data set with large T and moderate N [this study has only five cross-sections (*N*), which is not moderate, and 22 periods (*T*)]

2.5.2.1 Levin-Lin-Chu and Breitung Tests

The Levin-Lin-Chu and Breitung tests are tests that employ the null hypothesis of a unit root, which assume the existence of a common unit root process (therefore, $p_i = p$ for all i). They are represented by the following basic ADF equation:

$$\Delta y_{it} = \alpha y_{it-1} + \sum_{j=1}^{p_i} \beta_{ij} \Delta y_{it-j} + X'_{it}\, \delta + \varepsilon_{it} \qquad (2.3)$$

Whereby it is assumed a common $\alpha = p - 1$, while the lag order for the difference terms p_i is allowed to vary across East African countries. Since there will be sufficient lags to be included in $\Delta y_{i,t}$ from question (2.3) above, then ε_{it} will stand as white noise. This is due to the reason that the test does not consider ε_{it} to have the same variance across all East African countries. Therefore, the null hypothesis of the model will be [H_0: $\alpha = 0$]; that is panels contain unit roots, while the alternative hypothesis will be [H_a: $\alpha < 0$]; that is, panels are stationary.

The LLC method of unit root test derives the estimates of α from the variable that explain the dependent variable $\Delta y_{i,t}$ and $y_{i,t}$ that will be standardized and left to control the serial correlation (to free autocorrelations), as well as the deterministic trend. In their study LLC (2002) recommended that their method is suitable for panel data, in which the panel N is smaller relative to time period T. Therefore, the LLC method is found to suit our study, because the number of cross-sections is only 5 (East African countries) and the number of T is 22.

In the Breitung method for unit root test, the demand is only for specification of the lag orders that have to be used in each cross-section ADF regression, p_i, and the explanatory variables (exogenous regressors). The regression for $\Delta y_{i,t}$ and $y_{i,t-1}$ on $\Delta y_{i,t-1}, \ldots, \Delta y_{i,t-p}$ is done when the trend option is not specified; and therefore, the residuals from those regressions should be used in place of $\Delta y_{i,t}$ and $y_{i,t-1}$ to make computation of the test. The Breitung test is said to have enough power even with small panel data sets (we assume that our panel data set is small with only $N = 5$ and $T = 22$); therefore, it is good for us to use the Breitung method for unit root as it also suits our panel data. It should be noted that the Breitung test assumes that the idiosyncratic error term ε_{it} does not correlate with both i and t.

2.5.3 Panel Cointegration Testing

Having shown how we test for the panel unit root (the order of stationary), the following task is to determine if a cointegrating relationship exists between financial development and economic growth. This study applies combined individual tests, which are the Fisher-type and Johansen panel cointegration tests suggested by Maddala and Wu (1999). With the use of Fisher-type results, Maddala and Wu (1999) extracted an alternative approach for testing panel data cointegration by making combination of tests from individual cross-sections (in our case countries) to attain a test statistic for the full panel. The ADF-Stat is most robust for small sample studies like our study, which involves a small number of observations; therefore, we use this statistic to test the cointegrating relationship between financial development and economic growth in five East African countries (Burundi, Kenya, Rwanda, Tanzania and Uganda). The null hypothesis of no cointegration is tested in this suggested method. Therefore, if π_i defined as the *p*-value from an individual cointegration test for country *i*, then under the null hypothesis for the panel (East African countries and the respective time under the studies), one should have the asymptotic result that:

$$-2\sum_{i=1}^{N}\log(\pi_i) \rightarrow x_{2N}^2 \qquad (2.4)$$

The study uses the χ^2 value suggested by MacKinnon-Haug-Michelis (1999) *p*-values to make decisions on both Johansen's cointegration test and maximum eigenvalue test.

2.5.4 Granger Causality Tests

Another step in this part of the study involves analysing the direction of the panel data causal relation between financial development and economic growth. Indeed, the procedures for unit root test are only for showing whether or not the variables are stationary, and the panel cointegration test for determining if there is an equilibrium long-run relationship between financial development and economic growth. To identify the causality between financial development and economic growth we use the Engle-Granger test (Engle & Granger, 1987) to test for causality. In general, two basic bivariate equations can only be estimated in a panel data using Granger Causality Tests; these are:

$$y_{i,t} = \alpha_{0,i} + \alpha_{1,i}y_{i,t-1} + \ldots + \alpha_{1,i}y_{i,t-1} + \beta_{1,i}x_{i,t-1} + \ldots + \beta_{1,i}x_{i,t-1} + \varepsilon_{i,t} \qquad (2.5)$$

$$x_{i,t} = \alpha_{0,1} + \alpha_{1,i} x_{i,t-1} + ... + \alpha_{1,i} x_{i,t-1} + \beta_{1,i} y_{i,t-1} + ... + \beta_{1,i} y_{i,t-1} + \varepsilon_{i,t} \quad (2.6)$$

Whereby; term *t* shows the time period dimension of the panel and term *i* indicates the cross-sectional dimension, *y* denotes the dependent variable economic growth (GDP), and *x* denotes the independent variables (the proxies of financial development and other included variables). The various methods of causality tests in the panel differ in the assumptions made on the homogeneity of the coefficients across the cross-sections. This study applies the approach that we assume all coefficients given in equations 2.5 and 2.6 above are different across the East African countries, Kenya, Tanzania, Uganda, Rwanda and Burundi (Dumitrescu & Hurlin, 2012): homogenously, the Dumitrescu and Hurlin method is:

$$\alpha_{0,i} \neq \alpha_{0,j}, \alpha_{1,i} \neq \alpha_{1,j}, ..., \alpha_{1,i} \neq \alpha_{1,j}, \forall i, j \quad (2.7)$$

$$\beta_{1,i} \neq \beta_{1,j}, ..., \beta_{1,i} \neq \beta_{1,j} \forall i, j \quad (2.8)$$

2.6 Descriptive Statistics of the Selected Variables

Table 2.3 below shows the summary statistics of selected financial development and economic growth indicators of the five East African countries included in this study. The average GDP per capita growth across the panel for the period under study was at 1.4 percent and gives an indication of the low level of economic growth in East African countries. The average however does not indicate the variations among individual countries selected in this study. The values vary from the minimum of -47.7 percent to the maximum of 37.1 percent, which is very huge gap among the countries in a panel. In the case of domestic credits to private sector, the mean value of 2.5 percent is indicative of the low rate of domestic credits granted to private sectors in the East African financial system. However, the minimum and maximum values in the DCPS are not wide as they vary between the minimum of 0.46 percent to 3.55 percent.

The domestic credit provided by banking sector, another measure of financial development, has an average of 2.9 percent to indicate that there is also low rate of loans granted by banking sector in the panel of five East African countries. The minimum and maximum values of DCPBS vary between 1.48 percent to 3.98 percent respectively, this is also not a big gap among the East African countries. Another indicator of financial development is money supply, which has a mean of 3.06 percent indicating low level of money supply in the economy of East African countries; with the maximum value of 1.99 percent and minimum value of 3.98

percent. The average values of the additional variables FDI, GVT consumptions and inflation-CP are -1.41 percent, 2.67 percent and 2.19 percent respectively. Moreover, the standard deviations of the indicators of financial development (DCPS, DCPBS and Money-M2) have the values 0.67 percent, 0.61 percent and 0.39 percent respectively (Table 2.3); the additional variables FDI, GVT consumption and Inflation-CP have values 2.94 percent, 0.28 percent and 1.02 percent respectively, which are very low standard deviations indicating that the deviation/dispersion from the mean values shown above is very small; hence, we can rely on our panel data set.

Table 2.3: Summary Statistics on Panel Data

Variable	Mean	Std. Dev.	Min	Max
GDP per capita	1.419	6.707	-47.723	37.128
DCPS	2.457	0.670	0.459	3.551
DCPBS	2.904	0.605	1.477	3.975
Money (M2)	3.058	0.389	1.986	3.914
FDI	-1.412	2.944	-13.495	1.899
GVT Consumption	2.665	0.282	1.942	3.452
Inflation (CP)	2.186	1.017	-2.676	5.279

2.7 Empirical Results

2.7.1 Panel Unit Root Results

In Table 2.4 are the displayed results from the unit root tests for GDP per capita growth (a proxy for economic growth), DCPBS, and DCPS and money supply (M2) as the proxies for financial development. The stationarity results on control variables (FDI, Government consumption and Inflation-consumer price) included in this study can also be seen Table 2.4 below. The results for panel unit root tests on all variables selected as the proxies for economic growth and financial development are displayed in Table 2.4 below, together with other selected controlling variables. Since the correction method for autocorrelation between variables and white noise is the number of lags for most of the unit root methods used in this study, we select our number of lags using the Schwarz Info Criterion (SIC) for each variable. When regressing our equations for panel unit root, our LLC tests include both individual intercept and individual linear trend. This indicates that our unit root test allowed the inclusion of the panel-specific means in equation 2.3 above. By so doing, the study assumes the time dimension, T must grow even faster than the number of countries included N.

It can be seen in the results that except for foreign direct investments and inflation-consumer price, which were found to have unit root at both level and first differences when tested using the Breitung method, and the GDP per capita growth when tested using both LLC and Breitung methods; the other variables, Domestic Credit to Private Sector, Money Supply, and General Government Final Consumption were found stationary at first difference when tested using all selected methods for unit root tests. However, other variables were found stationary even at level. Thus, at first difference the null hypothesis [H_0: $\alpha = 0$] that the panels contain unit roots is strongly rejected in favour of the alternative hypothesis [H_a: $\alpha < 0$] that the panel series are stationary at first difference. We, therefore, in this study confirm the results that all the variables tested show that they are stationary at first difference (see Table 2.4 below).

Table 2.4: Panel Unit Root Results

Method	LLC	Breitung
GDP	-5.22**	-2.74**
D(GDP)	-8.76**	-4.86**
DCPBS	0.42	0.76
D(DCPBS)	-6.71**	-4.70**
DCPS	1.98	1.82
D(DCPS)	-1.93*	-3.71**
Money (M2)	-1.91*	-1.17
D(Money-M2)	-7.06**	-3.97**
FDI	-4.54**	-1.86*
D(FDI)	-5.87**	0.49*
Gvt-Consum	-0.51	-0.23
D(Gvt-Consum)	-6.15**	-5.38**
Inflation	-15.72**	-0.99
D(Inflation)	-9.11**	0.13*

Note: Variables are presented both at level and first differences, variables in the brackets are the one reported at first differences, * and ** indicate stationary at the 5% and 1% levels of significance respectively. The Null hypothesis of both Unit root methods by LLC and Breitung are assuming common unit root process. The probabilities of both tests conducted assume asymptotic normality.

2.7.2 Panel Cointegration: Long-run Equilibrium Relationship Results

Having confirmed that all the chosen series in this study are integrated of order one (that they are stationary at first difference), the next step is to test for panel cointegration so as to detect the existence of a long run equilibrium relationship between financial development and economic growth. To test for panel cointegration, the study used the approach introduced by Maddala and Wu (1999); that is the Fisher-type test based on Johansen's test methodology, which combines the tests from individual cross-sections (East African countries) to attain a test statistic for the full panel. Table 2.5 below reports the results for the panel cointegration for the group and for individual countries (East African countries included in our study).

The results of testing cointegrating relations using Johansen Fisher Panel cointegration test, presented in Trace Test Statistics and the Maximum Eigenvalue Statistics, show that from six cointegrating relations ($r \leq 1$, $r \leq 2$, $r \leq 3$, $r \leq 4$, $r \leq 5$ and $r \leq 6$) and no cointegrating relation ($r = 0$), two cointegrating relations which are $r \leq 5$ and $r \leq 6$ were found insignificant (from both Trace test and Maximum Eigenvalue) when tested under a group. However, other four cointegrating equations ($r \leq 1$, $r \leq 2$, $r \leq 3$, $r \leq 4$) were found to be significant at 1% level when reported at both Trace test and Maximum Eigen test –Fisher statistics. Therefore for the group result shown in Table 2.5 below, using the Fisher statistics from both the Trace test and Maximum Eigen test, we reject the null hypothesis of no cointegration in four cointegrating equations ($r \leq 1$, $r \leq 2$, $r \leq 3$, $r \leq 4$); while, the null hypothesis could not be rejected in other two cointegrating equations ($r \leq 5$ and $r \leq 6$), since the statistics were found to be insignificant. Thus, having only two cointegrating vectors that failed to reject the null hypothesis of no cointegration, the study confirms the existence of cointegrating relations between financial development and economic growth in the East African countries when taken as a region, the East African Community.

When coming to analyse the results obtained from individual cross-section as presented in Table 2.5 below, the study finds that the null hypothesis of at most one cointegration relationship ($r \leq 1$) is rejected in favour of the alternative hypothesis, which states that there is existence of more than one cointegration relationship in East African countries. It can be seen in all five countries of East African Community, when H_0: $r \leq 1$, their cointegration test statistics were found to have statistical significance at the 1% level, therefore, confirming the existence of a cointegration relationship between financial development and economic growth in each individual country. The same applies when the null hypothesis is tested for $r \leq 2$ that there is long-run equilibrium relationship between financial development and economic growth

in every country of East Africa individually. However, when the null hypothesis is tested for r ≤ 3, we reject the null and accept the alternative hypothesis of the existence of cointegration for Burundi and Kenya at 5% and 10% levels of significance when reported at Trace test statistics and maximum Eigen statistics respectively; but in other countries at the 1% level of significance from both reported statistics. When testing the null hypothesis in cointegration r ≤ 4, we find mixing results from individual East African countries, since that the null hypothesis could only be rejected for Tanzania and Rwanda, which were found to have a cointegrating relationship between financial development and economic growth; while in the remaining three countries (Burundi, Kenya and Uganda), their test statistics from both trace and maximum Eigen tests were found insignificant, hence, no cointegrating relationship between financial development and economic growth.

No country was found to have a cointegrating relation between financial development and economic growth when testing the null hypotheses for r ≤ 5 and r ≤ 6 cointegrating relationships. This is because the test statistics were found to be insignificant in all included five countries (Burundi, Kenya, Tanzania, Uganda and Rwanda). The levels of significance were insignificant in both trace and maximum Eigen test statistics (see Table 2.5 below); therefore, the study failed to reject the null hypothesis of no cointegration over the alternative hypothesis in both r ≤ 5 and r ≤ 6 cointegration relationships between financial development and economic growth for the East African countries. Hence, using the group results presented in Table 2.5 below, this study confirms the existence of an equilibrium long-run relationship between financial development and economic growth in East African countries.

Table 2.5: Panel Cointegration Results

Johansen Fisher Panel Cointegration Test
Unrestricted Cointegration Rank Test (Trace and Maximum Eigenvalue)

Hypothesized No. of CE(s)	Fisher Stat.* (from trace test)	Prob.	Fisher Stat.* (from max-eigen test)	Prob.
None	92.10	0.0000	92.10	0.0000
r ≤ 1	251.8	0.0000	128.9	0.0000
r ≤ 2	154.5	0.0000	106.0	0.0000
r ≤ 3	72.21	0.0000	62.90	0.0000
r ≤ 4	22.01	0.0150	20.33	0.0263
r ≤ 5	9.665	0.4704	9.852	0.4535
r ≤ 6	8.650	0.5656	8.650	0.5656

* Probabilities are computed using asymptotic Chi-square distribution.

Individual Cross Section Results				
Cross Section	Trace Test Statistics	Prob.**	Max-Eign Test Statistics	Prob.**
Null Hypothesis H_0: r = 0				
Burundi	919.8901	0.0001	721.1170	0.0001
Kenya	911.8472	0.0001	737.6746	0.0001
Rwanda	1009.6676	0.0001	695.0835	0.0001
Tanzania	962.0516	0.0001	689.3203	0.0001
Uganda	906.8367	0.0001	721.1170	0.0001
Null Hypothesis H_0: r ≤ 1				
Burundi	198.7731	0.0000	101.7255	0.0000
Kenya	174.1726	0.0000	73.6358	0.0000
Rwanda	314.5841	0.0000	166.3096	0.0001
Tanzania	272.7313	0.0000	129.7869	0.0000
Uganda	185.7197	0.0000	72.1698	0.0000
Null Hypothesis H_0: r ≤ 2				
Burundi	97.0476	0.0001	44.6599	0.0018
Kenya	100.5368	0.0000	49.3106	0.0004
Rwanda	148.2745	0.0000	73.1015	0.0000
Tanzania	142.9444	0.0000	61.3735	0.0000
Uganda	113.5499	0.0000	56.7963	0.0000
Null Hypothesis H_0: r ≤ 3				
Burundi	52.3877	0.0177	25.6174	0.0874
Kenya	51.2262	0.0233	26.4661	0.0690
Rwanda	75.1730	0.0000	47.9283	0.0000
Tanzania	81.5708	0.0000	50.5345	0.0000
Uganda	56.7536	0.0059	34.1268	0.0063
Null Hypothesis H_0: r ≤ 4				
Burundi	26.7703	0.1074	19.9463	0.0726
Kenya	24.7602	0.1702	14.3897	0.3339
Rwanda	27.2447	0.0958	20.1630	0.0679
Tanzania	31.0363	0.0358	20.3469	0.0641
Uganda	22.6268	0.2649	13.9908	0.3658
Null Hypothesis H_0: r ≤ 5				
Burundi	6.8239	0.5982	6.8227	0.5103
Kenya	10.3704	0.2533	9.6232	0.2379
Rwanda	7.0817	0.5681	6.3603	0.5674
Tanzania	10.6894	0.2313	9.0612	0.2811
Uganda	8.6360	0.4001	8.0399	0.3747
Null Hypothesis H_0: r ≤ 6				
Burundi	0.0012	0.9717	0.0012	0.9717
Kenya	0.7472	0.3874	0.7472	0.3874
Rwanda	0.7214	0.3957	0.7214	0.3957
Tanzania	1.6283	0.2019	1.6283	0.2019
Uganda	0.5961	0.4401	0.5961	0.4401

Note: The p-values on individual cross-section Results are calculated based to MacKinnon-Haug-Michelis (1999).

2.7.3 Panel Causality Results: Causal Relationship between Variables

One objective of this study as introduced earlier is to examine the direction of the causality relation between the proxies of financial development and that of economic growth in the East African countries; Burundi, Kenya, Rwanda, Tanzania and Uganda. Having conducted the analysis and found a long run equilibrium relationship between financial development and economic growth in East African countries, both as a group and individuals (see Table 2.5 above), the study attains the objective of examining the direction of causality using the approach of Dumitrescu Hurlin (2012), who assumed individual coefficients (not common coefficients). This means that in this approach, we assume all coefficients given in equations 2.5 and 2.6 above are different (not the same) across East African countries Kenya, Tanzania, Uganda, Rwanda and Burundi. The justification for using the method that allows individual coefficients among East African countries is because, these countries have different natural resources (minerals, fertile lands, harbor/ports, human resources, gas) that are not fixed or common among themselves, and they play a big part on the contribution of economic growth of their respective countries.

The panel causality results are displayed in Table 2.6 below. When the individual coefficients are used among East African countries; the null hypothesis that domestic credit provided by public sector does not homogeneously cause GDP per capita growth is rejected, because it was found significant at the 1% level. We, therefore, accept the alternative hypothesis that DCPBS homogenously causes GDP per capita growth in East African countries. On the other hand, we failed to reject the null hypothesis that GDP per capita growth does not homogeneously cause DCPBS against the alternative hypothesis that GDP per capita growth does homogenously cause DCPBS in East African countries. Therefore, the causality relation between DCPBS and GDP per capita growth in the Eastern Africa is flowing from the DCPSB to GDP per capita growth, and not the other way round. Moreover, the study found that the other measures for financial development 'domestic credit provided to private sector' and 'money supply' do not homogeneously cause GDP per capita growth, and the GDP per capita growth itself does not homogeneously cause both DCPS and M2; their p-values were found to be insignificant, therefore, we do not reject their null hypothesis of no causality (see Table 2.6).

On the other variables included in this study as controlling variables that may explain the GDP per capita growth; it was found that variables 'foreign direct investments' and 'government consumptions' do not homogeneously cause GDP per capita growth, simply because their p-values displayed insignificant results, which made us not to reject their null hypotheses of no

causality between them and GDP per capita growth. Only the causal relationship that flows from additional variable 'inflation (CP)' to GDP per capita growth was found to be significant at the 10% level, which indicates that the null hypothesis that inflation (CP) does not homogenously cause GDP per capita growth is rejected, and we accept the alternative hypothesis that inflation does homogeneously cause GDP per capita growth in East African countries. Surprisingly, it was found that GDP per capita growth does not homogenously cause any of FDI, government consumptions or inflation-consumer price; we, therefore fail to reject the null hypothesis of a homogenous causal relationship from GDP per capita growth to any of the selected controlling variables in this study.

Table 2.6: Dumitrescu Hurlin Panel Causality Results

Pairwise Dumitrescu Hurlin Panel Causality Tests

Null Hypothesis:	**W-Stat.**	**Zbar-Stat.**	**Prob.**
DCPBS does not homogeneously cause GDP	3.101	2.560	0.010
GDP does not homogeneously cause DCPBS	0.207	-1.174	0.240
DCPS does not homogeneously cause GDP	0.586	-0.686	0.492
GDP does not homogeneously cause DCPS	0.869	-0.321	0.748
MONEY (M2) does not homogeneously cause GDP	2.083	1.247	0.215
GDP does not homogeneously cause MONEY (M2)_	0.251	-1.118	0.263
FDI does not homogeneously cause GDP	0.819	-0.386	0.699
GDP does not homogeneously cause FDI	0.414	-0.907	0.365
GVTCONSUMPTION does not homogeneously cause GDP	0.942	-0.227	0.487
GDP does not homogeneously cause GVTCONSUMPTION	1.669	0.709	0.478
INFLATION (CP) does not homogeneously cause GDP	2.421	1.682	0.092
GDP does not homogeneously cause INFLATION (CP)	2.192	1.387	0.165

Note: W-Stat. stands for the Wbar statistic, which is the average of the test statistics. The Zbar statistic is the standardized version of the Wbar statistic (which is appropriately weighted in unbalanced panels), which follows a standard normal distribution.

Therefore, with the use of individual coefficients across the East African countries, the study found that only variable 'DCPBS' a measure of financial development and controlling variable 'inflation-consumer price' are the only variables that do homogeneously cause the GDP per capita growth in the panel of five East African countries. However, there is no causal relationship that flows from GDP per capita growth to any selected variables of DCPBS, DCPS, M2, GVT consumptions, and FDI and inflation-consumer price. Hence, the study declares that there is unidirectional causal relationship flowing from financial development (only with the

use of DCPBS) to economic growth (GDP per capita growth) in the Eastern Africa (Burundi, Kenya, Rwanda, Tanzania and Uganda).

To prove the causality results displayed in Table 2.6 above, a Granger causality test was conducted using the standard way that assumes all coefficients are the same (not different) across the East African countries included in this study. That is:

$$\alpha_{0,i} = \alpha_{0,j}, \alpha_{1,i} = \alpha_{1,j}, ..., \alpha_{1,i} = \alpha_{1,j}, \forall i, j \quad (2.8)$$

$$\beta_{1,i} = \beta_{1,j}, ..., \beta_{1,i} = \beta_{1j} \forall i, j \quad (2.9)$$

In this test, we start by treating the panel data as one large accumulated set of data, and then we conduct the Granger causality test in the standard method without letting data from one East African country enter the lagged values of data from the next East African country.

Table 2.7: Granger Causality Results

Pairwise Granger Causality Tests

Null Hypothesis:	**Obs.**	**F-Statistic**	**Prob.**
DCPBS does not Granger Cause GDP	110	2.130	0.147
GDP does not Granger Cause DCPBS		3.978	0.048
DCPS does not Granger Cause GDP	110	0.540	0.464
GDP does not Granger Cause DCPS		0.193	0.660
MONEY (M2) does not Granger Cause GDP	110	0.025	0.876
GDP does not Granger Cause MONEY (M2)		0.159	0.690
FDI does not Granger Cause GDP	110	3.536	0.064
GDP does not Granger Cause FDI		0.583	0.454
GVTCONSUMPTION does not Granger Cause GDP	110	4.436	0.037
GDP does not Granger Cause GVTCONSUMPTION		0.993	0.321
INFLATION (CP) does not Granger Cause GDP	110	0.008	0.921
GDP does not Granger Cause INFLATION (CP)		2.583	0.111

Table 2.7 above displays the results from Granger causality tests for explanatory variables (proxies of financial development and controlling variables) and that of the independent variable (proxy of economic growth- GDP per capita growth). As can be seen, the results show that DCPBS does not Granger-cause GDP per capita growth, as we failed to reject the null hypothesis since its p-value was found to be insignificant; however, we reject the null hypothesis that GDP per capita growth does not Granger cause DCPBS, its p-value was found

significant at the 5% level to make this study accepts the alternative hypothesis that GDP per capita growth does Granger cause DCPBS. Moreover, the study found that the other measures for financial development 'domestic credit provided to private sector' and 'money supply' do not Granger cause GDP per capita growth, and the GDP per capita growth itself does not Granger cause both DCPS and M2; this is because their p-values were found to be insignificant to explain the relationship. Therefore, we do not reject their null hypothesis of no Granger causality between these proxies of financial development and GDP per capita growth. The results on the Granger causal relationship (when using common coefficient) between variables 'DCPS and M2' and 'GDP per capita growth' confirm the results displayed in Table 2.5 above (when using individual coefficients)

On the other hand, while no causal relationship was found between 'inflation-consumer price' and the GDP per capita growth (see Table 2.7 above), a Granger causal relationship is found between GDP per capita growth and other controlling variables 'foreign direct investments' and 'government consumption'. The results indicate that the GDP per capita growth of East African countries does not Granger cause either foreign direct investment or government consumptions, but both foreign direct investments and government consumption do Granger cause GDP per capita growth (economic growth). The study concludes that there is a unidirectional causal relationship between financial development (with the use of Domestic Credit Provided by Banking Sector) and economic growth (GDP per capita growth) in the East African countries; however, there is no causal relationship between financial development and economic growth when other proxies of financial development are used.

2.7.4 Results from GMM System Approach

The results from the dynamic panel data approach (GMM) are presented in Table 2.8 below. To estimate these results, we used Arellano-Bond robust VCE estimator, which is suitable for the one-step estimator results like ours in Table 2.8 below. The study uses one-step method of GMM approach, because our data set involves a very small number of countries (only five countries). It was introduced earlier that our interpretation is based on the results from the GMM system approach by the Arellano-Bover/Blundell-Bond estimation technique; but Table 2.8 below present the results from the GMM dynamic - instrumental variable modelling approach by the Arellano-Bover/Blundell-Bond (system estimator) and the Arellano-Bond (difference estimator) techniques. The results by Arellano-Bond (difference estimator) are incorporated in this study purely for comparison purposes, but we are not going to analyse and discuss our results with reference to.

However, before presenting our results, we conducted the Arellano-Bond test for zero autocorrelation (Arellano and Bond, 1991); this was conducted in order to check if the first-differenced error terms of the first and second order are serially correlated (autocorrelation of order *m*). The results of the Arellano-Bond test for AR (1) [z-statistic -1.473 with p-value 0.141] and for AR (2) [z-statistic -1.062 with p-value 0.288] shown in Table 2.8 below indicate that the null hypothesis of no autocorrelation is not rejected. When the idiosyncratic errors are independent and identically distributed (i.i.d.), the first-differenced errors are not first-order and second-order serially correlated; therefore, the study confirm the existence of zero autocorrelation in first-differenced errors at both order 1 and order 2. Having zero autocorrelation (no serial correlation) in first-differenced error terms of the first and second order, implies that the moment conditions used in our estimation are valid.

From the results displayed in Table 2.8 below, the first lagged dependent variable 'GDP per capita growth' [GDP (-1)] is found to be significant at the 1% level of significance; this shows that it has the power to explain the dependent variable, economic growth. However, the coefficient of lagged GDP per capita growth was found with negative sign to indicate that the lagged GDP per capita growth does negatively influence economic growth. Conclusively, the study declares that the previous year's GDP per capita growth can negatively affect the current GDP per capita growth (economic growth) of the East African countries as a panel.

Financial development, when measured by both domestic credits provided to the private sector and domestic credit provided by banking sector, was found to be significant at the 10% and 5% level of significance respectively. Having them significant shows that they have the power to explain economic growth (GDP per capita growth). The selected explanatory variable DCPS was found to be statistically significant at the 10% level with a positive coefficient of (4.123); this indicates that an increase in domestic credit to private sector by 1% will increase the GDP per capita growth (economic growth) by 4.123% in the panel of East African countries (see Table 2.8 below). In the other words, domestic credits to the private sector can positively contribute towards economic growth of East African countries (Burundi, Kenya, Rwanda, Tanzania and Uganda).

Table 2.8: The Results from GMM Approach

Dependent Variable: GDP	Arellano-Bover/Blundell-Bond: System Estimator	Arellano-Bond: Difference Estimator
Independent Variables	**Coefficient**	**Coefficient**
GDP (-1)	-0.328*** (0.079)	-0.310*** (0.103)
DCPS	4.123* (2.214)	5.038** (2.328)
DCPBS	-6.569** (3.121)	-6.030* (3.394)
Money(M2)	-8.799 (6.292)	-8.113 (6.525)
FDI	1.072 (0.841)	0.744 (0.546)
GVT consumption	1.953 (2.651)	1.644 (3.132)
Inflation-CP	-0.105 (0.780)	-0.048 (0.703)
Constant	34.087 (16.678)	28.377 (15.580)
Number of Countries	5	5
Wald test	13.59	495.85
P-value of Wald test	0.009	0.000
AR(1) of Arellano-Bond test	-1.473	-1.492
P-value of AR(1)	0.141	0.136
AR(2) of Arellano-Bond test	-1.062	-0.967
P-value of AR(2)	0.288	0.333

Note: The estimation results are from One-step GMM in both Differenced Estimator of Arellano & Bond (1991) and System Estimator of Arellano & Bover (1995)/ Blundell and Bond (1998). Both AR (1) and AR (2) are tests of null of zero first-order and second-order serial correlation. The figures in parentheses are Robust Standard Error. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels respectively.

However, the domestic credit provided by banking sector as a measure of financial development has a power to explain the current GDP per capita growth since it is significant, it has negative coefficient (-6.57). This shows its negative marginal effect on economic growth for East African countries when they are to be taken as a panel. This indicates that an increase of 'domestic credit provided by the banking sector' by 1% tends to decrease the 'GDP per capita growth' by 6.57% within East African countries. This shows that the domestic credit provided by the banking sector makes negative contribution to the GDP per capita growth, since they were found to have a negative significant relationship. Therefore, this indicator does not support the economic growth of East African countries, and instead it harms the economic growth of these countries, as it negatively contributes towards GDP per capita of these countries in a panel (see Table 2.8 above).

Another indicator for financial development (money supply) was found to be insignificant against the GDP per capita growth of the panel of East African countries, as were other controlling/additional variables included in this study (foreign direct investments, government consumptions and inflation-consumer prices (see Table 2.8 above)). Hence, they have no explanatory power against the GDP per capita (economic growth) of the selected countries. Conclusively, the study highlights that it is only financial development's indicator DCPS that can positively influence economic growth through GDP per capita growth for East African countries; however, DCPBS can negatively influence economic growth of these countries, financial development's indicator money supply and other selected additional variables have got no statistical significance to affect/influence economic growth of the selected five East African countries.

2.8 Discussion and Conclusion

This empirical study examined the causal and long-run relationships between financial development and economic growth in East African countries using a dynamic panel data approach over the period 1988-2010. The study had three objectives. First, to determine if there is a long-run relationship between the proxies of both financial development and economic growth in the East African countries. Second, to investigate on the role financial development play in economic growth of East African countries. Third, to examine the direction of any causality relation that exists between financial development and economic growth in East African countries. To meet these objectives, various econometric techniques were used to test and estimate all variables or proxies for both financial development and economic growth. Panel unit root tests, panel co-integration tests, and Granger causality tests were used to test

and estimate (through a GMM system approach) the variables/proxies of financial development and economic growth. In relation to the works of Rachdi & Mbarek (2011), Levine et al (2000) and Egbetunde & Akinlo (2014), this study used the Generalized Method of Moment (GMM) estimators to control for the key problems (endogeneity bias, simultaneity bias and omitted variable bias), which affected many previous studies. The GMM approach used to solve the said problems by using exogenous instrument variables. However, unlike previous studies that used only system GMM estimators, this study used both differenced GMM estimators and system GMM estimators for comparison purposes, if necessary.

To test for panel unit root, the study used both Breitung (Breitung, 2000) and Levin-Lin-Chu (Levin, Lin and Chu, 2002) methods, because our panel data set was balanced (balanced panel) with the same observations (number of variables and time periods) in each East African country. The results displayed in Table 2.4 above indicate that all the variables tested are stationary at first difference. To test for panel cointegration the study used Johansen Fisher panel cointegration tests as suggested by Maddala and Wu (1999). The study found two cointegrating relations which are $r \leq 5$ and $r \leq 6$ that were insignificant (from both Trace test and Maximum Eigenvalue) when tested under a group (see Table 2.5 above). Since we failed to reject the null hypothesis of no cointegration in the remaining four cointegrating relations ($r \leq 1$, $r \leq 2$, $r \leq 3$, $r \leq 4$); therefore, the study confirms the existence of cointegrating relations between financial development and economic growth in the East African countries when taken as a region, the East African Community. Our findings are in consistency with the findings in the studies of Rachdi & Mbarek (2011) and Falahaty & Hook (2013). In their panel data cointegration studies, which were also conducted on a region basis, they found that in MENA countries there is existence of a long-term relationship between financial development and economic growth.

In the case of causality, the study used pairwise Dumitrescu Hurlin panel causality tests (Dumitrescu Hurlin, 2012) to test for Granger causality. In this method, the study assumed that the coefficients in the regression equations are not the same across East African countries involved in this study. The results displayed in Table 2.6 above show that only variable 'DCPBS' a measure of financial development and controlling variable 'inflation-consumer price' are the only variables that do homogeneously cause the GDP per capita growth in the panel of five East African countries. Our findings on the causality relation between financial development and economic growth are in agreement with the findings of the previous studies that follow *supply-leading phenomenon* (Levine, 1997; King and Levine, 1993b; Levine and Zervos, 1998). However, there is no causal relationship that flows from GDP per capita growth

to any selected variables of DCPBS, DCPS, M2, GVT consumptions, and FDI and inflation-consumer price. Hence, the study declares that there is unidirectional causal relationship flowing from financial development (only with the use of DCPBS) to economic growth (GDP per capita growth) in the Eastern Africa (Burundi, Kenya, Rwanda, Tanzania and Uganda).

In estimating our dynamic panel data results, we used the one-step GMM approaches of differenced estimator (Arellano & Bond, 1991) and that of system estimator (Arellano & Bover; 1995 and Blundell & Bond; 1998). It is only the proxy for financial development DCPS that was found to have a positive relation with the proxy for economic growth (GDP per capita growth). This implies that the domestic credit to private sector (DCPS) contributes towards the economic growth of East African countries (Burundi, Kenya, Rwanda, Tanzania and Uganda). Therefore, the East African countries should put a lot of emphasis on promoting the increase of domestic credit to the private sectors, as it can be seen in Table 2.8 above that an increase in domestic credit to private sector by 1 percent will increase the GDP per capita growth (economic growth) by 4.12 percent in the panel of East African countries. Therefore, our results are in consistency with previous studies that favour positive relation (Demirguc-Kunt and Levine, 1996; Levine and Zervo, 1996; King and Levine, 1993a, b; Beck and Levine, 2004). However, having 4.12 percent of DCPS indicates the availability of low level of both financial system development and domestic investments in East African economies, since it is argued that a high rate of DCPS to GDP shows the availability of both higher level of domestic investments and financial system development, hence economic growth (Hassan, et al. 2011).

Another proxy of financial development that was found significant but with a negative coefficient is domestic credit provided by the banking sector. It can be seen in Table 2.8 above that an increase of 'domestic credit provided by the banking sector' by 1 percent tends to decrease the 'GDP per capita growth' by 6.57 percent within East African countries. Therefore, our results are in consistency with previous studies that favour negative relation between financial development and economic growth (Naceur and Ghazouani, 2007). This shows that the domestic credit provided by the banking sector makes negative contribution to the GDP per capita growth, since they were found to have a negative significant relationship. Therefore, this indicator does not support the economic growth of East African countries, and instead it harms the economic growth of these countries, as it negatively contributes towards GDP per capita growth of these countries in a panel. This may be due to the fact that much of the domestic credit provided by the banking sector is not utilized for investments or savings

purposes; instead, people within these countries are utilizing them (DCPBS) for private purposes such as for buying luxury commodities.

Since our DCPBS is not high, with a negative coefficient (-6.6 percent), it is inconsistent with the idea of Hassan, et al. (2011) who asserted that when DCPBS tends to be higher, the degree of dependence on the banking sector for financing becomes higher; in other words, it indicates that the financial development becomes high because banks are in a position to perform all important financial functions, as indicated in the study of Levine (1997). Therefore, in order not to affect the GDP per capita growth, the governments of these countries should establish policies that affect the domestic credit provided by the banking sector towards economic growth. For instance, banks that provide domestic credits should conduct more research on borrowers' firms, make use of corporate control, provide education on risk management control, make transactions more facilitated and encourage mobility of savings (Levine 2005). Lastly, they should make sure that the concerned credit is given and utilized for the purpose applied for (for investment purposes) so as to contribute to the GDP per capita growth (economic growth) of the selected countries in East Africa.

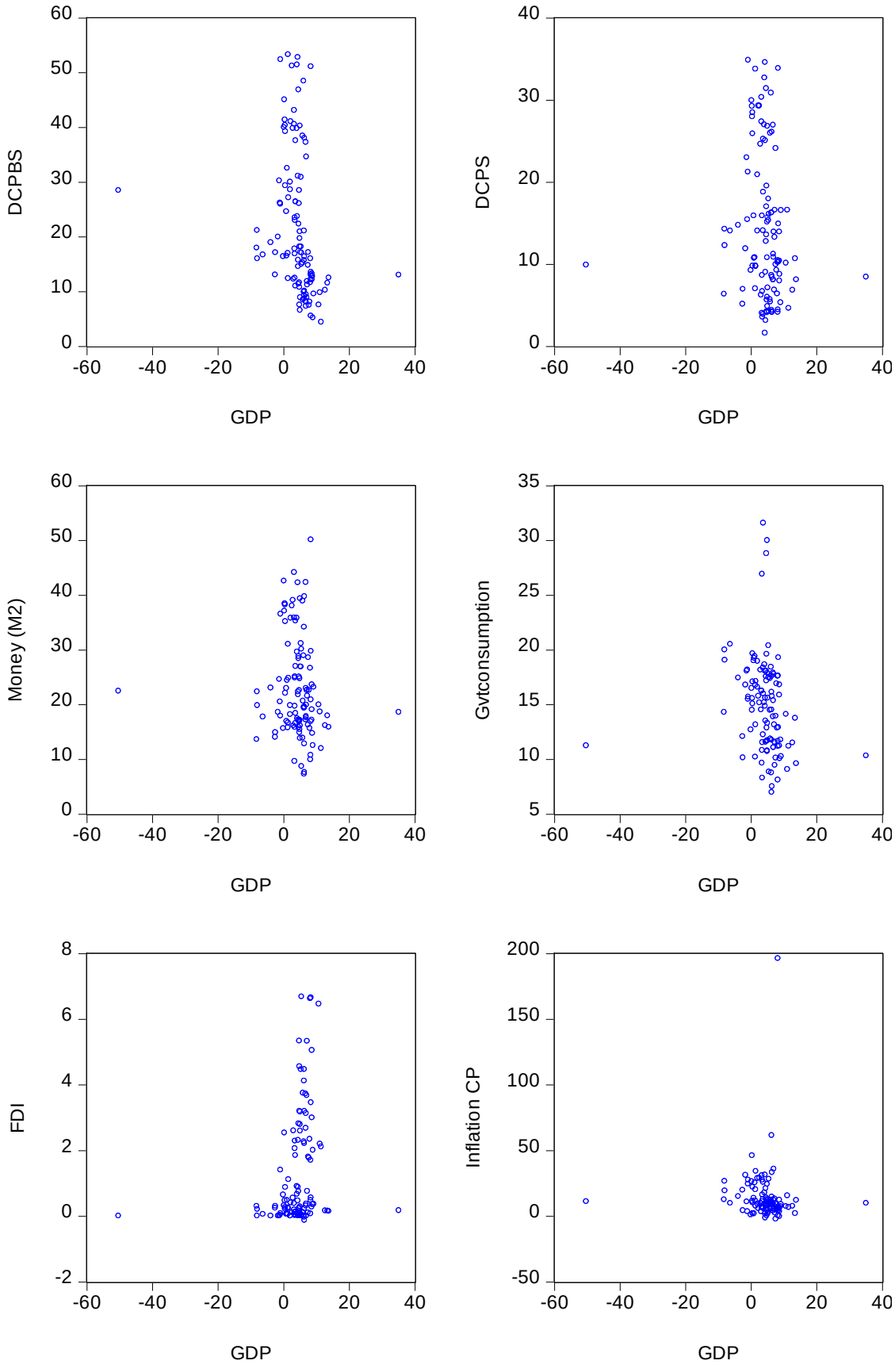
Generally, the findings from the GMM approaches in both difference estimator (Arellano & Bond 1991) and system estimator (Arellano & Bover; 1995 and Blundell & Bond; 1998) suggest that there should be an improvement in the functioning of other indicators, which were found either with negative coefficient but significant level (domestic credit provided by banking sectors) or with insignificant p-value (money and quasi money supply – M2); this will make the banking sector development more crucial towards the economic growth in East African countries (Burundi, Kenya, Rwanda, Tanzania and Uganda). Also governments (through the policy makers) in the East African countries, should formulate very appropriate macro-economic and institutional policies that will spur the importance of financial development, so as to improve economic growth in the region. Moreover, the governments of East African countries should accelerate the financial reforms that the EAC-governments launched early 1990s, and they should also improve the efficiency of the financial system as a whole, so as to stimulate long-term economic growth.

In conclusion, our findings also suggest that in order to maintain a sustainable economic growth in East African countries, the governments have to deepen the financial sector and undertake necessary actions to reinforce the positive relationship between the financial sectors and economic growth. These actions include limiting the states' government to have a direct involvement in financial systems, enabling market competition, investing in human resources

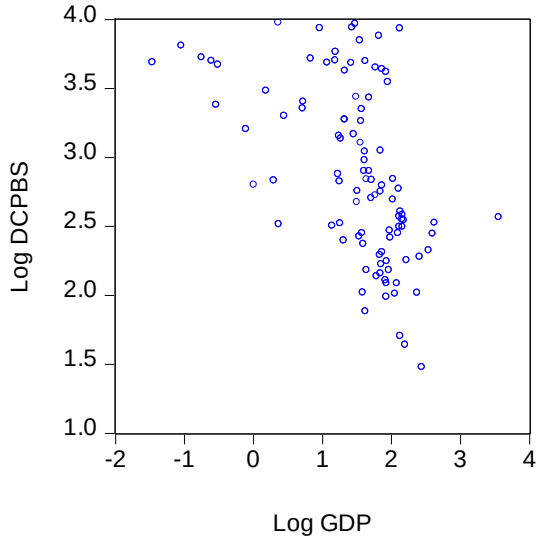
and the legal environment, as well as improving the quality of functioning financial institutions. The said actions are essential for strengthening the relationship between financial development (through DCPBS and money supply) and GDP per capita growth, and improving the allocation of resources based on efficiency grounds. In EAC, the substantial government involvement in the financial system is responsible to a large extent for the poorly performing loans (DCPBS) made to public enterprises, and to well-connected individuals instead of private sectors. This lack of a close relationship between 'the provided credits' and 'market risk' is considered by this study, to be the main weakness of the regulatory system in East African countries, which contributes to the instability of its financial system.

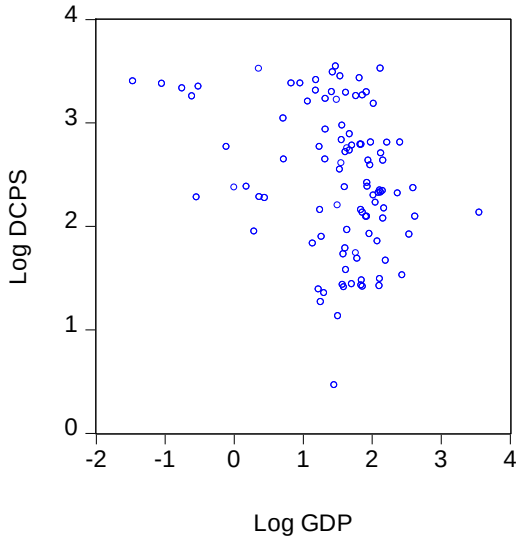
Appendix 2

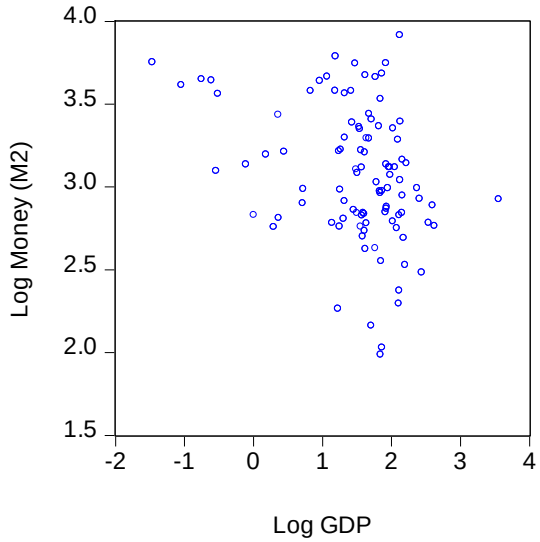
Appendix 2a: The Plotted Data Set Before Transformed into Logarithms

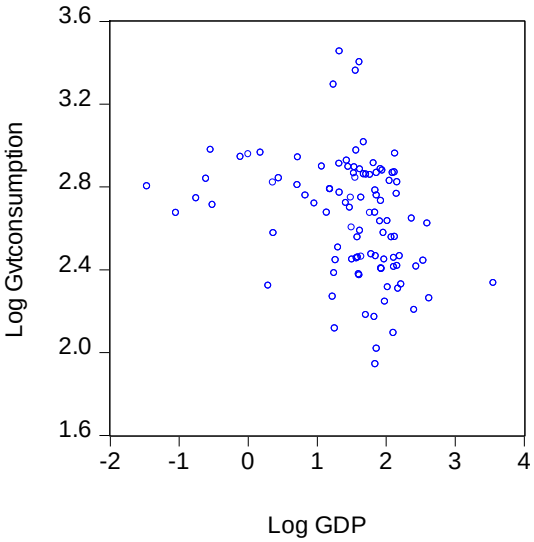


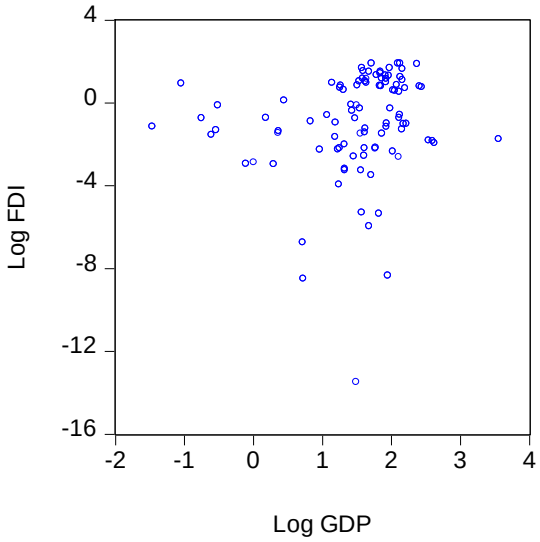
Appendix 2b: The Plotted Data Set After Transformed into Logarithms

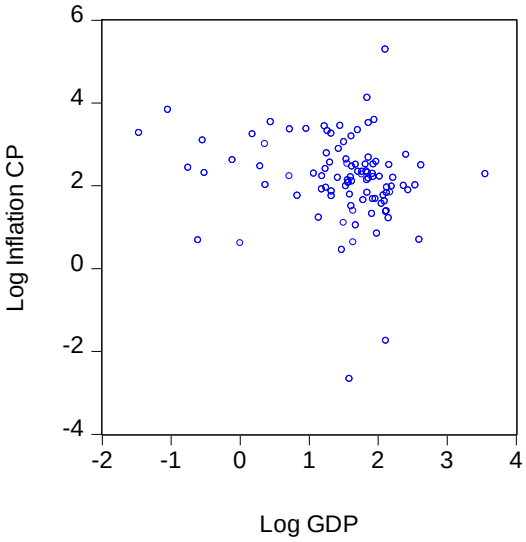












CHAPTER 3: THE CAUSAL EFFECT OF SUB-SAHARA AFRICAN EQUITY MARKETS ON ECONOMIC DEVELOPMENT: EMPIRICAL EVIDENCE FROM ELEVEN SELECTED COUNTRIES

3.1 Introduction

The world stock markets have advanced in the past few decades with much of this boom accounted for by emerging markets. The sudden development of stock market in emerging economies, has led to the movement of capital investment flows from developed economies to the emerging economies. The financial structure of the emerging economies has also shifted from an informal to a formal financial structure as required by investors who desire to invest in emerging economies (Mullin, 1993). In the formal financial sector, in Africa there was an increase by 10 stock markets from only 8 stock markets in 1980 to a total of 18 stock markets by 2002 (Okeahalam & Afful, 2006; Ntim et al., 2011; Ntim, 2012). By the end of 2014 there were 29 active stock markets in Africa, including two regional integrated stock markets (The Bourse Regional des Valeurs Mobilieres – BRVM, with its headquarters in Abidjan, Ivory Coast, and The Bourse Regional des Valeurs Mobilieres d' Africa Centrale – BVMAC, with its headquarters in Libreville-Gabon)[16]; and according to Ntim (2012), there are proposals in progress on the establishment of the new stock markets in many African countries.

Stock market establishments in Sub-Saharan Africa (see Table 3.1 below) over the past few decades were basically driven by important changes in the developed economies[17]. These changes may have been caused by factors such as local and international deregulation of financial markets in developed economies, financial market integration, the establishment of financial services that permit both bigger and riskier investments, and the coming and accelerating role of new institutional investors in financial markets (Singh, 1997). It is believed that the World Bank Group (International Finance Corporation) encouraged the formation of many stock markets in Africa. According to Singh (1997), the establishment of both foreign portfolio investments and markets in Africa were encouraged and favoured by the International

[16] The Regional Stock Exchange BRVM includes the Western African countries of Benin, Burkina Faso, Guinea Bissau, Ivory Coast, Mali, Niger, Senegal and Togo; while the BVMAC includes the Central African countries of Central African Republic, Chad, Congo, Equatorial Guinea and Gabon.

[17] These changes in financial markets of developed economies perhaps encouraged them to establish international trade liberalization. Therefore, the capital flow liberalization and the formation of stock markets in emerging economies can be considered as part of global liberalization policies.

Finance Corporation (IFC), part of the World Bank group[18]. However, Kenny and Moss (1998) claimed that the significant increase in the number of stock markets in Africa was encouraged by the substantive reforms in financial sectors, which were taking place in many African countries. It is said that over two-thirds of the stock markets in Africa were established in the period of the adoption and implementation of the financial sector reform programmes (between the late 1980s and the late 1990s) in many African countries[19]; these reform programmes were called for by both the World Bank and the IMF (Mlambo & Biekpe, 2007; Afego, 2015).

Table 3.1: Sub-Saharan African Stock Exchanges

Countries	Security Exchange	Year of Establishment
Botswana*	Botswana Stock Exchange	1989
Cameroun	Cameroun Doula Stock Exchange	2001
Ghana*	Ghana Stock Exchange	1990
Ivory Coast	Bourse Regional des Valeurs Mobilieres (BRVM)	1998
Kenya*	Nairobi Securities Exchange	1954
Malawi	Malawi Stock Exchange	1994
Mauritius*	Stock Exchange of Mauritius	1989
Mozambique	Mozambique Stock Exchange	1999
Namibia*	Namibia Stock Exchange	1990
Nigeria*	Nigerian Stock Exchange	1960
Sierra Leone	Sierra Leone Stock Exchange	2009
Rwanda	Rwanda Stock Exchange	2005
Seychelles	Seychelles Securities Exchange	2012
South Africa	Johannesburg Stock Exchange	1887
Swaziland*	Swaziland Stock Exchange	1990
Tanzania*	Dar-es-Salaam Stock Exchange	1998
Uganda*	Uganda Securities Exchange	1998
Zambia*	Lusaka Stock Exchange	1994
Zimbabwe*	Zimbabwe Stock Exchange	1946

Note: Countries* are selected SSA-countries to be included in this study; some of the above information was obtained from the websites of the stock markets of the respective countries, and some from the African Securities Exchange Association (ASEA).

[18] According to IFC, the number of stock markets with active liquidity rose from 31 (1988) to 78 (1999) in emerging economies. This shows that the increased stock markets in developing countries have generated the increased demand for international operations.

[19] With the exceptions of Ivory Coast, which was formed in 1976, Kenya in 1954, Nigeria in 1960, South Africa in 1887 and Zimbabwe in 1946.

Theoretically, it is argued that stock markets provide different services that in the end promote economic growth. These services are liquidity, risk diversifications, acquisition about companies and their manager's information, corporate governance and mobilization of savings (Levine and Zervos, 1996). On stock market liquidity, Bencivenga et al. (1996) establish that the ability to trade equity/shares in the stock markets is more easy, hence reducing the liquidity risks, which will later spur economic growth. On risk diversification, Levine (1997) declares that stock markets may provide firms with the portfolio diversification opportunity, so as to protect the investors against idiosyncratic risk. Also, the risk diversification may promote investments into higher return projects, which will later generate higher output growth and contribute to economic growth (Obstfeld, 1994). On acquisition of information about the firms and corporate governance, Kyle (1984) argue that the liquid stock markets can promote both the availability of information about firms and corporate governance improvements by mitigating the principal-agent problem, which will later spur economic growth. On resource mobility, Obstfeld (1994) asserts that international risk sharing via internationally integrated stock markets, may promote resource mobilization, which will later accelerate economic growth.

However, there is existence of theoretical disagreement about the role stock markets play in economic growth. Demirguc-Kunt and Levine (1996) indicate that by reducing uncertainty, saving rates may be reduced by greater liquidity, thus slow economic growth. Stiglitz (1996) argues that stock market liquidity may not improve acquisition of information about the firms or enhancing corporate governance. Obstfeld (1994) also cautions that the greater risk sharing through international integrated stock markets, may as well reduce saving rates and slow economic growth if the resources are not allocated well. All these arguments here are either indicating that stock markets have no effect on economic growth, or argue that stock market development can certainly hurt economic growth.

Empirically, there have been a number of studies on the relationship between financial development and economic growth, conducted almost everywhere in the world (Ahmed & Ansari, 1998; Andersen & Tarp, 2003; Bhattacharya & Sivasubramanian, 2003; Christopoulos & Tsionas, 2004; Ghirmay, 2004; Choong et al., 2005; Guillaumont Jeanneney et al., 2006; Apergis et al., 2007; Abu-Bader & Abu-Qarn, 2008b; Abu-Bader & Abu-Qarn, 2008a; Ahmed, 2010; Akinlo & Egbetunde, 2010; Acaravci et al., 2011; Ahmed & Wahid, 2011; Gurgul & Łukasz, 2011; Al-Malkawi et al., 2012); however, few studies have concentrated on stock market development and economic growth, and most of them have focused widely on the

developed economy (Antonios, 2010; Vazakidis & Adamopoulos, 2009; Nieuwerburgh et al. 2006; Dritsaki and Dritsaki-Bargiota, 2005; Levine and Zervos, 1998; Levine and Zervos, 1996; King and Levine, 1993). Despite the presence of few studies on the same topic in developing economies as well (see Table 3.2 below) the focus has not certainly been on African continent, and particularly Sub-Saharan Africa. Most of the studies on African stock markets have focused only on testing for market efficiency in the region (Afego, 2015; Ntim, 2012; Ntim et al. 2012; Kenny and Moss, 1998) and impact of economic variables on equity markets (Okeahalam and Afful, 2006). Therefore, there is a need for a study on the role African stock markets play in economic growth.

However, there are few studies that have been conducted in Africa, on the causal relationship between stock market development and economic growth (Nyasha and Odhiambo, 2014; Ake and Ognaligui, 2012; Zivengwa et al., 2011; Augustine and Pius, 2010; Enisan and Olufisayo, 2009; Nowbutsing, 2009; Riman et al., 2008; Adjasi and Biekpe, 2006), the empirical results were inconsistent and therefore inconclusive. The reasons for their differences might be derived from the fact that stock markets and economic growth differ from state to state (*country-specific effects*) as well as from time to time (*time-related effects*). However, most of previous studies on the relationship between stock market development and economic growth have estimations weaknesses; a good example is the use of a cross-sectional approach[20] that could not adequately address issues in respect of *country specific effects*. For example, in their empirical findings, Levine and Zervos (1998), however, they show a positive and significant relationship between stock market development and economic growth, they used a cross-sectional approach that could limit the potential robustness of their empirical results with regard to both *country specific effects* and *time related effects*.

Considering the theoretical and empirical conflicting debate on the role stock markets play in economic growth, this study uses panel regression techniques to examine the causal effects of equity market development on economic growth of 11 Sub-Sahara African countries. In this context, it is noteworthy that there are countries like Tanzania and Uganda, which are introduced for the first time and no study of this kind has ever been conducted before. In this study, we investigate 11 selected countries[21] namely Kenya, Tanzania, Uganda, Botswana, Zambia, Zimbabwe, Nigeria, Ghana, Namibia, Swaziland, and Mauritius. The contribution of

[20] The problem of Cross-sectional approach comes from the fact that collecting together countries in different stages of financial development, can make it difficult to address country specific issues and time related effects of stock market development and economic growth, ceteris paribus (Odhiambo, 2009 & Odhiambo, 2008).
[21] The choice of countries depended much on the year of establishment of the stock markets and the availability of required data in a particular period of time.

this study to empirical literature comes in many ways: First, it examines both the role African stock markets play in economic growth (using Fixed Effect Technique) and if there is long run relationship between stock market development and economic growth (using Pedroni cointegration technique) in 11 Sub-Sahara African countries. We consider the characteristics of stock markets in sub-Saharan Africa as they are almost new in their origin, most of them are still small in size compared with other emerging stock markets (see Table 3.4), inadequate or small amount of equity listed in the stock markets (see Appendix 3a), they are thin in trade with low stock traded value (see Table 3.5), and they are extremely illiquid with low turnover ratios compared with other emerging markets (see Table 3.6).

Second, the approaches used in many related studies tend to favour either a cross-sectional approach (King and Levine, 1993; Levine and Zervos, 1996; Levine and Zervos, 1998) or a time-series approach (Odhiambo, 2008; Shahbaz et al., 2008; Nowbutsing, 2009; Odhiambo, 2009); this study uses a panel data approach that combines both time series and cross-sectional observations to give more informative data. Also the panel approach we use, unlike cross-sectional (which does not solve the problem of endogeneity in the data set) and time-series approaches, it gives us results with less collinearity on variable indicators, more degrees of freedom and of course more efficiency and variability. For example, this study uses Panel technique-fixed effects model, which was approved by the Hausman tests (Hausman, 1978) we conducted to control for unobservable heterogeneity since they are correlated with the selected explanatory variables; thus, the model treated them as they are fixed/constant overtime, however, in the process the constant was removed from the data series when we differenced (at first difference data series), and "time invariant" features were removed from the model.

We find that African stock markets play significantly positive role in economic growth of the 11 Sub-Sahara African countries via stock market development indicators-equity market capitalization rate percentage to GDP and stock traded-turnover ratio. These findings are not in line with the findings of Adjasi and Biekpe (2006), in their study they found that the stock market capitalization percentage to GDP and stock traded-turnover ratio do not play any significant role in economic growth of 14 African countries. However, we also found that African stock markets via indicator stock traded value percentage to GDP play a negative role in economic growth of 11 SSA countries. This is contrary with the findings of Adjasi and Biekpe (2006) and Rousseau and Wachtel (2000) since they conclude that stock market through share traded value percentage to GDP have a positive influence on economic growth.

Following the introduction provided above, the rest of this chapter is divided into the following sections: section 3.2 provides a brief history of Sub-Sahara African stock markets, section 3.3 displays the stock markets determinants and their trends in Sub-Saharan Africa, section 3.4 contain a theoretical literature review on the role of the stock markets in economic growth, and stock market liquidity on economic growth. The empirical literature on stock market development and economic growth (both in general and in Sub-Saharan Africa) are reviewed in section 3.5. Data and data sources, which highlights the measurements for equity market development and economic growth, and additional controlling variables are provided in section 3.6. While, section 3.7 recognizes the research methodology and estimation techniques of the study, descriptive summary statistics are explained in section 3.8. Empirical results are distributed and analysed in section 3.9, before we present a discussion and conclusion in section 3.10 of this chapter.

3.2 Sub-Sahara African Stock Markets: A Brief History

The history of stock markets in sub-Saharan Africa is dominated by the Johannesburg stock exchange (JSE) of South Africa; it is said to be the oldest, largest and highly sophisticated stock market in Africa (Afego, 2015). The exchange came into operation in 1887 for the main reason of funding the first gold rush in South Africa. JSE is a member of both the African Securities Exchange Association (ASEA) and the World Federation of Exchanges (WFE). In 2014, the JSE was ranked in 19th place among the top 20 largest securities exchanges in the World in relation to equity market capitalization value (which was about $ 951 billion) (Erbar, 2014)[22]. Also, according to ASEA (2014)[23] the JSE was ranked as the 'best Financial Exchange' in the category of the best managed firms in Sub-Sahara African countries for 2014. In 2010 and 2011 the Johannesburg Stock Exchange was ranked No.1 regulated stock exchange in the World by the World Economic Forum Competitiveness Report (ASEA, 2014). Also ACCA (2014) reports that South Africa was ranked the first among 148 countries for the fourth consecutive year as the best regulated securities exchange in the world, by the World Economic Forum (WEF).

The second stock market to be established in sub-Saharan Africa was the Zimbabwe stock exchange (ZSE), founded in 1946 after World War II. However, despite the formulation of the new stock exchange, Zimbabwe had the very first stock exchange to open its activities, in 1896

[22] For more information one can have a look at http://www.insidermonkey.com, accessed on 12th June 2015.
[23] See ASEA-year book (2014) at http://www.african-exchanges.org for more information, accessed on 1st June 2015.

immediately after the introduction of Pioneer Column in Bulawayo. There were other stock exchanges that formed in Gweru and Mutare in same year 1896, but these exchanges closed in 1924 after the decline of the special activities that had caused them to be opened. In 2009, the Zimbabwe economy was dollarized, which led the Zimbabwe stock exchange to adopt the US dollar as the primary trading currency for stock exchange transactions. According to ASEA (2014), in 2010 the eight companies listed in Zimbabwe stock exchange raised about $82.5 mil through rights, offers and debentures. This is recorded as one of the biggest achievement of the ZSE in the last six years.

The Nairobi Security Exchange (NSE) in Kenya is the third oldest exchange in Sub-Saharan Africa. After being accepted and recognized as an overseas exchange in the London stock exchange in 1953, in following year, 1954, the Nairobi Security Exchange was constituted under the voluntary association of brokers in the Societies Act. The market is an active member of both the African securities exchange association (ASEA) and East African Securities Exchange Association (EASEA). The exchange is said to be the largest exchange in the East African region in terms of market capitalization and the liquidity of the market, compared with the other markets from Tanzania, Uganda and Rwanda. In the regionalization initiative the Nairobi stock exchange has been given a primary responsibility over the Somalia stock exchange (SSE) on technical development, including the identification of the most suitable trading partners and suitable expertise for the operations and development of the Somalia stock exchange (ASEA, 2014).

The fourth oldest stock exchange in sub-Saharan Africa is the Nigerian Stock Exchange, which was established in 1960 as the Lagos Stock Exchange. The market, which is an associate member of the World Federation of Exchanges (WFE), and an executive member of the African Securities Exchange Association (ASEA) was rebranded from the Lagos Stock Exchange to Nigeria Stock Exchange (NSE) in 1977. The exchange is said to be the second largest financial services centre in sub-Sahara African economies (as evidenced by the number of listed domestic companies in the exchange, which is the second best after South Africa – see Table 3.1 above). In 1999, the NASDAQ OMX Horizon automated trading system (ATS) started to be implemented as the Exchange moved from the Open Outcry system (OOS); while, in the same year in order to promote cross-border listings, the NSE signed a Memorandum of Understanding (MOU) with Johannesburg stock exchange. The Nigeria Stock Exchange is one of the large stock market in Africa that is expected to champion the development of economic growth in Africa (ASEA, 2014).

After the existence of only four stock exchanges in South Africa, Zimbabwe, Kenya and Nigeria for almost three decades, then Botswana and Mauritius established their own stock exchanges in 1989 to increase the number of stock exchanges in sub-Sahara Africa to six. In 1990, an interim exchange committee of Botswana Stock Exchange (BSE) was formed with the main purposes of encouraging foreign investors to invest in Botswana. In March 1998, the administration of the Botswana Stock Exchange was fully undertaken by Ernest and Young of Botswana; but after five years, in April 2003, the BSE disconnected from Ernst & Young Botswana and become an independent entity that was able to fully execute the stock exchange affairs, serving the exchange stakeholders, and acting as a responsible entity in the global and competitive events on its own. According to ASEA (2014), the BSE remains fundamental in the financial system of Botswana, particularly in the capital market; the exchange continues to be a means by which both public and private sectors raise equity and debts.

The stock exchange of Mauritius (SEM) was also established in 1989, it was incorporated as a private limited company with the responsibilities for promoting and operating an efficient and regulated stock market in the country. In 1994 the stock exchange of Mauritius (SEM) opened its doors to foreign investors[24] after stimulating the exchange control system. Unlike those of many of sub-Saharan African countries, the stock exchange of Mauritius attained membership of the World Federation of Exchanges (WFE) in 2005. According to ASEA (2014), having membership in WFE, the stock exchange of Mauritius saw the growing role of foreign investors in the exchange. In the same year, the stock market's foreign investments rose from 25% to 35% of the total traded values.

In 2010, in order to attract Global and Specialized Funds to list into the market, the SEM adopted listing rules in line with the Collective Investment Schemes Regulations 2008. Moreover, in the same year 2010, the SEM became the very first stock exchange in sub-Saharan Africa to list and make other transactions in US Dollars. Membership status in WFE and the SEM's permission to investors to settle their equity and debts in Euros, USD and Great British Pounds (GBP) have enabled SEM to position itself in the international front, so as to contribute towards the internationalization of the stock market globally. According to ASEA (2014) in 2012, the SEM was named the Most Innovative African Stock Exchange of the year,

[24] The approval to trade shares is not necessary to foreign investors, unless otherwise the purpose of investment is for legal or management control of a company in Mauritius; or such investment involves the holding of not less than 15% of a sugar company in Mauritius.

and was presented with the award at the Africa Investor (AI) Prestigious Annual Index Series Awards in New York Stock Exchange (NYSE).

In 1990, the number of sub-Sahara African stock exchanges reached nine after the addition of three more exchanges: The Ghana Stock Exchange, Swaziland Stock Exchange and Namibia Stock Exchange. In July 1990, the Swaziland Stock Exchange was established by a former World Bank executive officer who later on became the prime minister of Swaziland. The main purpose of its establishment was to enable many of the ordinary people in Swaziland to be involved in the growth of their own economy. The stock exchange is said to be very small but thriving. There are two indexes in the Swaziland stock exchange, the sole index and the SSM index, which include all the listings, which are un-weighted.

In October 1990, the Ghana stock exchange (GSE) was recognized and authorized as a stock exchange under the Stock Exchange Act of 1971. In April 1994, GSE became a public company limited by guarantee, showing that the exchange is not funded by the government, rather it is a private sector initiative. It was not until 2013 that Ghana Stock Exchange recorded exceptional performance of listed equities in the market. The recorded outstanding performance of 2013 was highly contributed by the increase of awareness of investors, and many of the companies listed in GSE recorded promising results of their operations. According to ASEA (2014), the GSE-Composite Index (GSE-CI) and GSE-Financial Stock Index (GSE-FSI) both recorded returns of 78.81% (from 23.81% in year ending 2012) and 71.81% (from 20.94% in year ending 2012) for the year ended 2013 to attain 2,145.20 points and 1,784.05 points respectively. This record highlights the Ghana Stock Exchange as one of the best performing stock exchanges in Sub-Saharan Africa for 2013.

The history of the Namibian Stock Exchange started in 1904 when the first exchange was founded in the country as a result of the diamond rush. However, the exchange lasted for only six years before the rush came to an end, which led to the closing of the exchange in 1910. The Namibian Stock Exchange (NSX), established in 1990, plays a crucial role in Namibia's economy; this is due to the fact that the NSX is taken as a market place for all capital and long-term money investment in the country. In terms of market capitalization, the Namibian stock exchange recorded $145 billion in 2014 to confirm its position as the second largest stock market in Sub-Saharan Africa after JSE of South Africa. According to the NSX-Annual report (2014)[25] the achievement in terms of market capitalization may have been caused by listings

[25] (NSX, 2014) It can be found at http://nsx.com.na for more information, accessed on 2nd June 2015.

of four big dual uranium companies, one gold company and one oil company in the stock exchange. In 2001, the NSX developed the 'Growing Education Programme' which included different stakeholders of the country such as students' portfolio competitions in schools, and a teachers' handbook for secondary school that was published through EMERGE under the heading 'Understanding Your Money and the NSX'. In 2014, the stock exchange was declared to have extended the partnership with Johannesburg stock exchange (JSE) of South Africa.

The SSA region continued with nine stock exchanges from 1990 to 1994, when Zambia and Malawi decided to establish stock exchanges in their respective countries, to reach 11 stock exchanges. In February 1994, the SSA saw the formation of Lusaka stock exchange as a result of financial liberalization and economic reforms that began in 1991 in Zambia. To facilitate foreign investment in Zambia, privatization programs were initiated, and the Lusaka stock exchange was taken as pivotal towards the achievement of the said programs. The Corporate Governance Code for all listed companies in Lusaka Stock Exchange was established in 2005. According to ASEA (2014), the listing requirements in Lusaka Stock Exchange have been harmonized with those prevailing in the stock exchanges of the SADC region; while in order to promote the listings of the companies in the exchange, the government of Zambia has introduced the tax incentives that favor only companies and stocks listed in the Lusaka Stock Exchange.

The number of stock exchanges in Sub-Saharan Africa increased to 13 by the end of 1998 after the formation of more two stock markets in the East African Region (Tanzania and Uganda). In January 1998, the SSA region saw the first formal trading operation in the Uganda Security Exchange (USE). On 27th March 2001, the USE was involved in the first ever cross-border listing in the East African region of the East African Breweries Limited (EABL). EABL is said to be amongst the 10 best companies in terms of market capitalization listed in Nairobi Stock Exchange. On 23rd October 2003, the USE launched the USE-All share index. According to the ASEA-website[26], one of the historic achievements of the Uganda securities exchange is that in 2004, 2005 and 2006, the databank services ranked USE as the third highest performing securities exchange in the world in terms of index returns for 2003, 2004 and 2006 respectively. In 2010, the USE launched the securities Central Depository (SCD), which began its operations on February 2010; while in 2012, the African Development Bank listed the bonds on the Uganda securities exchange.

[26]For more information see http://www.african-exchanges.org/members/uganda-se accessed on 12th June 2015.

Another Sub-Sahara African stock market that was established in 1998 is Dar-es-Salaam Stock Exchange (DSE) in Tanzania. It was just three months after the first trading activity in USE that the DSE commenced the trading activities on 15th April 1998. In 1999, the DSE deployed the Central Depository System, and saw the first listing of corporate debt. In 2004, the DSE was involved in the cross-listing of the first non-domestic company and the listing of the first ever airline company. In 2008, the stock exchange witnessed the listing of the first commercial bank in the market. In 2011, when Tanzania celebrated 50 years of independence of mainland Tanzania, the DSE was involved in exhibitions, whereby the public were educated on the presence and operations of capital markets. In the same year, the DSE employed big consulting firm to prepare strategic plans to redefine the vision and mission of the exchange for about five years; in May 2012, the Council of the DSE approved a 'Corporate Strategic Plan' for the period from 2012 to 2017 (ASEA, 2014). In 2013, the DSE launched a second tier market – the Enterprise Growth Market (EGM).

From 1999 to date, several stock exchanges have been established in Sub-Saharan Africa These are Mozambique Stock Exchange (1999), Cameroun Doula Stock Exchange (2001), Rwanda Stock Exchange (2005), Sierra Leone Stock Exchange (2009), Seychelles Securities Exchange (2012), Somalia Stock Exchange (2012), Bourse Regionale des Valeurs Mobilieres (BRVM)[27], and Bourse Regionale des Valeurs Mobilieres d'Afrique Centrale (BVMAC)[28]. Thus, by 2014 there were 22 stock exchanges in Sub-Saharan Africa. In this study, we include only 11 stock exchanges from 11 countries (Botswana, Ghana, Kenya, Mauritius, Namibia, Nigeria, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe)[29] to examine the effects of equity market on economic development.

However, with the exception of South Africa's Johannesburg Stock Exchange, despite the accelerated increase in the formation of stock markets in sub-Saharan Africa, many of these markets have remained under-developed, inefficient, and comparatively behind not only developed markets but also other emerging markets (Okeahalam and Afful, 2006; Ntimi, 2012; Afego, 2015). Several studies conducted in developing Africa economies have pointed out that lack of liquidity, failure to attract investors, low market capitalization, and inadequate number

[27] This Regional stock exchange involves the countries Burkina Faso, Benin, Guinea Bissau, Ivory Coast, Mali, Niger, Senegal and Togo.
[28] This Regional stock exchange involves the countries Central African Republic, Congo, Equatorial Guinea, Gabon and Tchad.
[29] Apart from South African stock market (JSE), which was excluded because its market efficiency is so high compared to the other selected SSA countries; the study excluded the other 10 SSA countries from the study because of the non-availability of the required data, and due to their short life time in terms of the number of years of their existence (we only included the stock exchanges that existed before 1999).

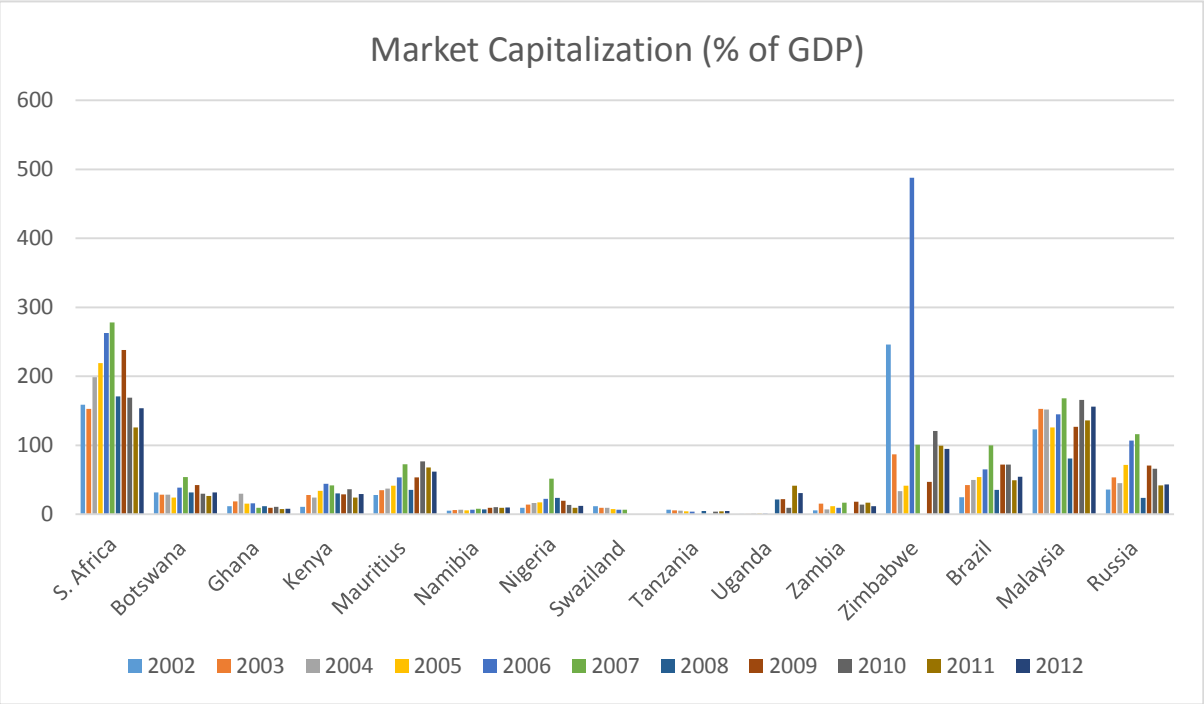
of listed companies, are factors that cause such under-development of African stock markets (Kenny and Moss, 1998; Mlambo and Biekpe, 2007; Ntimi et al, 2011; Ntimi, 2012; Afego, 2015).

The findings of this study are consistency with the previous study that lack of liquidity, failure to attract investors, low market capitalization, and inadequate number of listed companies, are factors that cause the African stock markets (with the exception of South Africa) not to develop compared with other emerging economies (see Table 3.4, Table 3.5, Table 3.6 and Appendix 3a). Moreover, the findings from our panel estimation technique show that if SSA stock markets size are improved by 1 percent of market capitalization rate, will boost the economic growth of SSA countries by only 2.8 percent; also, the improvement in SSA stock market liquidity via stock traded-turnover ratio by 1 percent, will as well spur the economic growth of SSA countries by only 3.3 percent. However, they have contribution to economic growth, yet the rates are not sufficient for the stock market development in Sub-Saharan African countries; considering that the other stock market development indicator stock traded value percentage to GDP was found to have a negative influence (-2.8 percent) on economic growth.

3.3 Sub-Sahara African Stock Markets: Their Determinants Development & Trends

In this part, the study highlights the determinants of equity market developments and their trends so as to be able to determine the stock market development in South Africa and 11 selected Sub-Sahara African countries. In this study the determinants of the stock market development are market capitalization (MCR), stock traded value (STV), turnover ratio (TR) and the number of domestic listed companies in the respective selected countries. From Figure 3.1 to Figure 3.5 we give out the determinants of the respective stock markets and their trends over the period 2002 to 2012. For comparison purposes, we incorporate the corresponding data from emerging markets of Latin America (Brazil), Asia (Malaysia) and Europe (Russia). Despite the fact that the GDP of these countries included for comparison purposes is relatively bigger compared to all the Sub-Sahara African countries included in this study, we included these markets because their institutional and economic structures have similar characteristics to those of the markets in African countries. All these countries together have seen the benefits obtained from high priced commodities (as they are abundant in commodities), and have pursued both privatization and liberalization programs that led to various economic and financial reforms (Afego, 2015).

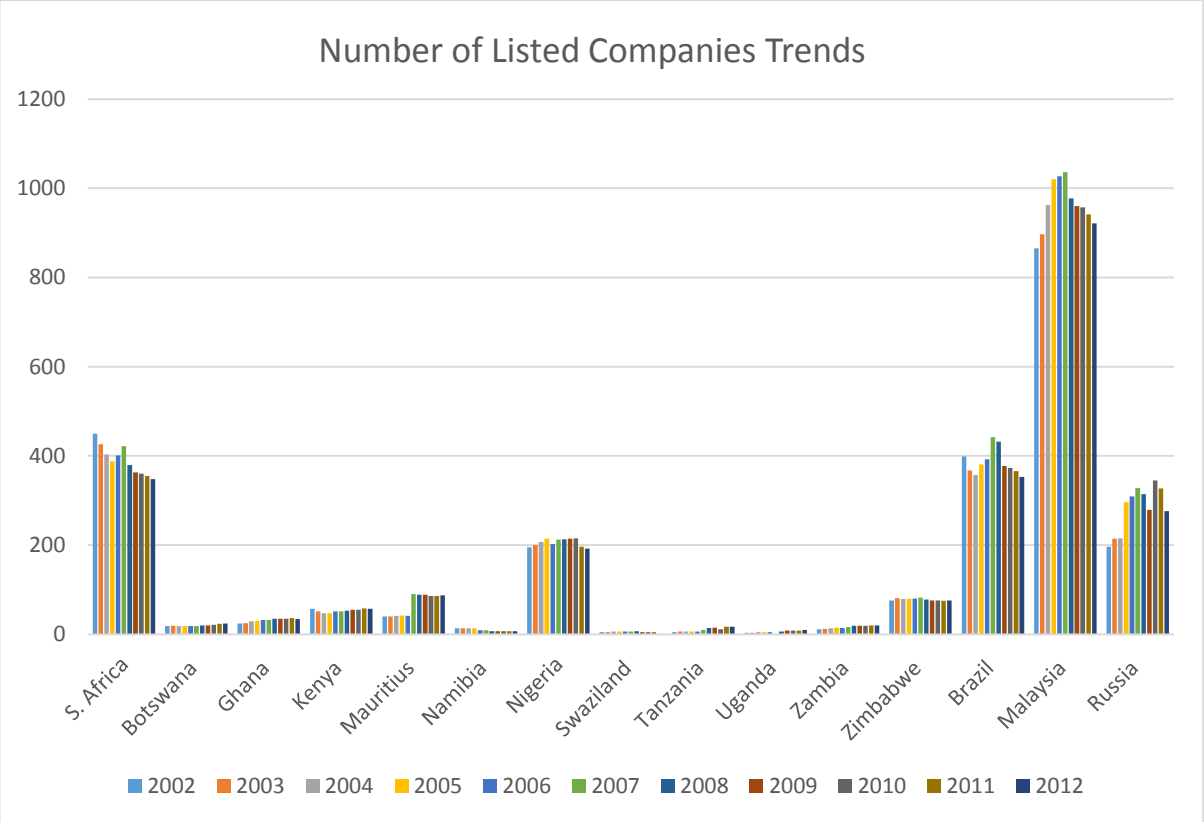
Figure 3.1: Market Capitalization (% of GDP) Trends



Source: World Data Bank; World Development Indicators (2015)

Moreover, the countries added for comparison purposes, especially Brazil and Russia, like many African countries, are similar in terms of business regulations efficiency, and perception of global corruption (Afego, 2015). As can be noticed in Figure 3.1 above, South Africa, represented by JSE had a market capitalization (% of GDP) of 219%, 263%, 278% and 238% for the years 2005, 2006, 2007 and 2009 respectively. The figure not only far exceed those of other Sub-Sahara African countries, but also exceed those of the other added countries of Brazil, Malaysia and Russia, to show that the stock exchange in South Africa is by far the biggest stock market in Sub-Saharan Africa. It is only in 2011 and 2012, that the market capitalization (% of GDP) of South Africa fell behind Malaysia by 10% (136% to 126%) and 2% (156% to 154%) respectively (see Figure 3.1 above). In other sub-Sahara African countries, excluding South Africa, the average number of the market capitalization (% of GDP) was only 27% for all eleven countries in 2012. When comparing this figure (27%) with the corresponding figure for Malaysia over the same year 2012, which stood at 156%; one can conclude that the stock markets in Sub-Saharan Africa (except South Africa) are relatively small in relation to the size of their economies.

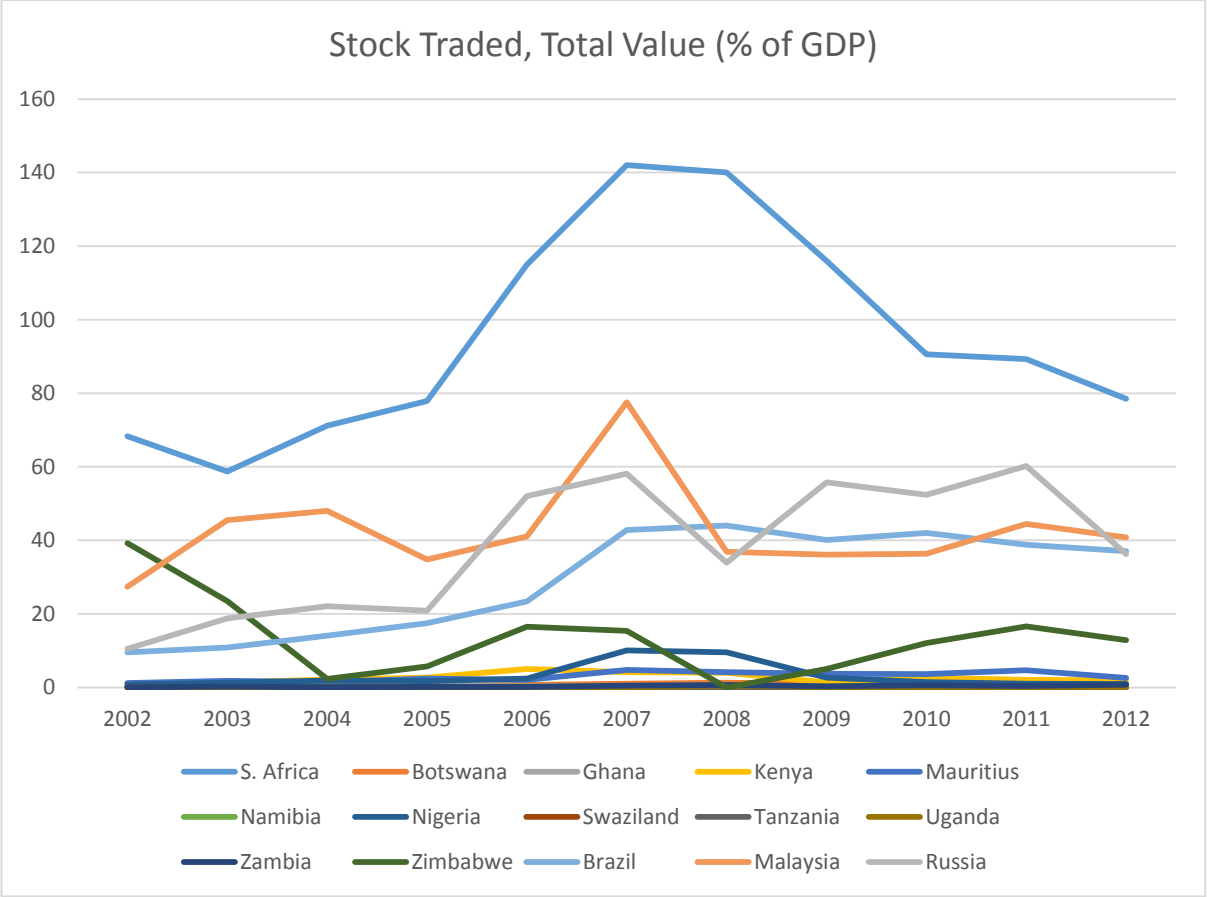
Figure 3.2: Number of Listed Companies Trends



Source: World Data Bank; World Development Indicators (2015)

An overview of the number of listed companies for each stock exchange in Sub-Sahara African countries included in this study is provided in Figure 3.2 (see also Appendix 3a) of this chapter. As can be observed from the Figure 3.2 above, in 2002, 2003, 2004, 2006 and 2007, South Africa accounted for 450, 426, 403, 401 and 422 listed companies respectively, whereas no other single country in Sub-Saharan Africa had at least 250 listings in their stock markets from 2002 to 2012. This is further evidence that the South African stock market is the largest in Sub-Saharan Africa. In 2012, there were 348 listings in South Africa and 192 listings in Nigeria, making a total of 540 listings out of 872 listings (that is 61% of listings) of all eleven included Sub-Sahara African countries (see Appendix 3a). Moreover, the average number of listed companies in Sub-Saharan Africa was just 40 at the end of 2012, compared to 276 listed companies for Russia and 353 listed companies for Brazil. According to Afego (2015) African stock exchanges accounted for only 2.01% of the total global stock listing by the end of 2010; while Malaysia alone accounted for almost 2.03% (957 listed companies) of the total global stock listings in the same year.

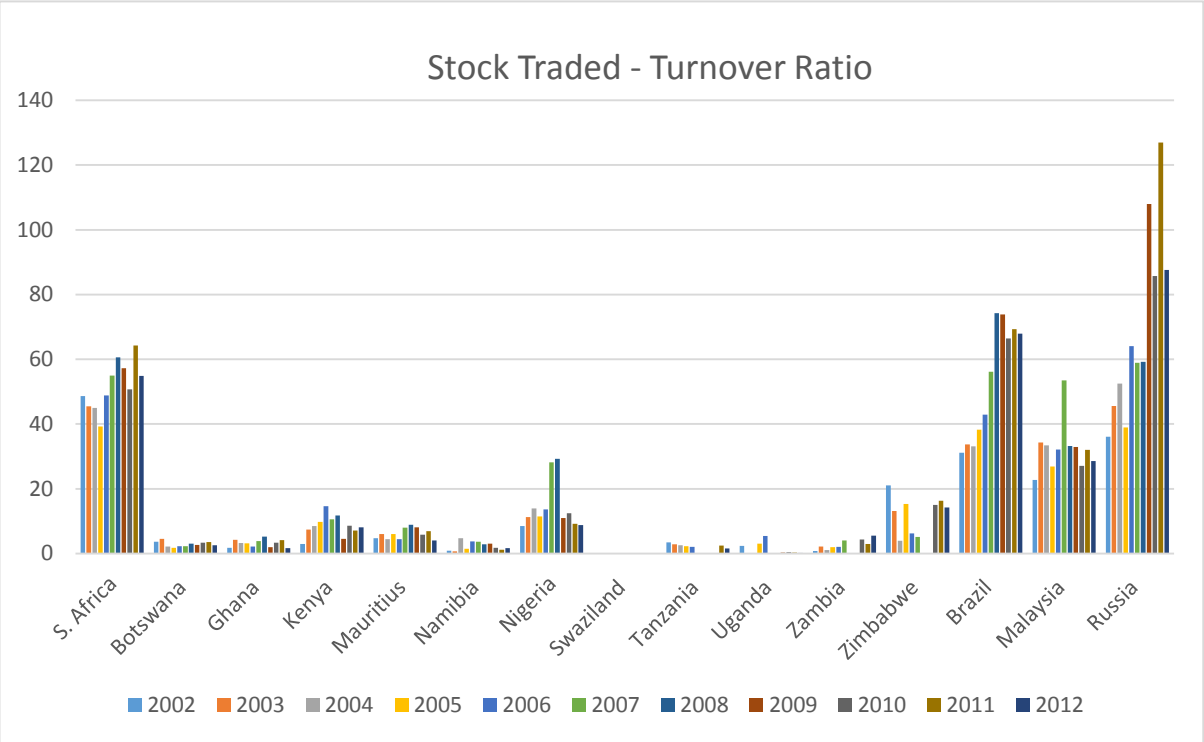
Figure 3.3: Stock Traded, Total Value (% of GDP) Trends



Source: World Data Bank; World Development Indicators (2015)

Figure 3.3 above highlights the total values of shares traded in percentage of GDP from 2002 to 2012. The stock traded complements the market capitalization ratio, as it indicates how the trading of stocks match the market size. One can easily detect that from 2002 to 2012 the stock traded (% of GDP) in South Africa is far larger not only than other selected countries in Sub-Saharan Africa, but also than even the included countries of Brazil, Malaysia and Russia. However, for the other Sub-Sahara African countries, the numbers show that their stock traded value is small relative to the size of the economies of their respective countries; together (SSA-countries included) they make 20.37% in total for 2012, while the corresponding figures for Brazil, Malaysia and Russia over the same period stood at 37.1%, 40.8%, and 36.3% respectively. This shows that the level of trading in many Sub-Sahara African stock markets is very small, making it difficult to complement the market capitalization (market size).

Figure 3.4: Stock Traded-Turnover Ratio Trends



Source: World Data Bank; World Development Indicators (2015)

The liquidity of the stock markets can be seen in Figure 3.4 above, measured by the turnover ratio. It can be seen from the given indicators that the liquidity in many of the Sub-Sahara African stock exchanges is very low. For example, in 2012 the stock traded, turnover ratio (liquidity) was the highest in South Africa at 54.9% followed by Zimbabwe with 14.2%, Nigeria with 8.79% and then Kenya with 8.07% (see Figure 3.4 above). In Uganda, the liquidity (stock traded – turnover ratio) was 0.15% in 2012, and the figure for turnover ratio from all included Sub-Sahara African countries (except South Africa) was 48.27% in comparison with 67.9% for Brazil and 87.6% for Russia in the same year. The average of the turnover ratio for the SSA countries including South Africa in 2012 was 8.6%, compared with 28.6% for Malaysia within the same period of time.

Having shown the small size of the stock markets in Sub-Saharan Africa (excluding South Africa) in terms of market capitalization (Figure 3.1), listed companies (Figure 3.2), stock traded-total value (Figure 3.3) and stock traded-turnover ratio (Figure 3.4) compared with Brazil, Malaysia and Russia, we conclude that despite continuous development in the formation of stock markets in Sub-Saharan Africa, the stock markets in the region remain comparatively different from other emerging markets in the world. Moreover, this study is in line with the ideas of Kenny and Moss (1998), Afego (2015), Ntim (2012) and Ntim et al. (2011) who argued that the stock markets in Africa (excluding South Africa) are small in size

compared with the size of their economies. This is also true with our study, as it can be seen in Figure 3.1 above that in 2012 the market capitalization in Tanzania and Ghana was only 4.7% and 8.3% of nominal GDP respectively, while the market capitalization for Namibia, Nigeria and Zambia was between 10% and 12.2% of their GDP. These figures are not only less than those of developed stock markets in the world, such as the USA with 122.8% and the UK with 145.6% (Ntimi, 2012), but also less than other emerging markets like Malaysia, with 156% of nominal GDP in 2012.

3.4 Theoretical Literature Review

3.4.1 The Role of Stock Markets on Economic Growth

Stock market referred to the business of buying and selling stocks, and need not imply a specific place. However, stock market may mean secondary equity markets which can either be organized as an exchange or as an over the counter (OTC) market (Grinblatt & Titman, 2002). The authors pointed out that an exchange is a physical location where buyers and sellers come together to buy and sell securities, while in OTC market buyers and sellers transact without meeting in a specific physical place. In the stock exchange, companies' shares can be traded in two ways: first, on the primary market on which companies issue stock for sale to the public for the first time, and second, on the secondary market whereby the existing stocks are traded in the stock exchange without the issuing company being involved.

The role of stock markets has been said to be a major developmental role in growing economies, due to the assumed impacts of the stock market on both corporate finance and economic activity within countries. The current interest in the impact that stock markets exert on economic growth has been explained in the literature in various ways. Rousseau and Wachtel (2000) provide four important reasons for the benefits that stock markets have for financial institutions. First, a prospective exit mechanism could be provided to the investors and entrepreneurs by the equity market. They explained further that in countries where a stock market exists there is a greater chance of attracting venture capital investments, than in countries where there is no stock market. Through the initial public offering (IPO) by the companies in the stock market, the possibility of earning profits from successful business projects is assumed by the venture capital investors. The venture capital investors could be attracted by the option of an exit mechanism in a liquid market; and in general this could increase entrepreneurial activity (Riman et al., 2008).

Secondly, the inflows of capital from both portfolio investments and foreign direct investments (FDI) could be facilitated in the liquid market. These are crucial means of investment capital for emerging stock markets. According to Rousseau and Wachtel (2000), international portfolio investments have rapidly increased as the benefits of international diversification became apparent to portfolio managers. Flow of capital from international portfolio investments has increased to countries with liquid and well managed markets. Therefore, the flow of investment capital can be facilitated by the availability of an equity market that will later be able to finance the deficit of the current account.

Thirdly, liquidity provision through well managed exchanges could persuade international and even domestic investors to transfer their superfluous to the long-term equity market from short term assets. According to the authors, the long-term equity market is where the investor's funds could attain firms' permanent capital, so as to be able to fund large and indivisible projects that benefit the large scale economies. Finally, the provision of important information by stock markets could improve the efficiency of financial intermediation. According to Rousseau and Wachtel (2000) the stock market could improve the availability of information from management to shareholders if with regard to traded companies; this will enable investors to easily evaluate the development of a company listed in a stock market.

According to Caporale et al, (2004) stock markets that are well managed may accelerate investment opportunities by financing useful projects that show the way to economic activities, mobilize savings, allocate capital resources, diversify risks and lastly smooth the progress of exchange of goods and services. Also, among their many roles, financial assets liquidity, investors' global risk diversification, availability of information for better investing decisions, promoting hard work by corporate managers in the interest of shareholders, and availability of more channels of savings to corporations, are key roles of stock markets in promoting economic growth (Nowbutsing, 2009). Allocation of capital to the corporate sector is one of the key functions of stock markets towards economic growth. Shahbaz et al., (2008) argued that stock markets take parts in a crucial role of distributing resources/capital to the corporate sector, which has a genuine effect on the economic growth. This is because most debt financing in developing countries is likely to be complicated, since the loans may be limited to a selected group of companies; this restriction may mirror constraints in credit markets or investors and higher interest linked with such debts (Shahbaz et al., 2008).

Another important function of capital markets/stock markets is their contribution to the international mobility of the capital resources, and the provision of fresh equity capital to the

corporate sector (Obstfeld, 1995). Apart from mobilizing capital and diversifying risks, a well-developed stock market can provide different types of financial services than the banking system in accelerating economic growth (Levine and Zervos, 1998). Moreover, stock markets can lower the cost of mobilizing savings and will later smooth the progress of investments into prolific technologies (Greenwood & Jovanovic, 1990). On the other hand, stock markets encourage investment by mobilizing savings, as well as stimulating the investment of domestic savings for aiding the privatization process. In addition, stock markets can create long-term investment through low transaction cost and therefore promote economic growth (Bencivenga et al., 1996; Levine, 1997).

A stock market that is well managed may provide liquidity that lowers the cost of the foreign capital, which is vital for development (Neusser & Kugler, 1998). It is also said that the capital markets of the less developed countries can effectively allocate funds and mobilize domestic savings. According to Singh (1997), by giving a boost to internal savings and accelerating the investments, a stock market can be used as a driver of economic growth. Individuals may use stock markets to deposit their money in a particular company, which will increase means of savings, and this is in agreement with Levine and Zervos (1996) who claim that the stock market plays the role of encouraging savings among individuals. The stock market liquidity is clearly possible when the market equity is traded easily so as to increase stock traded value – turnover ratio (liquidity); this may play an important role in economic growth (Bencivenga et al., 1996). They argued that people who save their money in stock markets can at any time sell them easily[30], while at the same time giving companies the ability to raise capital through issuing shares to the public; this gives companies stable right of access to capital introduced through equity issues.

Diversification is the method that reduces risk by allocating investments among various financial instruments, industries and other categories, which aim to maximize return and minimize risk (Francis & Ibbotson, 2002). By allowing the shareholders to invest in different securities of different companies, a stock market provides a means for managing risks, since investors will be in a position to invest on a portfolio basis (diversification). It has been argued that as the laws and regulations of many countries have been reformed, capital controls and other barriers to international capital flows have been removed (Demirgüç-Kunt & Levine, 1996). Indeed, many countries have undertaken such reforms to allow foreign investments to

[30] Apart from the facts that investments with high returns require a very long run capital formation, savers usually hate to surrender control of their saved money for a long period of time. This tension can therefore be resolved by a liquid stock market where savers can sell their assets easily and as quickly as possible.

flow to their respective countries, so as to increase stock market investments diversification, which will accelerate economic growth from international capital flows. In addition, internationally integrated stock markets can be used to improve the allocation of resources by allowing international risk sharing among investors, therefore, contributing to the economic growth (Obstfeld, 1994).

Stock markets facilitate the mobility of domestic savings by attracting the deposit of financial instruments available to savers, in order to diversify their portfolios, given that a significant source of investment capital at fairly low cost (Levine and Zervo, 1996). Thus, a stock market which is well managed, with adequate liquidity, and where the investors are able to diversify from unsystematic risk will increase the capital accumulation. Stock markets also contribute towards mobilization of domestic savings by facilitating the set of financial instruments available to savers to diversify their portfolio (Dailami & Atkin, 1990). Moreover, sound and efficient capital markets allow companies and investors to diversify sources of investment capital and spread investment risks respectively (Levine, 2005). Stock Markets also enable investors to invest in portfolio diversification, and therefore help private companies to engage in specialized production with efficiency gains (Acemoglu & Zilibotti, 1997).

Investors with liquid shares invested in a promising project in a well-managed stock market could be in a very good position to share risks (Atje & Jovanovic, 1993). They also argued that investors who are hit by liquidity shock can sell their shares to fellow investors who were not beaten by that shock; so as to enable them to cope with liquidity risk. However, it has been argued that apart from the benefits of risk diversification through stock markets, as stated above, yet risk diversification can hinder economic growth, because the greater risk sharing and the efficient capital allocation, together, can cause negative effects on savings rates (Beck & Levine, 2004).

Improving informational asymmetries is another of functions of the stock markets. According to Caporale et al (2004), stock markets have more information compared with other financial intermediaries, and that information is usually disclosed in more efficiently and transparent way. Stock markets may also be used to generate information about the innovative activity of entrepreneurs and technology (King & Levine, 1993a). Also for efficient resource allocation and economic growth, the availability of stock markets can reduce information asymmetry as well as alleviate the principal agent problem (Adjasi & Biekpe, 2006). Moreover, the availability of share prices that are determined by the stock exchanges and public information could help investors to make rational investment decisions. This will mean better allocation of

capital among listed companies, which will later accelerate economic growth. However, Demirguc-Kunt and Levine (1996) claimed that stock markets may also affect incentives for investors to acquire information about firms, since a liquid market can make investors who already have information about the company trade at posted price, therefore making it possible for the investors to make money before the information is widely spread and the price changes.

Both financial intermediaries and stock markets collect information as a guide to allocation of resources; but the information in stock markets, is collected in equity prices, while in other financial intermediaries like banks, the information is manipulated by loan officers. This shows that banks usually finance only borrowers who are safe, but stock markets, in order to improve informational asymmetry, can finance even risky projects (Caporale et al., 2004). However, it has been argued that other financial intermediaries and banks have an advantage over stock markets, as they could easily reduce the information asymmetries that cause the problem of adverse selection; and therefore improve the inefficiencies brought by information gaps (Stiglitz & Uy, 1996).

However, the function of improving informational asymmetries by stock markets has been questioned by other authors; for example, in their study Augustine and Pius (2010) show that the improvement of information asymmetries by stock markets may create a problem of adverse selection in the security market. Stiglitz (1994) argued that due to frequent changes in share prices and instability in the market, the information can be easily revealed in stock markets. He warned that, by revealing such information, the free-rider problem will occur; therefore, the incentives to the investors will decrease, uncertainty will increase, and ultimately the participants of the stock market, in order to be able to anticipate future market behaviour, will have to incur some costs to conduct a research. However, it was also argued that an investor can conduct a research about a firm before such information is widely spread, and before the changes of share prices; therefore, to earn adequate profit, investors must research and supervise firms/companies (Kyle, 1984).

Therefore, theoretical literature reviewed above suggests that the role of stock markets on economic growth have effects in liquidity, risk diversification, acquisition of firms and their managers' information, corporate control and savings mobilization. However, the debate over the sign of these effects still exist. Specifically, there are models that suggest the positive relationship between stock market development and economic growth, and others are not. This study contributes to the debate on the role of stock markets by examining the empirical causal effects of equity markets development on economic growth of 11 SSA countries.

3.4.2 Stock Market Liquidity and Economic Growth

The liquidity in the stock markets can be measured by two factors: first, stock traded value percentage to GDP, which measures the value shares transactions (transaction costs) in relation to the size of the economy; second, stock traded-turnover ratio, which measures the value of shares transactions (transaction costs) in relation to the size of the stock market[31] (Levine and Zervos, 1996). However, when they are compared with the size of both the markets and the economy, these two stock market liquidity indicators can measure the degree of trading in the countries stock markets. It is said that stock market liquidity is one of the promising channels through which all stock markets in the world can have a positive impact on the economic growth of their respective countries.

Demirguc-Kunt and Levine (1996) narrate that stock market liquidity may have the following roles in the development of stock markets: - (a) investment can be made less risky and more profitable and therefore attractive to savers (b) companies through issuing equity may enjoy permanent access to capital (c) allocation of capital may be improved and therefore increase the prospects for economic growth (d) savings and investment may increase due to less risky and profitable investment. Investors who are hit by liquidity shock can cope with liquidity risk by being allowed to sell their shares in the stock markets, where investors with non-liquidity shock will buy those shares (Caporale et al., 2004).

Stock market liquidity may reduce the cost of foreign capital, which is critical for economic growth, allows savers to sell their shares without any trouble, and allows companies to raise capital on encouraging terms (Bencivenga et.al; 1996). Many high-return long-term investments would not be undertaken if a liquid stock market were not available, because savers would be unwilling to commit their investments for long periods of time. However, Levine (1997) argued that long-term investment can be created by stock market liquidity through lower transaction cost which later will enhance economic growth. Savers can sell their shares easily in a liquid stock market; this will enable listed companies to raise share capital on favourable terms. In other words, the confidence of the investors is brought by the stock markets that are attainable whenever the need occurs. The more attainable the investors are in the market the more liquid the stock market will become; therefore, by improving the growth

[31] These two measures of stock market liquidity, STR and TVR complement the market capitalization rate (measure of stock market size) since that the equity markets may be large in size but inactive in operation. However, turnover ratio also compliments the other measure of liquidity-stock traded value percentage to GDP, since the stock markets may be small when they are compared with the countries' economy, but still liquid.

of long-term investment and high return investments, liquid markets develop the allocation of capital and boost the prospects for long-term economic growth.

However, surprisingly, there are negative views on the relationship between stock market liquidity (as an indicator for stock market development) and economic growth, since some economists warned that the development of stock market liquidity may harm economic growth. Theoretically, the argument is that the increased liquidity of stock markets may cause savings rates to decrease as a result of externalities in capital accumulation, and therefore hurt economic growth. The higher the stock market liquidity, the higher the investment returns, which could lower the saving rate caused by both substitution effect and income effect, leading to unfavourable economic growth (Obstfeld, 1994; Demirgüç-Kunt & Levine, 1996).

For example, Demirguc-Kunt and Levine (1996) argued that there are what they call three channels by which increased liquidity may deter economic growth. These are (a) reduction of saving rates through income and substitution effect, (b) reduction of saving rates due to explicit effects of uncertainty on savings and (c) the negative impact on corporate governance, which in the end will reduce economic growth; in this channel they went further to claim that the liquid stock markets may encourage investors not to demand preparation, since more liquid markets give investors the confidence to sell their shares quickly, reduce investors' commitment and lessen investors' incentives to apply corporate control by overseeing managers and monitoring the performance and potential of a company.

Theoretically, one can easily detect the conflicting debate on the role of stock market liquidity in economic growth. There are theories which suggest that liquidity may importantly play a role in economic growth by enabling large investments and long term projects, by improving the information acquisition about the listed companies and their managers (Levine and Zervos, 1996; Bencivenga et al. 1996; Levine, 1991). There are also theories which suggest that the stock markets with greater liquidity may harm economic growth via reduction of saving rates (Demirguc-Kunt and Levine, 1996; Obstfeld, 1994; Bencivenga and Smith, 1993). Certainly, theory is yet unclear about the effects of greater liquidity on economic growth. This is one of the factors that led this study to investigate if there is a need for the selected countries in sub-Saharan Africa to develop stock market liquidity as a means of economic growth. Therefore, we include the two measures of stock market liquidity that were proposed by Levine and Zervos (1996) to indicate stock market development on economic growth of 11 SSA countries, these are stock traded value percentage to GDP (STR) and stock traded-turnover (TVR).

3.5 Empirical Literature Review

3.5.1 Stock Market Development and Economic Growth: General Perspective

The growing trend of stock market development around the world has recently opened a new direction of empirical research on the relationship between stock market development and economic growth. Although much research has been conducted on the relationship between stock market development and economic growth (Filer et al., 1999; Rousseau & Wachtel, 2000; Arestis et al., 2001; Levine, 2003; Caporale et al., 2004; Dritsaki & Dritsaki-Bargiota, 2005; Adjasi & Biekpe, 2006; Nieuwerburgh et al., 2006; Naceur & Ghazouani, 2007; Deb & Mukherjee, 2008; Riman et al., 2008; Enisan & Olufisayo, 2009; Nowbutsing, 2009; Vazakidis & Adamopoulos, 2009; Ake, 2010; Antonios, 2010; Augustine & Pius, 2010; Zivengwa et al., 2011; Ake & Ognaligui, 2012; Marques et al., 2013), the debate is yet to be concluded, as many researches reached different results and conclusions (see Table 3.2); therefore, more empirical work is required to contribute to the body of knowledge.

Much literature has theoretically and empirically argued that the two are positively correlated, and others have not agreed with that idea and argued that there is no correlation between stock market development and economic growth. From a theoretical perspective, stock market development should promote economic growth by means of the stock market functions discussed above, namely, capital accumulation, resource allocation and mobility of savings, stock trading that increases liquidity, risk diversification and portfolio investment, managing for corporate governance and control, and acquisition and distribution of the required information to investors and other stakeholders. For example, theoretically, Capasso (2006) after examining the empirical and theoretical literature, concluded that, in empirical fact the positive correlation between stock market development and economic growth is well known and truly exists.

In their study, Caporale et al. (2004) assert that a well-developed stock market can in the long run push the economy into growth. They narrate that economic growth can be pushed by a well-developed stock market that fuels the engine of growth, and promotes economic efficiency through both quick capital accumulation and effective resource allocation. In their theoretical contribution, Rousseau and Wachtel (2000) concluded that stock market development can push forward economic growth through: (a) giving venture capitalists a so-called exit mechanism, (b) sustaining the stock liquidity to investors, which attracts international risk diversification and portfolio investment, (c) enabling companies to easily

obtain sufficient capital that can then be allocated to big and promising projects, and (d) providing crucial information about the quality of sustainable investments.

Empirically, Levine and Zervos (1998) after controlling for many political and economic factors that could affect economic growth, found that a liquid stock market is positively and robustly correlated with economic growth, capital accumulation and productivity growth. However, they also showed that the size of stock market, international integration and volatility are not robustly correlated with economic growth. In their study, Demirgüç-Kunt and Levine (1996), agreed that stock market development is positively and significantly correlated with long-run economic growth. In addition, with the use of a cross-country regression framework (Rousseau & Wachtel, 2000; Beck & Levine, 2002) found that the development of stock markets is strongly linked with real GDP per capita, which stands for economic growth. They went further to show that both stock market liquidity and banking development can influence future economic growth, especially when those variables are included in growth regression. With the use of time series data from five industrialized countries, Germany, USA, Japan, UK and France (Arestis et al., 2001), they found that though it is exaggerated in the cross-sectional[32] growth regression studies, there is a contribution of stock market development to economic growth. However, in their study they found that banking contribution to the economic growth is more powerful than the contribution of stock markets.

[32] In the cross-country studies on the interaction between stock market development and economic growth the endogeneity problem has been found to weaken the estimated effect of stock market development [(Harris, 1997)]

Table 3.2: Stock Market Development and Economic Growth-Empirical Review

Author(s)	Countries + Method used	Results of the Study
King and Levine (1993)	77 countries (from 1960 to 1989) in cross-section study.	A robust relationship between stock market development and growth.
Levine and Zervos (1996)	41 countries (from 1979-1993) in cross-country study using pooled regression	Strong correlation between stock market and long-run economic growth.
Levine and Zervos (1998)	48 countries (from 1976 to 1993) in cross-sectional study.	Strong statistical significant between stock market indicators, banking development and growth.
Rousseau & Wachtel (2000)	47 countries (from 1980 to 1995) in panel study using panel VAR	Stock market indicators promote economic performance.
Arestis at al. (2001)	5 countries (at least from 1968 to 1998 unbalanced) using time series methods	Both banks and stock markets promote economic growth, but banks are more powerful.
Caporale et al. (2004)	7 countries (1977:1 to 1998:4) using the causality testing in VARs	Stock market indicators if well-developed can spur economic growth.
Dritsaki and Dritsaki-Bargiota (2005)	In Greece (1988:1 to 2002:12) using Trivariate autoregressive VAR model	It is economic growth that causes stock market development in Greece.
Adjasi and Biekpe (2006)	14 African countries (unbalanced period) using dynamic panel data modelling	Positive relationship between stock market development and economic growth.
Nieuwerburgh et al. (2006)	In Belgium (from 1830 to 2000) using VECM technique	Stock market development causes the growth of the economy in Belgium.
Naceur & Ghazouani (2007)	11 MENA countries (1979-2003) using dynamic panel model-GMM estimators	No relationship between stock markets, banks and economic growth in MENA.

Deb and Mukherjee (2008)	In India (1996-2007) using Granger non-causality testing of Toda & Yamamoto	The flow of the relationship is from stock market development to growth.
Shahbaz et al. (2008)	In Pakistan (1971-2006) using J-J cointegration and ARDL bounds approaches	Long-run bidirectional relationship between stock markets & economic growth.
Enisan & Elufisayo (2009)	7 SSA countries (1980-2004) using Autoregressive Distributed Lag (ARDL) bounds test	Stock markets have significant positive impact on economic development in SSA.
Nowbutsing (2009)	In Mauritius (1989-2006) using Error Correction Method (ECM)	Stock market development do influence the growth of the economy in Mauritius.
Vazakidis & Adamopoulos (2009)	In France (1965-2007) using the VECM – Vector Error Correction Model	It is economic growth that promotes stock market development in France.
Antonios (2010)	In Germany (1965-2007) using the VECM – Vector Error Correction Model	Stock market development influences Germany's economic growth.
Ake (2010)	In 5 Euronext countries (1995:1-2008:4) using Granger causality test	In countries with high liquidity there is a relationship, but in those with less liquidity there is no relationship.
Zivengwa et al., (2011)	In Zimbabwe (1980-2008) using VAR and Granger causality tests	Unidirectional causal relation from stock market development to growth.
Ake and Ognaligui (2012)	In Cameroon (2006-2010) using Granger causality testing.	Stock market development does not affect Cameroun's economic growth.
Marques et al., (2013)	In Portugal (1993-2011) using VAR and Granger causality testing.	A bi-directional relation between economic growth & stock market development.
Nyasha & Odhiambo (2014)	In South Africa (1980-2012) using newly developed ARDL bounds testing.	There is no relationship between stock market and economic growth.

Srinivasan & Prakasam (2014)	In India (1991-2013) using Cointegration and Granger causality testing.	Stock market indicators (mkt capitalisation and turnover ratio) cause economic growth in India.
Pradhan et al., (2015)	In 34 OECD countries (1960-2012) using a panel vector autoregressive model (Pradhan et al., 2015)	There are linkages between stock mkt indicators & economic growth in both short and long run.

Source: Researcher's own Collections of Reviewed Empirical Literature

3.5.2 Stock Market Development and Economic Growth in Sub-Saharan Africa

Over the last decade, there have been a few studies on the relationship between stock market development and economic growth in Sub-Saharan Africa (Adjasi & Biekpe, 2006; Okeahalam & Afful, 2006; Riman et al., 2008; Enisan & Olufisayo, 2009; Nowbutsing, 2009; Augustine & Pius, 2010; Zivengwa et al., 2011; Ake & Ognaligui, 2012; Nyasha & Odhiambo, 2014). For example, Adjasi and Biekpe (2006) classified their 14 African countries into low, low-middle and upper-middle income economies to study the effect that stock market development can have to economic growth; to a large extent their results indicate a positive linkage between the two. They go further to analyse their results based on the level of stock market capitalization and economic growth. It was revealed that in upper-middle income countries there is positive impact of stock market development on economic growth. However, when they grouped countries based on market capitalization, it was found that in countries with moderate market capitalization, stock market development does not influence economic growth.

Nyasha and Odhiambo (2014) investigated the effect of both financial development and stock market development on economic growth in South Africa. With the use of an Autoregressive Distributed Lag (ARDL) bound approach they found that there is no relationship between stock market development and economic growth in both short-run and long-run. However, they found a positive relationship between financial development indicators and economic growth. Therefore, this recent study shows that the economic growth of South Africa does not depend on the development of the stock market, but rather depends on the development of the bank-based financial sector. This is very different from the information displayed in Figure 3.1 and 3.3 above, which shows that the market capitalization (% of GDP) and stock traded-total value (% of GDP) for South Africa in 2012 were 154% and 78.5% respectively. This means that both indicators contribute to the economic growth of South Africa.

Ake and Ognaligui (2012), used Doula stock exchange of Cameroon to examine the stock market development and economic growth in developing countries. They collected the data from 2006 to 2010 (although in our opinion a span of four years is very short for this kind of study) to reach the objective of their study, with the help of Granger causality testing. Their findings confirm non-existence of a relationship between the two, as they found that the stock market development does not positively influence the economic growth in Cameroon. However, due to lack of adequate data from Cameroon, our study excludes Cameroon from the list of Sub-Sahara African countries to be investigated on the effect of stock market development towards economic growth.

Zivengwa et al. (2011) used the Zimbabwe stock market to study the causal relationship between economic growth of Zimbabwe and stock market development. With the use of stock market size and stock turnover ratio annual data from 1980 to 2008 as measured by market capitalization and stock traded value for stock market development respectively, they found that stock market development Granger causes economic growth in Zimbabwe. However, unlike the study of Zivengwa et al. (2011), which included only one country, Zimbabwe, in their investigation, and used a time series data approach, we include Zimbabwe in our panel study on the effect of stock market development in economic growth with another ten selected countries in SSA. Moreover, we use a very recent data set from 1988 to 2012 for Zimbabwe to draw a conclusion that will be meaningful, as it is known that in the past few years, Zimbabwe was surrounded by political instability that in one way or another affected the stock market activities.

Enisan and Olufisayo (2009) considered seven countries in SSA to investigate whether there is a long-run causality relation between stock market development and economic growth. Like the study of Nyasha and Odhiambo (2014), they also used Autoregressive Distributed Lag (ARDL) bounds testing, and found a long-run relationship between the two, only in Egypt and South Africa (for South Africa, this result contradicts the result of Nyasha and Odhiambo (2014) who claimed that the two have no relationship in both long and short run); whereby it is stock market development indicators that Granger influence economic growth. Alhough they found the existence of a relationship in other countries, their causality is bidirectional in Zimbabwe, Morocco, Kenya, and Ivory Coast. However, they were unable to get the results for economic growth-led market size (stock market development indicator) in the case of Nigeria. They argued that if well developed, the stock market can spur economic growth in Africa.

In his study, Nowbutsing (2009) investigated the linkage between stock market development and economic growth in Mauritius. It was found that there is a positive relation between the stock market and economic growth in both short run and long run analysis. In his study, he used only one country (Mauritius) and time series data for the period of 1989 to 2006. In our study, we include Mauritius among eleven selected countries in sub-Sahara Africa to investigate if there is a short run or long run relationship between the two, but we use a panel data approach with very current data from 1990 to 2012 for Mauritius; the conclusion of which could contribute to the existing body of knowledge.

In Nigeria, when investigating the relationship between stock market performance and economic growth (Riman et al., 2008); found evidence to suggest the existence of a long-run relationship between stock market and economic growth. They used Johansen's Vector Error Correction Model (VECM), applied to annual data from 1970-2004. The results of Riman et al., (2008) also contradict the results of Enisan and Olufisayo (2009) who found no relationship between stock market development and economic growth in Nigeria. Unlike their study, which included one country, Nigeria, our study includes Nigeria as one of eleven countries selected from sub-Sahara Africa to examine the causal relationship between stock market development and economic growth, with a panel approach that uses very recently available data from 1998 to 2012.

Specifically, most of the studies on stock market development and economic growth have focused mostly on developed economy and big emerging countries, and for the luckily ones that study on less developing economies the emphasis has not been immensely on Africa particularly SSA. Most of the studies that based on African stock markets the emphasis has been on testing market efficiency (Afego, 2015; Ntim, 2012; Ntim et al., 2011; Kenny and Moss, 1998). Therefore, there is a need for a detailed study of the African situation particularly SSA, to examine the role that African equity markets play in economic growth of their respective countries. This study contributes to empirical literature on African stock markets by examining the causal effects of equity markets development on economic growth of 11 Sub-Sahara African countries. It goes further to include for the first time the newly established small stock markets from Tanzania and Uganda, to examine the cointegration and causal relationship between the equity market development and economic growth in a panel of 11 SSA countries.

However, the following are the reasons that influenced our investigation of the effect of SSA equity market on economic development: -

- There are very few studies conducted in SSA on the effects of stock market development on economic growth (see Table 3.2); for example, one can notice from the study of Enisan and Olufisayo (2009) that they included Morocco and Egypt among SSA countries, which is not valid since these countries are counted as MENA countries. Our study investigates the matter using exclusively SSA countries and a panel data approach, unlike their time series approach. Our study also uses recent data that are available up to 2012 to give a clear picture of what has been happening in the development of SSA stock markets in relation to their economic growth.
- There are no such studies of newly established and infant stock markets in some selected countries in SSA such as Tanzania and Uganda. Their exclusion might be due to the fact that since they were new (less than 20 years old), they did not have sufficient data to be included in various studies conducted in Sub-Saharan Africa. We include these less developed countries with infant stock markets (Tanzania and Uganda) in our unbalanced panel data approach, as we now believe that they have sufficient data to be included in SSA studies on equity markets. Therefore, this adds to body of knowledge on the effect of stock market development on economic growth.
- In their study, Adjasi and Biekpe (2006) suggest that less developed stock markets in low income Sub-Sahara African countries have to grow more, and develop their stock markets, to promote economic growth. It is about a decade since they offered this advice. Thus, our study investigates if Sub-Sahara African countries, excluding South Africa, have developed their respective stock markets to an extent that can promote economic growth.
- Moreover, it is almost 20 years since Demirguc-Kunt and Levine (1996) suggested two things; *first,* it was not yet clear if countries need their own active stock market for economic growth, *second*, policy makers of the respective countries were not ready to push for stock market development. Therefore, this study examines if Sub-Saharan Africa need to develop their own stock markets for economic growth, and to suggest whether the policymakers of the selected countries should push stock market development as a means of economic growth[33].

[33] As a suggestion given in the study of Demirguc-Kunt and Levine (1996), to see if the selected sub-Saharan African countries need to develop their stock market for economic growth; and as well to see if it is now time for policy makers of the respective countries to push for stock market development.

In pursuing the above objectives, we address the following important questions to be answered in the empirical results of this chapter:

- *Is there a long-run relation between equity market development and economic growth in selected Sub-Sahara African countries?*
- *Do equity markets in Sub-Sahara Africa play any role in economic growth of their respective countries?*
- *What is the nature of any existing causal link between equity market development and economic growth in selected Sub-Sahara African countries*?

3.6 Data and Data Sources

As mentioned earlier, the study is carried out in eleven sub-Saharan African countries Kenya, Tanzania, Uganda, Ghana, Botswana, Zambia, Zimbabwe, Nigeria, Namibia, Swaziland, and Mauritius. Year of establishment of the stock markets and the availability of the data are the determinants for countries' selection. An unbalanced panel data approach is used in this particular study using data sets for the minimum of 11 years and maximum of 24 years from 1988 to 2012[34] (see Table 3.3 below).

Table 3.3: Data Periods Included in Selected SSA Countries (unbalanced Panel Data)

Country	Periods Included	Number of Years
Botswana	1991 to 2012	21
Ghana	1993 to 2012	19
Kenya	1990 to 2012	22
Mauritius	1990 to 2012	22
Namibia	1994 to 2012	18
Nigeria	1989 to 2012	23
Swaziland	1994 to 2006	12
Tanzania	1998 to 2012	14
Uganda	2001 to 2012	11
Zambia	1996 to 2012	16
Zimbabwe	1988 to 2012	24

Note: Number of years included were decided according to data presence in the particular countries of the study.

[34] It is unbalanced panel as some of the countries' stock markets are young (eg; the Tanzanian and Ugandan stock markets established in 1998), while some of the stock markets are old (eg; Kenya, Nigeria, Zimbabwe and even Mauritius). Therefore, the availability of the data obtained was different according to countries' year of establishment.

The data for equity market development indicators (market capitalization rate, stock traded value and turnover ratio), economic growth indicator (GDP per capita), and control variables real interest rate[35] and inflation-GDP deflator were all collected from the World Bank-World Bank Development Indicators Data (2015); while the data for the additional variable, openness was found from Penn World Table version 7.1. We also incorporated the Dar-es-salaam Stock Exchange annual reports and handbook to obtain some of the data in market capitalization, stock traded values and turnover ratio for some years.

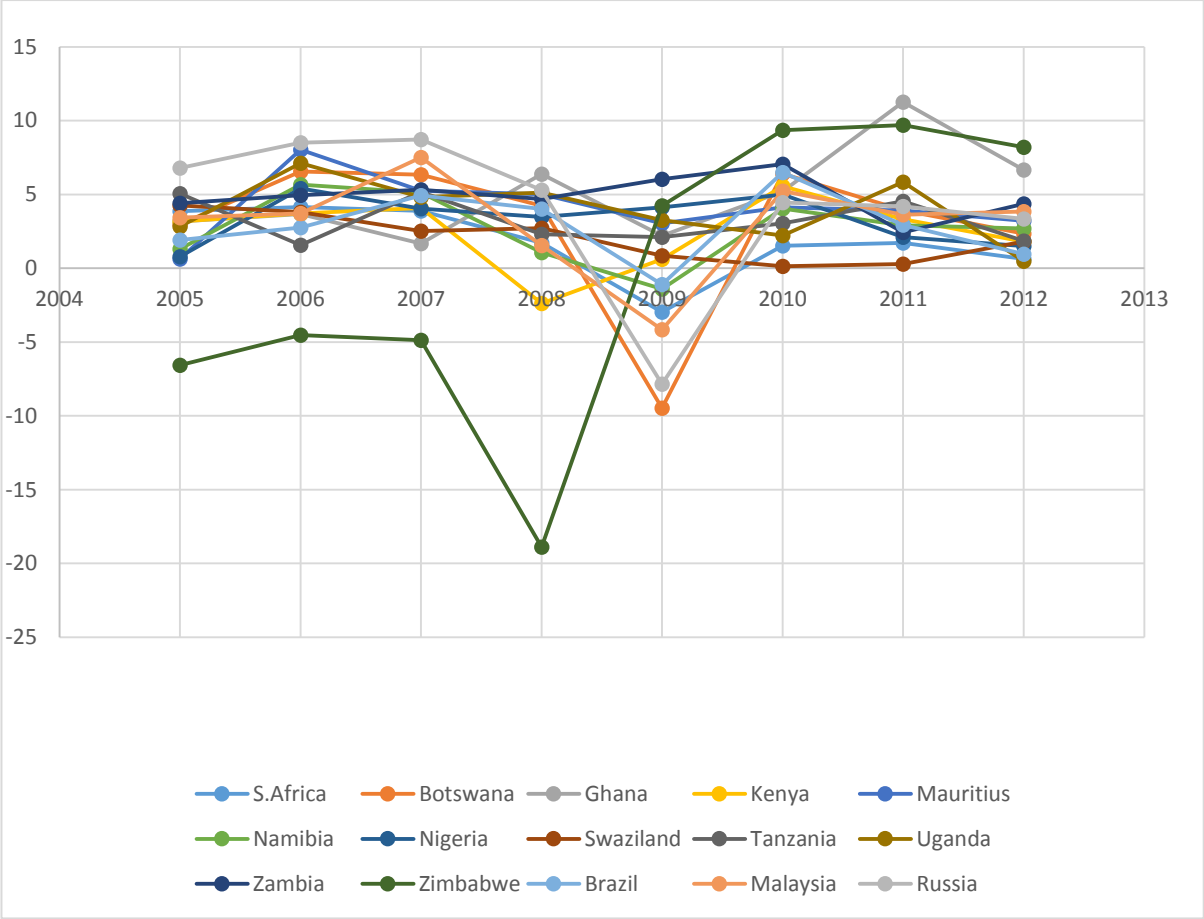
Generally, many of the selected countries, except for Tanzania and Uganda, came into operation before 1998 and therefore have sufficient data for the variables selected for the purpose of this study. The market capitalization ratio of GDP, the stock traded ratio of GDP and the turnover ratio are used as the proxies for stock market development, which should determine the level of economic growth for the eleven countries included in this study as can be seen in Table 3.3 above. The sample data for the selected stock market development indicators; the market capitalization percentage of GDP can be seen in Table 3.4, the stock traded value percentage of GDP in Table 3.5, and the turnover ratio in Table 3.6 and economic growth indicator GDP per capita growth in Figure 3.5 below.

3.6.1 Measurement for Economic Growth

In measuring economic growth, many of the researchers (Pradhan et al. 2015; Ahmed and Wahid, 2011; Adjasi and Biekpe, 2006; Beck and Levine, 2004; Rousseau and Wachtel, 2000; Levine and Zervos, 1996; Atje and Jovanovic, 1993) used per capita GDP growth as a proxy for economic growth. In line with the previous studies mentioned above, we also adopt the GDP per capita growth to represent the economic growth of the countries selected (see the trends of GDP per capita growth from 2005 to 2012 in Figure 3.5 below) in this study; other countries like South Africa, Malaysia, Russia and Brazil are included for comparison purpose. One can notice that the economic growth (GDP per capita growth) of many selected countries (see also Appendix 3b) has been decreased in 2012 compared to figures in 2011, or two years (2010) before, with the exception of Swaziland (0.28 percent 2011 to 1.81 percent 2012) and Zambia (2.43 percent 2011 to 4.37 percent 2012) for countries in Sub-Saharan Africa; and Malaysia (3.62 percent 2011 to 3.84 percent 2012) in other emerging economies.

[35] The World Bank didn't have real interest rates data for Zimbabwe from 2008 to 2012, therefore, we used the lending interest rates to fill the gap; the source for such data is (R.B.Z, 2015)

Figure 3.5: GDP per Capita Growth (Annual %): The Trends from 2005 to 2012



Sources: World Data Bank; World Development Indicators (2015)

This study investigates whether such volatility (see Figure 3.5 and/or Appendix 3b) of the GDP per capita growth rate (economic growth), have been influenced by the equity market development in the eleven selected SSA countries. However, it is surprising that the GDP per capita growth rate for countries like Ghana, Tanzania, and Uganda were massively dropped from 11.25 percent to 6.66 percent, 4.53 percent to 1.85 percent, 5.85 percent to 0.49 percent respectively; unlike other selected SSA countries. For this reason, together with the decreased GDP per capita growth rate from 2010 to 2012 in many of the selected SSA countries, it could be suggested that the SSA' economies are still struggling to grow, compared with other emerging economies like Malaysia and Russia.

3.6.2 Indicators for Equity Market Development

The equity market development indicators used in this study stand for measures of the stock market development. Filer et al (1999) used market capitalization over GDP, turnover velocity (the ratio of turnover to market capitalization) and the change of the domestic shared listed, as the three variables to measure the stock market development. Levine and Zervos (1998) used the measures of (a) stock market liquidity, (b) stock market size, (c) volatility and (d) integration with world capital markets to see if they are robustly correlated with current and future rates of economic growth, capital accumulation, productivity improvements and savings rates. Stock market size is an important indicator of stock market development, since it is influential on other measures such as risk diversification as well as the level of savings mobilization (Cappaso, 2006). However, Cappaso (2006) showed that market size as an indicator has got weaknesses because of its inability to measure qualitative features of stock market development. Therefore, he decided to use the volume of share traded to measure the level of market liquidity, and degree of concentration to measure the level of risk diversification instead of stock market size.

Therefore, in totality Capasso (2006) selected (a) Market capitalization ratio (b) Number of listed companies (c) Total value traded (d) Turnover ratio (e) Institutional and regulatory framework and (f) Concentration (that is measured by the average size of the companies listed in the stock exchange) as the indicators of stock market development. In this study, the indicators of equity market development are (a) Market capitalization of listed companies (% of GDP) (b) Stock traded value (% of GDP) (c) Stock Traded-Turnover ratio (% of GDP). The rationale for selecting these indicators comes from the study of Beck et al (2000) who indicate these variables as the three main indicators of stock market development. The indicators measure the size, activity and efficiency of the stock market respectively.

1. Market Capitalization Rate (MCR)

MCR is considered as a measure of the size of the stock markets as it accumulates the value of all shares listed in the stock exchange. Naceur and Ghazouani (2007) argued that there is a positive correlation between the size of the market and its ability to mobilize capital and diversify risk; however, the stock market size does not indicate stock market liquidity. This study uses the market capitalization percentage to GDP to indicate equity market development of the eleven SSA countries. Table 3.4 below partly shows the market capitalization ratio of the panel countries from 2002 to 2012. In 2012, only Zimbabwe, with 94.7 per cent market

capitalization, shows that the size of its market is fairly big compared to other selected countries in sub-Sahara Africa (except South Africa). Mauritius follows for a size of the market as it has 61.9 per cent market capitalization; while, Tanzania has a very small market in size compared with other selected countries in SSA, with only 4.7 per cent market capitalization in 2012 (see Table 3.4).

Table 3.4: Market Capitalization (% of GDP) Trends – From 2002 to 2012

Country	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
S. Africa	159	153	199	219	263	278	171	238	169	126	154
Botswana	31.7	28.4	28.4	24.5	38.9	53.8	31.9	42.3	29.7	26.7	31.6
Ghana	12.0	18.7	29.8	15.5	15.8	9.6	11.9	9.7	10.9	7.8	8.3
Kenya	10.8	28.0	24.2	34.1	44.1	41.9	30.4	29.1	36.2	24.3	29.4
Mauritius	27.9	34.9	37.3	41.7	53.4	72.7	35.7	53.6	76.6	68.1	61.9
Namibia	5.1	6.2	6.7	5.7	6.8	8.0	7.3	9.5	10.4	9.3	10.0
Nigeria	9.7	14.0	16.5	17.2	22.6	51.9	23.9	19.7	13.8	9.5	12.2
Swaziland	11.7	9.3	9.3	7.6	6.8	6.7	-	-	-	-	-
Tanzania	6.5	5.7	5.2	4.2	3.8	-	4.7	-	4.1	4.6	4.7
Uganda	0.8	0.7	1.2	1.1	1.2	-	21.6	22.0	9.5	41.4	30.7
Zambia	5.6	15.3	7.3	11.9	9.3	16.7	-	18.3	13.9	16.9	12.0
Zimbabwe	246	86.9	33.4	41.7	488	101	-	47.0	121	99.5	94.7
Brazil	24.6	42.5	49.8	53.8	65.3	100	35.7	72.0	72.1	49.6	54.7
Malaysia	123	153	152	126	145	168	81	127	166	136	156
Russia	36.0	53.6	45.3	71.8	107	116	23.9	70.5	65.9	41.8	43.4

Sources: World Data Bank; World Development Indicators (2015).

2. Stock Traded Ratio (STR)

It is an indicator that gives the total value of share traded in the stock market during the period. It is a measure of liquidity of the stock market. It is also an indicator that harmonizes the market capitalization ratio and indicates whether market size is matched by trading activity; although a stock market can be large in size with little trading. According to Naceur and Ghazouani (2007), stock market liquidity decreases disincentives to investments as it widens the scope for allocation of resources and therefore spurs economic performance. This study uses the market stock traded value percentage to GDP to indicate equity market development of the eleven SSA countries. In Table 3.5 below, we can again see that Zimbabwe leads with 12.9 per cent of stock traded value in 2012, compared with the other ten SSA countries selected in this study. This indicates that Zimbabwe is ahead of other SSA countries (excluding South Africa) when speaking of market liquidity. Mauritius and Kenya follow with 2.59 per cent and 2.00 per cent

of stock traded value respectively in 2012, while Uganda (0.05 per cent) and Tanzania (0.07 per cent) have very low market liquidity (stock traded value) compared with the other Sub-Sahara African countries in 2012.

Table 3.5: Stock Traded, Total Value (% of GDP) Trends – From 2002 to 2012

Country	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
S. Africa	68.3	58.7	71.2	77.9	115	142	140	116	90.6	89.3	78.5
Botswana	1.02	1.15	0.56	0.45	0.72	1.01	1.30	1.02	1.02	0.95	0.78
Ghana	0.18	0.60	0.74	0.63	0.26	0.44	0.53	0.22	0.32	0.35	0.13
Kenya	0.28	1.40	2.14	2.70	5.03	4.12	4.01	1.34	2.71	2.10	2.00
Mauritius	1.19	1.77	1.50	2.40	2.04	4.74	4.18	3.73	3.68	4.64	2.59
Namibia	0.04	0.03	0.27	0.09	0.23	0.26	0.22	0.25	0.16	0.12	0.16
Nigeria	0.80	1.27	1.90	1.73	2.45	10.08	9.59	2.70	1.43	1.01	0.91
Swaziland	0.01	0.00	0.00	0.00	0.00	-	-	-	-	-	-
Tanzania	0.18	0.17	0.13	0.10	0.08	-	0.10	0.19	0.08	0.10	0.07
Uganda	0.01	0.00	0.00	0.03	0.06	-	0.54	0.06	0.05	0.08	0.05
Zambia	0.05	0.22	0.11	0.17	0.18	0.51	0.65	0.31	0.60	0.42	0.78
Zimbabwe	39.2	23.5	2.34	5.76	16.5	15.4	-	5.05	12.1	16.6	12.9
Brazil	9.56	10.9	14.1	17.5	23.4	42.8	44.0	40.1	42.0	38.8	37.1
Malaysia	27.4	45.5	48.0	34.8	41.1	77.5	36.9	36.1	36.4	44.5	40.8
Russia	10.5	18.8	22.1	20.9	52.0	58.1	33.9	55.8	52.4	60.2	36.3

Sources: World Data Bank; World Development Indicators (2015)

3. Turnover Ratio (TVR)

Stock traded-turnover ratio measures the volume of domestic shares traded in the domestic stock markets relative to size of the market (Levine and Zervos, 1998). The higher the turnover[36] the lower the transaction costs and a large stock market does not always represent a liquid market. Thus, a stock market may still be large but if it is inactive with its large market capitalization, will have small turnover. Of course, having high percentage in both market capitalization and stock traded value could produce a high percentage of turnover ratio; for example, in 2012, Zimbabwe had a 14.2 per cent turnover ratio (see Table 3.6 below) which indicates the efficiency of its stock market, compared with the stock markets of other SSA countries (excluding South Africa).

[36] Turnover ratio indicates the efficiency of the domestic stock market (see Naseur and Ghazouani; 2007)

Table 3.6: Stock Traded, Turnover Ratio (%) Trends – From 2002 to 2012

Country	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
S. Africa	48.6	45.5	45.0	39.3	48.8	55.0	60.6	57.3	50.7	64.3	54.9
Botswana	3.70	4.50	2.15	1.81	2.27	2.24	3.05	2.64	3.35	3.55	2.60
Ghana	1.78	4.20	3.22	3.15	2.14	3.88	5.19	1.96	3.37	4.13	1.63
Kenya	2.94	7.46	8.54	9.83	14.6	10.6	11.8	4.59	8.60	7.12	8.07
Mauritius	4.75	6.04	4.41	6.05	4.42	7.97	8.85	8.06	5.87	6.92	4.01
Namibia	0.88	0.71	4.71	1.50	3.78	3.67	2.84	3.03	1.82	1.23	1.71
Nigeria	8.53	11.3	13.9	11.5	13.6	28.2	29.3	11.0	12.5	9.21	8.79
Swaziland	0.13	0.03	0.02	0.01	0.03	-	-	-	-	-	-
Tanzania	3.44	2.89	2.52	2.29	2.10	-	-	-	-	2.45	1.60
Uganda	2.38	0.00	0.00	3.02	5.48	-	-	0.29	0.36	0.33	0.15
Zambia	0.82	2.21	1.11	1.96	2.11	4.07	-	-	4.33	2.94	5.58
Zimbabwe	21.1	13.1	3.92	15.3	6.19	5.09	-	-	15.0	16.3	14.2
Brazil	31.1	33.7	33.1	38.3	42.9	56.2	74.3	73.9	66.4	69.3	67.9
Malaysia	22.7	34.3	33.4	26.9	32.1	53.5	33.2	32.9	27.1	32.0	28.6
Russia	36.1	45.6	52.5	39.0	64.1	58.9	59.2	108	85.7	127	87.6

Sources: World Data Bank; World Development Indicators (2015)

3.6.3 Selected Controlling Variables in the Model

It is believed that the economic growth of any particular country may be affected by other variables (apart from strictly exogenous variables selected as proxies for stock market development), and their exclusion may bring biased results in the direction of a causal relationship between equity market development and economic growth. For example, in their study Levine & Zervos (1998) controlled for political and economic factors as they could affect economic growth. Also, Augustine & Pius (2010) in their study controlled for consumer price index, physical capital, and government expenditure, as they thought that their exclusion could produce biased results. With the idea of avoiding simultaneous biasness (Gujarati, 1995) in our regression, we include real interest rate (IRR), openness ratio (OR) and Inflation-GDP deflator (IR) as additional or controlling variables. We believe that the named three additional variables may be effective channels by which stock market development influences economic growth.

*The openness ratio (OR)***:** This has been included in our study as a measure of the impact of financial liberalization that occurred in most African countries at the end of 1980s and beginning of the 1990s. In their interest group theory of financial development, Rajan and Zingales (2003) suggested that openness in trade and finance can stimulate financial development. With the use of a panel data approach in their empirical work, Baltagi et al. (2009) suggested that trade openness has a positive significant relationship with financial

development. In line with the work of Rajan and Zingales (2003) and the empirical work of Baltagi, et al. (2009), we believe that openness in the financial sector can bring effects on the economic growth of many African countries; we, therefore, include the variable openness measured at 2005 constant price (%)[37] as one of the control variables in this study.

*Real Interest Rate (IRR)***:** This is one of the crucial determinants that could influence the economic growth of any country. Real interest rate is included in our regression model as one among the factors that can influence the economic growth of the selected SSA countries. We include the real interest rate as a control variable in this study because it was found in some previous studies that there is a positive and significant relationship between real interest rate and economic growth (King & Levine, 1993b; Beck et al., 2000).

*Inflation Rate (IR)***:** Another additional variable we include in this study as a control variable is Inflation rate measured by GDP deflator (IR). According to World Bank World Development Indicators (2015) this type of inflation shows the rate of price differences in the whole economy, as it is measured through the annual growth rate of the GDP implicit deflator. Therefore, since the inflation GDP deflator shows the rate of change in price for the whole economy, we tend to believe that it could have a big impact in the overall economic growth of the selected countries. The use of different measures gives a broader picture of the relationship between equity market development and economic growth rather than using a single measure.

3.7 Research Methodology and Estimation Techniques

In this section, the study highlights different econometric techniques that are used to attain the objectives of this study; which are to examine the effects of stock market development on economic growth, and to determine the direction of the causal linkage between stock market development and economic growth. The panel unit root is tested to see if the variables are stationary and ready for estimations. To test for unit root, the study uses both Im-Pesaran-Shin (IPS) and Fisher type tests. The estimation technique used to examine the effects of equity market development for eleven SSA countries on their economic growth, was the fixed effect model (FEM). The direction of causality between the equity market development and economic growth in a panel of those eleven countries, was determined by the Granger Causality method.

[37] The data on the control variable 'openness at 2005 constant price (%)' were obtained from Alan Heston, Robert Summers and Bettina Aten; Penn World Table version 7.1, Center for International Comparisons of Production, Income and Prices at the University of Pennsylvania, Nov 2012.

3.7.1 Panel Unit Root Tests

Before proceeding with the estimation techniques to achieve the results of our study on the effects of stock market development on economic growth, we first have to test for the unit root against our given variables to check if they are stationary and ready to be used for estimation. For this purpose, our study applies the unit root test used when the panel is unbalanced, namely the Fisher-type tests (Maddala and Wu, 1999; Choi, 2001) and Im-Pesaran-Shin (IPS) tests proposed by Im, Pesaran and Shin (2003). When comparing the Fisher-type, Levin-Lin (LL) and Im-Pesaran-Shin (IPS) panel data unit root tests, the Fisher test is quite simple and direct to use; therefore, it is preferable to the others (Maddala & Wu, 1999). However, the study uses both IPS and Fisher-type methods because the two tests allow for panel-specific autoregressive parameters among countries, unlike other unit root tests that assume common autoregressive parameters among cross-section in a panel.

In Fisher-type tests, there are two methods, that is, Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests; this study uses both types. The great benefit of Fisher-type test[38] is their ability to be applied in both finite and infinite dimensions of cross-section together with dimensions of time series. Since these tests (ADF tests) involve combination of tests, they are found to be more powerful than the *t*-bar test (IPS statistic) in finite samples (Choi, 2001). However, Im, Pesaran and Shin (2003) claimed that the IPS can be the most powerful because it allows for heterogeneity in the analysis of panel unit root. However, both methods Im-Pesaran-Shin (IPS) and Fisher-ADF and PP tests allow the processes for individual unit root; hence, p_i could change across SSA countries. Also, since the three tests of unit-root are applied separately to each individual in the panel data, then the *p*-values are combined[39] to capture an overall test of whether the panel variables have a unit root or not. Therefore, we simply note that these three tests for unit root are characterized by the combination of separate individual unit root tests to derive a panel-specific result.

3.7.1.1 IM-PESARAN-SHIN (IPS) Unit Root Test

A separate ADF equation for each SSA country is given under here by using the Im-Pesaran-Shin idea: -

[38] The Fisher-type test can make each group to have different types of stochastic and non-stochastic elements. See Baltagi (2005) and Maddala and Wu (1999) for more information on the unit root test comparisons.
[39] For detailed information on the combination of the *p*-values from a unit root test applied to each panel variable; see Choi (2001).

$$\Delta y_{it} = \delta y_{it-1} + \sum_{j=1}^{pi} \beta_{ij} \Delta y_{it-j} + X'_{it}\alpha + \varepsilon_{it} \quad (3.1)$$

Where $y_{i,t}$ represents each variable to be tested, and X'_{it} stands for exogenous variables (MCR, STR, TVR, IRR, IFR, and OPR) included in the model (with inclusion of fixed effects or individual trends). In this method the assumption is that $\delta \neq p$-1 to show that p_i varies across SSA countries. Hence our null hypothesis is given as follows:

$$H_0: \delta_i = 0, \text{ for all } i \quad (3.2)$$

While the alternative hypothesis is written as;

$$H_{1:}\ \delta_i = 0, \text{ for } i = 1, 2, ..., N_1 \text{ or}$$

$$H_{1:}\ \delta_i < 0, \text{ for } i = \text{N+1, N+2, ..., } N \quad (3.3)$$

Whereby the term *i* if it is found necessary, can be reordered; its interpretation will be as a non-zero fraction if the individual country process is stationary (with no unit root). Since the IPS test statistic recognizes both specifications of the number of lags and deterministic component for every cross-section (SSA country) ADF regression equation, we, therefore include both individual constant and trend in our analysis.

3.7.1.2 FISHER-ADF and FISHER-PP Unit Root Tests

Maddala and Wu (1999) proposed an alternative approach to unbalanced panel unit root tests, these are Fisher-ADF and Fisher-PP. Thus, if this study defines π_i as a *p*-value from any individual cross-section *i* unit root, so that under the null hypothesis of unit root for all SSA countries *N*, we get the asymptotic result written as:

$$-2\sum_{i=1}^{N} \log(\pi_i) \rightarrow x^2_{2N} \quad (3.4)$$

The null and alternative hypotheses for both Fisher-ADF and PP are exactly the same as indicated in equations 3.2 and 3.3 respectively as in IPS above. As we do with IPS, we also include both individual constant and trend terms in Fisher-ADF and PP.

3.7.2 Panel Cointegration Tests

One of the objectives of this study is to determine the long-run equilibrium relationship between stock market development and economic growth in SSA African countries. In order to attain this objective, we have to test for a cointegrating relation between the proxies of stock market development and the proxy of economic growth. In line with the previous studies (Ahmed and Wahid, 2011; Falahaty and Hook, 2013), this study also uses the Pedroni method (Pedroni, 1999; 2004) to test if there is long run equilibrium relation between equity markets development and economic growth in selected SSA countries.

The study uses Pedroni cointegration because it has the following advantages. First, this approach modifies the OLS to account for autocorrelation effects, in addition to testing for endogeneity among regressors to allow for heterogeneity among cross-sections (11 Sub-Sahara African countries). Second, the Pedroni approach has better small sample properties (our sample is the case) and the mechanism to deal with disturbance parameters. Third, the Pedroni approach also allows for flexibility in alternative hypothesis, especially when examining the average equilibrium relationships (Ahmed and Wahid, 2011). The method is designed on the asymptotic and finite-sample properties, testing the null hypothesis of no cointegrating relation in the pooled data. The cointegration test method consists of two sets of statistics; the first group is based on four statistics: panel *v*-statistic, panel *p*-statistic, panel *PP*-statistic and panel *ADF*-statistic, which are designed on the within-dimension approach of the concerned panel. The four statistics mentioned above pool the AR coefficients from different members of the panel for testing unit root on the residuals. The second set is based on three statistics, namely, group *p*-statistic, group *PP*-statistic and group *ADF*-statistic, which are designed on pooling the residuals among the between-dimension approach of the panel.

The second group allows for heterogeneity autocorrelation parameters across the panel members. However, all groups of statistics have estimators that provide the average of the individual estimated coefficients across members of the panel. The Pedroni cointegration test (Pedroni, 1999; 2004) may be introduced with the help of the following function:

$$y_{it} = \alpha_i + \delta_i t + \beta_i x_{it} + \varepsilon_{it} \qquad (3.5)$$

whereby $t = 1, \ldots, T$; $i = 1, \ldots, N$; Y_{it} and X_{it} are observable series that are assumed to integrate at order one I(1); α_i is an individual effect, and δ_i is a trend effect (we include both individual intercept and trend). Therefore, because of the null hypothesis of no cointegration between

variables, the ε_{it} residual in equation 3.5 above will be integrated of order one I(1). So that to test if the residuals are integrated of order I(1);

$$\varepsilon_{it} = \rho_i \varepsilon_{it-1} + \mu_{it} \tag{3.6}$$

The null hypothesis of no cointegration by Pedroni cointegration test in all groups is tested by H_0: $p_i = 1$, while the alternative hypotheses are divided into two: first, the homogenous alternative hypothesis H_1: $(p_i = p) < 1$ for all cross-sections (i) which is described as the within-dimension test (panel statistics test); second, the heterogeneous alternative hypothesis H_1: $p_i < 1$ for all i (cross-sections), which is described as the between-dimension test (group statistics test).

3.7.3 Panel Estimation Technique: Fixed Effects Model

The main objective of this study is to examine the effect of equity market development on economic growth in a panel of eleven selected Sub-Sahara African countries. The panel estimation technique that we use in this study is the fixed effects technique, as we believe it should give us a result that indicates the true effects of equity market development on economic growth. The study applies the fixed effects model (FEM) over random effect model (REM), because before we selected to use it, we conducted a Hausman test (Hausman, 1978), whereby its null hypothesis is that random effects is a preferred model, and it is fixed effects model with the alternative hypothesis. Hausman test usually tests whether the error term, in the model, is correlated with the explanatory variables, while the null hypothesis is that it is not (Baltagi & Liu, 2008). Therefore, whether the error term is correlated with observed variables, it is fixed effects and whether the error term is not correlated with the observed variables, it is random effects.

In this study, we use fixed effects model (FEM) because it has an advantage of controlling for omitted variables that were not included in the regression, but vary among 11 countries/all cross-sections (all i) and are fixed over time. Examples of these variables that vary among SSA countries but they are fixed overtime are culture, citizen's specific characteristics, country heterogeneity in skills or preferences, and countries natural resources (e.g. Harbors, Minerals, Land fertility, Oil and Gas just to mention the few).

However, the fixed effects model can help our study to control for unobservable heterogeneity as they are correlated with the selected explanatory variables (MCR, STR, TVR, RIR, IFR and

OPR); therefore, the model treats them as they are fixed/constant overtime. But, in the process the constant is removed from the data series through differencing procedures (e.g. first difference data series), which tend to remove any "time invariant" features in the model. The fundamental framework for the fixed effect model is shown here under:

$$y_{it} = X'_{it}\beta + Z'_{i}\alpha + \varepsilon_{it}. \quad (3.7)$$

$$y_{it} = X'_{it}\beta + v_i + \varepsilon_{it}. \quad (3.8)$$

The general model above shows that there are *K* regressors (MCR, STR, TVR, RIR, IFR and OPR) in X_{it}, without including a constant term. While, $Z'_i\,\alpha$ from equation (3.7) shows the country effects or unobservable heterogeneity. Z_i includes a constant term and a set of specific variables of a single or group of countries which can be observed (for example; location, natural resources such as minerals, harbor just to mention the few) and which cannot be observed (culture, citizen's specific characteristics, country heterogeneity in skill or preferences just to mention the few); all of the mentioned observable and unobservable specific variables are assumed to be constant/fixed overtime *t*. While, Z_i stands for unobservable specific variables of the selected countries but correlated with X_{it}, this may cause β of the least squares (OLS) estimator to be bias and inconsistent as a result of the omitted variable. The fixed effects model that we use in our study comes from the assumption that the omitted effects or unobservable characteristics, v_i, in equation model (3.8) above $y_{it} = X'_{it}\beta + v_i + \varepsilon_{it}$, are considered to be correlated with the included variables.

Since the v_i is unobserved characteristic that differs from country to country (in all 11 Sub-Sahara African countries) but does not change over time, and the bracket term shown in the model above is not correlated with X_i by construction; so it could be absorbed in the disturbance term and we structure our fixed effect model (FEM) as follows:

$$y_{it} = X'_{it}\beta + \alpha_i + \varepsilon_{it}. \quad (3.9)$$

Our fixed effect model (3.6) will be considered to be a classical linear regression model with further added assumption that Variance $[v_i \mid X_i]$ is constant. Moreover, our model entails that variations across 11 Sub-Saharan African countries can be captured in differences among constant term (α_i). The treatment of each constant term (α_i) in this model is considered as unknown parameter to be estimated. We can now re-write our fixed effect model with the inclusion of all variables as follow:

$$y_{it} = \alpha_i + \beta_1 MCR_{it} + \beta_2 STR_{it} + \beta_3 TVR_{it} + \beta_4 RIR_{it} + \beta_5 IFR_{it} + \beta_6 OPR_{it} + \varepsilon_{it}. \quad (3.10)$$

Whereby *y* is the GDP per capita growth proxies' economic growth; i = 1,…, N; and t = 1,…, T; α is the constant term and ε is the error term.

But since because our data series were all found to be integrated in the same order I (1) when tested for stationarity in the 1st difference, we use the following fixed effects regression to analyze our results: -

$$\Delta y_{it} = \alpha_i + \beta_1 \Delta MCR_{it} + \beta_2 \Delta STR_{it} + \beta_3 \Delta TVR_{it} + \beta_4 \Delta RIR_{it} + \beta_5 \Delta IFR_{it} + \beta_6 \Delta OPR_{it} + \varepsilon_{it} \quad (3.11)$$

Where Δ shows the value of the variables after being differentiated into first difference.

3.7.4 Panel Vector Autoregressive (Panel VAR) Tests

One of the objectives of this study is to determine the causal relationship between equity market development and economic growth in a panel of eleven Sub-Sahara African countries (cross-sections) and 24 years (time series). To attain this objective, the study applies the panel vector autoregressive (PVAR) technique. In PVAR tests, every data series has its regression equation describing its changes in relation to its own lags and the lags of other panel data series in the model. One of the assumptions that prevails in the VAR model is the same order of integration among variables. Therefore, since our data series are all stationary at first difference (see Table 3.8 below), we use the figures for variables tested at first difference as they meet the condition of the same order of integration I(1). The second condition that can influence the application of VAR model is that there should no long-run equilibrium relationship between equity market development and economic growth. Also, this study found that there is no cointegration between equity market development and economic growth (see Table 3.9 below); hence, given first condition together with this condition, the use of PVAR is suitable to determine the causal relationship between variables.

The Vector Autoregressive (VAR) approach allows for country-specific unobservable heterogeneity in the level of panel data series. Hence, it enables the study consider the complex relationship between the equity market development and economic growth. The PVAR approach we use in this study combines the VAR technique that considers all the included variables in the model as endogenous in the panel-data approach, from which the short-run dynamic relationships between stock market development and economic growth can be easily indicated (Luetkepohl, 2011). Since it is expected that there should be correlation between

unobserved heterogeneity and other exogenous variables, we use PVAR that allows for unobservable individual heterogeneity (Love and Zicchino, 2006) in each cross-section (SSA-countries) within the *p* order VAR model, denoted VAR (*P*) as shown hereunder:

$$y_t = c + \beta_1 y_{t-1} + \beta_2 y_{t-2} + \ldots + \beta_p y_{t-p} + \varepsilon_t \quad (3.12)$$

where *t-1, t-2* and *t-p* indicate the previous period observations of *y*; *y* stands for any *k* variable known as an endogenous variable; c indicates a *k* x 1 vector of constant term (intercept); β indicates time-invariant *k* x *k* matrix; and ε_t is a *k* x 1 vector of disturbance terms.

3.8 Summary Statistics of the Selected Series

The descriptive statistics of the selected indicators for equity market development and economic growth of the 11 Sub-Sahara African countries are provided in Table 3.7 below. All variables display a very high rate of consistency. This is indicated by the mean and medium values, as they fall between the maximum and minimum values of all the given variables. As for standard deviation of the panel data variables, one can notice that its value is very low, which indicates that the deviation/dispersion from the mean values shown is very small; hence, we can rely on our panel data set.

Table 3.7: Descriptive Statistics for the Included Variables of the Study

Series / Stats	GDP	MCR	STR	TVR	RIR	IFR	OPR
Mean	2.303	2.643	-0.881	1.128	2.328	2.180	4.289
Median	2.449	2.591	-0.682	1.323	2.321	2.223	4.268
Maximum	30.34	6.190	3.668	3.381	6.351	4.728	5.312
Minimum	-18.87	-0.508	-6.793	-4.287	-1.469	-1.389	3.479
Std. Dev.	4.290	1.005	1.890	1.295	0.997	0.950	0.401
Skewness	-0.005	-0.081	-0.508	-1.602	0.325	-0.404	0.137
Kurtosis	15.39	3.979	3.669	6.772	6.482	3.970	2.585
Jarq - Bera	1370.8	8.777	13.175	218.458	111.896	14.221	2.207
Probability	0.000	0.012	0.001	0.000	0.000	0.001	0.332
Sum	492.76	565.60	-188.50	241.40	498.22	466.55	917.76
Observation	214	214	214	214	214	214	214

When coming to the normality test, it is observed that the mean and median values of the statistical distribution are very similar, especially when both the skewness and the kurtosis of the data distribution are close to zero (0) and three (3) respectively. Since, for a normal distribution, the mean should be equal to the median, and our descriptive statistics show that the mean and median values are very close, we, suggest that our panel data set is well modelled in respect of a normal distribution.

One can detect from the summary statistics (Table 3.7) displayed above that the average GDP per capita growth across the panel is at 2.3 percent, this gives an indication of the low level of growth in Sub-Sahara African economies. The average however does not indicate the variations among individual countries selected in this study. The values vary from the minimum of -18.9 percent to the maximum of 30.3 percent, which seems to be very huge gap among the SSA countries included in a panel. In the case of market capitalization ratio, the mean value of 2.6 percent is indicative of the small size of the stock markets in SSA countries. This small percentage (2.6) of the market capitalization rate, also indicates the low level of stock markets integration in Sub-Saharan Africa (Adjasi and Biekpe; 2006). Though, the minimum and maximum values in the MCR are not wide as they vary between the minimum of -0.5 percent and maximum of 6.2 percent, showing that there are countries in SSA with negative size of the stock markets and positive size with very little impact on economic growth.

The mean value of the equity market development indicator stock traded value rate is at -0.9 percent, this is indicative of the lack of liquidity in the selected eleven SSA countries as a whole. Here the gap is not wide between the minimum of -6.8 percent and maximum of 3.7 percent, indicating that in SSA there are stock markets with no trading/liquidity and countries with very small level (3.7 percent) of participation in trading activity (liquidity). The turnover ratio, which is another measure of equity market development, has an average of 1.13 percent which indicates that the volume of shares traded in the SSA stock markets is very low, hence low efficiency (Naceur and Ghazouani, 2007) and even higher transaction costs (Levine and Zervos, 1998) in the equity markets of these selected SSA countries.

3.9 Empirical Results

In this section we analyse the results from different econometric tests and estimations used to attain the three objectives of the study. The panel unit root tests indicate our analysis can proceed if the tests find that the variables are stationary. The cointegration test gives our study the answers regarding the availability of long-run equilibrium relationship between equity market development and economic growth in Sub-Sahara African countries. The estimation technique that was employed in this study is the fixed effect approach, which helped the study to attain one of its objectives, which is to ascertain the effect of equity market development on economic growth. The panel vector autoregressive (PVAR) model was also used in this study to answer a research question on causal relationship between stock market development and economic growth among a panel of 11 selected countries in Sub-Saharan Africa. The following sub-sections show the various results from the panel unit root tests, panel cointegration tests, fixed effect estimation technique, panel vector autoregressive model and Granger causality results.

3.9.1 Panel Unit Root Results: Stationarity of the Variables

The results from the panel unit root tests are shown in Table 3.8 below. In this result, we report three test statistics from IPS (Im-Pesaran-Shin, 2003), Fisher-ADF and Fisher-PP as proposed by Maddala and Wu (1999). All variables in the panel were tested in levels and first difference with individual constant and trend. When looking at Table 3.8 below one may notice that it is only variable OPR that was found insignificant when testing the unit root at level using all three methods. This shows that the variable OPR is not stationary (has a unit root) when tested at level data as witnessed in Fisher-PP method; although it was found significant (at the 1% level of significance) when tested at first difference in all three methods used to test the unit root. However, in other methods IPS and Fisher-ADF, the variable openness (OPR) was found stationary both at level and first difference. Moreover, this study rejects the null hypothesis for other variables, market capitalization, stock traded ratio, turnover ratio, interest rate, and inflation rate when the unit root test is performed at levels and first difference in all three testing methods; as they show that they are stationery at both levels and first difference.

Table 3.8: Panel Unit Root Results

Variables	Im-Pesaran-Shin (IPS)		Fisher-ADF		Fisher-PP	
	Level	1st Diff	Level	1st Diff	Level	1st Diff
GDP	-5.06***	-12.18***	76.64***	144.92***	99.66***	700.54***
MCR	-2.25**	-10.53***	36.19**	119.55***	42.65***	225.02***
STR	-4.44***	-8.89***	60.17***	114.04***	62.99***	176.92***
TVR	-5.28***	-16.45***	68.05***	153.06***	60.54***	177.90***
RIR	-2.95***	-8.52***	46.47***	113.75***	54.02***	419.16***
IFR	-6.41***	-9.29***	75.81***	106.27***	81.78***	459.27***
OPR	-1.65**	-8.96***	37.55**	110.81***	27.11	213.63***

Note: *** and ** indicate significance at 1% and 5% levels respectively. Probabilities for Fisher-type tests (ADF and PP) are computed using an asymptotic Chi-square distribution. While IPS assumes asymptotic normality.

It can also be noticed that the levels of significance shown in the results displayed in Table 3.8 above have slight differences. The variables market capitalisation (MCR) and openness (OPR) are the only exogenous variables that were found significant at the 5% level, when tested at level data using Im-Pesaran-shin (IPS) and Fisher-ADF. However, all variables were found significant at the 10% level when tested at first difference with the use of all three-unit root test techniques. Having the equity market development and economic growth indicators stationary at level data, shows that there is no long-run relationship between the two; therefore, using the panel unit root results, the study declares that there is short-run relationship between equity market development and economic growth in selected SSA countries.

3.9.2 The Equilibrium Relationship between the Variables in SSA countries

To achieve one of our research objectives, which is to examine if there is long-run relationship between equity market development and economic growth in SSA countries, the Pedroni (1999; 2004) cointegration test was applied. We specified to use lag 1 as our lag length in order to avoid some of the selected countries with few number of years (e.g. Uganda and Swaziland) to be dropped from the sample of eleven SSA countries included. In most cases, five out of seven Pedroni panel and group tests significantly failed to reject the null hypothesis of no cointegration (see Table 3.9 below). Based on first group 'within-dimension', the null hypothesis of no cointegration was rejected against the alternative hypothesis only when the

'*Panel-PP* test' was significant at least at the 1% level. Other three test statistics (with weighted statistics as well) in first group (within-dimension) were found statistically insignificant (with all *p*-values > the 1% level of significance).

Table 3.9: Pedroni Panel Cointegration Results

Alternative Hypothesis: Common AR coefficients. (Within-dimension)				
	Statistic	Prob.	Weighted Statistic	Prob.
Panel v-Statistic	-3.459	0.999	-4.460	1.000
Panel rho-Statistic	1.746	0.959	2.007	0.977
Panel PP-Statistic	-5.849**	0.000	-7.518**	0.000
Panel ADF-Statistic	0.858	0.805	-0.555	0.289
Alternative Hypothesis: Individual AR coefficients. (Between-dimension)				
	Statistic	Prob.		
Group rho-Statistic	3.325	0.999		
Group PP-Statistic	-11.80**	0.000		
Group ADF-Statistic	1.028	0.848		

Note: The null hypothesis (H_0) of the alternative hypotheses above– "no cointegration". ** shows the significance of the statistics at the 1% level. Lag 1 was the lag length selected for the computed variables.

However, when the null hypothesis of no cointegration was tested based on 'between-dimension' (see Table 3.9 above), was not rejected only by '*Group PP*-statistic' with *p*-value < the 1% level of significance; but was rejected by the other two test statistics, which were statistically insignificant. Since many of the test statistics (five out of seven test-statistics) that were introduced into two groups failed to reject the null hypothesis of no cointegration, the overall conclusion from the Pedroni cointegration results is that there is no evidence of long-run relationship between equity market development and economic growth in the panel of 11 Sub-Sahara African countries.

3.9.3 The Equity Market and Economic Growth in SSA: Fixed Effect and PVAR

The main objective of the study was to determine the causal effects of SSA' equity markets developments on economic growth. To achieve this the study used fixed effect model (FEM) as shown on equation 3.11 above. One of the reason that made us to use fixed effects model is due to the fact that we wanted to control for omitted variables that vary among the panel countries in SSA, but they are fixed/constant over time (unobservable heterogeneity); for example, natural resources such as minerals, harbours, and fertile land that together may influence the economic growth of their respective 11 panel countries in SSA.

However, to decide between fixed effects (see Table 3.11) and random effects models (see Appendix 3c), we conducted an Hausman test in which the null hypothesis is that there is no correlation between explanatory variables and the error term in the model (random effects model), while the alternative hypothesis is that there is correlation between explanatory variables and error term in the model (fixed effects model). Hausman test results displayed in Table 3.10 below shows that the probability of chi^2 is statically significant (with p-value of 0.008) at the 1% level; therefore, we reject the null hypothesis (preferred model is random effects) and accepts the alternative hypothesis (preferred model is fixed effects). Having established that our preferred model is fixed effects model over random effects model, with the help of Hausman test, Table 3.11 below display the results from fixed effects model reported at first difference when all the variables where stationary in the same order of integration I (1).

Table 3.10: Results from Hausman Tests

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	17.29	6	0.008

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
D(MCR)	2.839	3.212	0.033	0.034
D(STR)	-2.806	-3.796	0.092	0.001
D(TVR)	3.314	4.141	0.089	0.006
D(RIR)	-0.571	-0.529	0.057	0.862
D(IFR)	-0.443	0.168	0.057	0.010
D(OPR)	-0.288	1.087	1.925	0.322

Note: estimated cross-section random effects variance is zero.

The results displayed in Table 3.11 below indicate that all the variables used as proxies for equity market development: market capitalization ratio, stock traded ratio and turnover ratio are statistically significant at the 1% level of significance, indicating that they have influence on the GDP per capita growth (as the proxy for economic growth). For example, the equity market development indicator 'market capitalization ratio to GDP' has a positive influence (with β_1 = 2.829) on GDP per capita growth, and gives an indication that any increase of stock MCR by 1% will increase the GDP per capita growth of the 11 SSA countries by 2.8 percent. Another stock market development indicator is stock traded value ratio to GDP, which was found to have a negative coefficient (with β_2 = -2.806), indicating that any increase of STR by 1% will decrease the GDP per capita growth by 2.8 percent; this means that the stock market development does play a negative role in economic growth. However, the stock market development again plays a significantly positive role in economic growth of the 11 SSA countries through the 'stock traded-turnover ratio'. As can be seen the indicator turnover ratio has a positive influence (with β_3 = 3.313) on GDP per capita growth, this gives an indication that any increase of stock traded-turnover ratio by 1% will increase the GDP per capita growth by 3.3 percent. Moreover, all the additional variables (RIR, IFR and OPR) included in this study, none was found significant to indicate that they don't have statistical power to influence the economic growth indicator GDP per capita growth.

Table 3.11: Results from Fixed Effects Model (FEM)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(MCR)	2.829***	1.046	2.704	0.007
D(STR)	-2.806***	1.034	-2.714	0.007
D(TVR)	3.313***	1.046	3.166	0.002
D(RIR)	-0.571	0.402	-1.418	0.157
D(IFR)	-0.442	0.407	-1.086	0.278
D(OPR)	-0.288	1.630	-0.176	0.860
C	-7.907	8.876	-0.891	0.374

Note: The dependent variable is D(GDP); *** indicate statistical significance at 1%. The variables are reported at first difference.

However, because the study uses PVAR in the causality test, a number of lags were applied in the panel estimation method (Fixed Effects Model) to study the causal effects of equity market development and economic growth in the selected 11 SSA countries. We selected 2 lags as we

assume that 2 lags are optimum and will make the value of Akaike's Information Criteria the lowest. On the other hand, to estimate the panel VAR framework the variables are required to be stationary in the same order of integration; therefore, since our panel data series were not integrated in the same order I (0), we adjusted our data at first difference, whereby they became stationary in the same order of integration I (1), hence, ready for PVAR estimation.

Table 3.12: Results from Panel Vector Autoregressive (PVAR) Model

	Equation1	Equation2	Equation3	Equation4	Equation5	Equation6	Equation7
D(GDP(-1))	-0.567***	0.005	0.005	0.0053	0.003	-0.006	-0.002
	(0.077)	(0.009)	(0.015)	(0.013)	(0.013)	(0.015)	(0.002)
D(GDP(-2))	-0.315***	-0.003	-0.012	-0.010	-0.006	-0.004	0.000
	(0.074)	(0.009)	(0.014)	(0.012)	(0.013)	(0.015)	(0.002)
D(MCR(-1))	2.529*	-0.189	0.393	-0.102	-0.315	-0.271	0.020
	(1.358)	(0.158)	(0.261)	(0.229)	(0.232)	(0.275)	(0.036)
D(MCR(-2))	-0.360	-0.089	0.247	0.070	-0.174	-0.413	0.035
	(1.278)	(0.148)	(0.245)	(0.215)	(0.218)	(0.258)	(0.034)
D(STR(-1))	-3.860*	0.035	-0.477	-0.145	0.536	0.545	-0.024
	(2.088)	(0.243)	(0.401)	(0.353)	(0.356)	(0.423)	(0.055)
D(STR(-2))	-0.413	-0.138	-0.504**	-0.328*	-0.086	0.602***	-0.017
	(1.101)	(0.128)	(0.211)	(0.186)	(0.188)	(0.223)	(0.029)
D(TVR(-1))	3.355	-0.001	0.158	-0.229	-0.550	-0.558	0.033
	(2.149)	(0.249)	(0.412)	(0.363)	(0.367)	(0.435)	(0.057)
D(TVR(-2))	0.413	0.156	0.406*	0.233	0.091	-0.569**	0.017
	(1.136)	(0.132)	(0.218)	(0.192)	(0.194)	(0.230)	(0.030)
D(RIR(-1))	-0.457	-0.086*	-0.144*	-0.090	-0.257***	-0.205**	0.009
	(0.436)	(0.051)	(0.084)	(0.074)	(0.074)	(0.088)	(0.011)
D(RIR(-2))	-0.413	-0.009	0.090	0.085	-0.124*	-0.132	0.009
	(0.442)	(0.051)	(0.085)	(0.075)	(0.075)	(0.089)	(0.012)
D(IFR(-1))	-0.299	-0.034	-0.059	-0.026	0.049	-0.478***	0.024**
	(0.399)	(0.046)	(0.076)	(0.067)	(0.068)	(0.081)	(0.011)
D(IFR(-2))	0.595	-0.003	0.012	0.037	0.134**	-0.378***	0.024**
	(0.404)	(0.047)	(0.077)	(0.068)	(0.069)	(0.082)	(0.011)
D(OPR(-1))	2.680	0.353	0.398	0.086	0.240	0.105	-0.269***
	(2.919)	(0.339)	(0.561)	(0.493)	(0.498)	(0.591)	(0.077)
D(OPR(-2))	-1.169	0.249	-0.001	-0.143	-0.804	-0.983*	-0.003
	(2.927)	(0.340)	(0.562)	(0.495)	(0.499)	(0.592)	(0.078)
C	0.462	0.062	0.065	0.033	0.027	-0.089	0.025***
	(0.345)	(0.040)	(0.066)	(0.058)	(0.059)	(0.069)	(0.009)

Note: ***, ** and * indicate significance at the 1%, 5% and 10% levels respectively. Figures in parentheses are standard error. Equation1, 2, 3, 4, 5, 6 and 7 represent models for D(GDP), D(MCR), D(STR), D(TVR), D(RIR), D(IFR) and D(OPR) respectively.

We extended our analysis on the causal effects of stock market development towards economic growth by using a panel vector autoregressive (PVAR) model. The PVAR estimation results are displayed in Table 3.12 above. It can be noticed that individually only the lag 1 and lag 2 of the GDP per capita growth itself, the lag 1 of the market capitalization (market size), and the lag 1 of the stock traded value percentage to GDP are statistically significant at the 1% and 10% levels of significance (see Equation1 in Table 3.12 above). This gives an indication that the previous year's value of GDP per capita growth, market capitalization percentage of GDP, and stock traded value percentage to GDP can together cause the value of current GDP per capita growth to change among the selected SSA countries. However, it is only lag 1 of the indicator market capitalization percentage to GDP (2.53 percent) that can positively influence the GDP per capita growth (economic growth) of the 11 SSA countries; the previous year's (both lag 1 and lag 2) value of GDP per capita and the previous year's (only lag 1) value of stock traded value percentage to GDP (-3.86 percent) were found to negatively influence the economic growth of the 11 SSA countries.

In other models, for example, in equation2 where MCR was a dependent variable, it was found that the MCR can only be negatively influenced by lag 1 of real interest rates. In equation3 where STR is a dependent variable; it was found that lag 2 of STR, lag 2 of TVR, and lag 1 of RIR can influence the stock traded value percentage to GDP. In equation4 where TVR was a dependent variable; we found that the turnover ratio can only be negatively influenced by lag 2 of stock traded value percentage to GDP. The RIR is a dependent variable in equation5 of our estimation results; in this model, we found that both lag 1 and lag 2 of RIR, and lag 2 of IFR can influence the real interest rates. However, in equition6 where the addition variable inflation rate was a dependent variable; it was found that lag 2 of STR, lag 2 of TVR, lag 1 of RIR, both lag 1 and lag 2 of inflation rates itself, and lag 2 of OPR can influence the inflation rates. Lastly; it was found that the control variable open ratio, which is a dependent variable in equation7 can be influenced by both lag 1 and lag 2 of IFR, and lag 1 of OPR itself (see Table 3.12 above).

Having seen the causal effect of the stock market development on economic growth using both the fixed effect model (FEM) and PVAR estimation as shown in Table 3.11 and Table 3.12 above respectively, the study goes further to determine the direction of causality between the indicators of equity market development and economic growth indicator. To achieve this, the study uses the PVAR Granger causality (Block Exogeneity Wald tests). Table 3.13 below displays the results from the VAR Granger causality/Block Exogeneity Wald tests.

Table 3.13: Panel VAR Granger Causality Results

A: Dependent variable: D(GDP)

Excluded	Chi-sq	df	Prob.
D(MCR)	7.16	2	0.03
D(STR)	3.42	2	0.18
D(TVR)	2.44	2	0.29
D(RIR)	1.49	2	0.47
D(IFR)	3.90	2	0.14
D(OPR)	1.25	2	0.54
All	25.75	12	0.01

B: Dependent variable: D(MCR)

Excluded	Chi-sq	df	Prob.
D(GDP)	0.85	2	0.65
D(STR)	1.28	2	0.52
D(TVR)	1.48	2	0.47
D(RIR)	3.05	2	0.21
D(IFR)	0.58	2	0.74
D(OPR)	1.33	2	0.51
All	7.53	12	0.82

C: Dependent variable: D(STR)

Excluded	Chi-sq	df	Prob.
D(GDP)	1.33	2	0.51
D(MCR)	2.27	2	0.32
D(TVR)	3.46	2	0.17
D(RIR)	5.87	2	0.05
D(IFR)	0.79	2	0.67
D(OPR)	0.53	2	0.76
All	17.54	12	0.13

D: Dependent variable: D(TVR)

Excluded	Chi-sq	df	Prob.
D(GDP)	1.52	2	0.46
D(MCR)	0.83	2	0.65
D(STR)	3.12	2	0.21
D(RIR)	4.12	2	0.12
D(IFR)	0.65	2	0.72
D(OPR)	0.15	2	0.92
All	14.95	12	0.24

E: Dependent variable: D(RIR)

Excluded	Chi-sq	df	Prob.
D(GDP)	0.56	2	0.75
D(MCR)	1.85	2	0.39
D(STR)	2.80	2	0.24
D(TVR)	2.97	2	0.22
D(IFR)	3.78	2	0.15
D(OPR)	3.37	2	0.18
All	10.71	12	0.55

F: Dependent variable: D(IFR)

Excluded	Chi-sq	df	Prob.
D(GDP)	0.16	2	0.92
D(MCR)	2.55	2	0.27
D(STR)	7.99	2	0.01
D(TVR)	6.64	2	0.03
D(RIR)	5.97	2	0.05
D(OPR)	3.09	2	0.21
All	23.20	12	0.02

G: Dependent variable: D(OPR)

Excluded	Chi-sq	df	Prob.
D(GDP)	1.56	2	0.45
D(MCR)	1.09	2	0.58
D(STR)	0.46	2	0.79
D(TVR)	0.55	2	0.76
D(RIR)	1.01	2	0.60
D(IFR)	7.61	2	0.02
All	10.27	12	0.59

From the results displayed in Table 3.13 above, it can be seen that it is only market capitalization percentage to GDP (market size) that was found statistically significant (with p-value of 0.03) at the 5% level of significance (see Table 3.13A above). This is the indication that in a panel of 11 SSA countries, it is only stock market capitalization indicator for stock market development that Granger causes economic growth (GDP per capita growth). However, in the same Table 3.13A, other stock market development indicators and the additional control variables were found to be statistically insignificant, yet they Granger cause economic growth (GDP per capita growth) in 11 SSA countries when all variables are taken together as a group (as they were significant at the 1% level of significance). Hence, one can conclude that from all included independent variables when taken together (with the p-value of 0.01) in the 11 SSA countries, they Granger cause economic growth. However, it can be seen in Table 3.13 above that when GDP per capita growth was considered as independent variable from B-G, nowhere was found significant; this indicates that the GDP per capita growth does not Granger cause equity market development.

Moreover, the study detected another directions of causality between the explanatory variables themselves; for example, it can be seen in Table 3.13C that the real interest rates Granger causes stock traded value percentage to GDP. Also, Table 3.13F provides the results that the stock traded value percentage to GDP, turnover ratio and real interest rates Granger cause inflation (GDP-Deflator) rates. Therefore, this study concludes that in Sub-Sahara African countries there is unidirectional Granger causality relation flowing from stock market development (using indicator market capitalization percentage to GDP) to economic growth.

3.10 Discussion and Conclusion

This research was about the effect of equity markets on economic growth of the selected eleven Sub-Sahara African countries (Kenya, Tanzania, Uganda, Botswana, Zambia, Zimbabwe, Nigeria, Ghana, Namibia, Swaziland, and Mauritius). The main motivation of the study is the fact that many previous studies are based on either developed countries or/and big emerging economies, while little research has concentrated fully on Sub-Saharan Africa with all the characteristics of SSA equity markets, which are almost new in their origin, many are still small in size compared with other emerging stock markets, inadequate or small amount of equity listed in the stock markets, they are thin in trade with low stock traded value, and they are extremely illiquid with low turnover ratios compared with other emerging markets (Afego, 2015; Ntimi, 2012; Ntimi et al, 2011; Okeahalam and Afful, 2006). To consider all the features of stock markets in the region, as mentioned above, this study, therefore, included Tanzania and Uganda (which were not included in previous studies and have all the characteristics of stock markets in SSA) to provide new results in the continuing debate.

In this study, the unbalanced panel data approach was used to examine both the equilibrium relationship and causal effects between equity market development and economic growth in 11 Sub-Saharan African countries. According to Adjasi and Biekpe (2006) the nature of unbalanced panel could be undesirable effects, which might be minimal compared to the efficiency and loss of sample data if they are restricted to a balanced panel data. It is unbalanced panel because in some countries, the stock markets are young in age (e.g. Tanzanian and Ugandan stock markets established in 1998), while in other countries, have older stock markets (e.g. Kenya, Nigeria, Zimbabwe and even Mauritius). Therefore, the availability of the data obtained differed according to the countries' year of establishment and availability of data required (11 years was the minimum period and 24 years was the maximum period) from 1988 to 2012.

In this study, the indicators for the measurements of stock market development are market capitalization (% of GDP), stock traded value (% of GDP) and stock traded-turnover ratio (% of GDP). Beck et al (1999) indicate that these variables are the three main indicators of stock market development as they measure the size, activity and efficiency of the stock market respectively. Like many previous researches (Pradhan et al. 2015; Ahmed and Wahid, 2011; Adjasi and Biekpe, 2006; Beck and Levine, 2004; Rousseau and Wachtel, 2000), also this study uses per capita GDP growth to indicate economic growth. Moreover, in order to avoid simultaneous biasness in our regression (Gujarati, 1995), the study included real interest rate

(IRR), openness ratio (OR) and Inflation-GDP deflator (IR) as the additional or control variables.

To get the results that indicate the true effects of equity market development on economic growth, the panel estimation technique that we used in this study is the fixed effects technique. The fixed effects model (FEM) that we used has an advantage of controlling for omitted variables that were not included in the regression, but vary among 11 countries/all cross-sections (all *i*) and are fixed over time; these are culture, citizen's specific characteristics, country heterogeneity in skills or preferences, and countries natural resources (e.g. Harbors, Minerals, Land fertility, Oil and Gas just to mention the few). The fixed effects model, which was approved to be used by the Hausman tests (Hausman, 1978) we conducted, helped our study to control for unobservable heterogeneity as they are correlated with the selected explanatory variables (MCR, STR, TVR, RIR, IFR and OPR); therefore, the model treated them as they are fixed/constant overtime. But, in the process the constant was removed from the data series when we differenced (at first difference data series), which removed any "time invariant" features in the model.

The fixed effects results indicate that the two proxies for equity market development, market capitalization rate percentage to GDP and turnover ratio, play a significantly positive role in economic growth of the 11 Sub-Sahara African countries. Here, two important findings are: first, improvement in the size of the SSA stock markets (MCR) by only 1% will boost the economic growth of these countries by 2.8 percent, and second, improvement in the stock market liquidity (TVR) by only 1% will as well spur the economic growth of SSA countries by 3.3 percent. And according to Levine and Zervo (1996) though the turnover ratio measures the liquidity of the stock market, it also complements the measure of stock market size since the markets may be large but inefficient or inactive; therefore, having these two indicators play positive role in the economic growth of SSA countries, shows that the size of the stock markets in SSA is positively correlated with the ability to mobilize capital, diversify risk and degree of trade (Levine and Zervo, 1996). It should be remembered that the inclusion of South Africa in this panel of 11 countries would have produced massive bias results. Our findings are against the findings of Adjasi and Biekpe (2006) who included 14 African countries to conclude that the stock market capitalization and stock turnover ratio do not play any significant role in economic growth.

However, this study found that the stock market development does play a negative role in economic growth of these SSA countries through the stock traded value percentage to GDP.

This finding is certainly different with the findings of some previous studies; for example, in their study Adjasi and Biekpe (2006) confirm that the stock traded value percentage to GDP does play a positive role in economic growth of their included 14 African countries. Rousseau and Wachtel (2000) also conclude that stock market development positively influence economic growth through share traded value. Nevertheless, our finding is suggestive of where policy makers should focus on, with regards to equity markets in SSA countries.

Moreover, there was no any additional variable (RIR, IFR and OPR) included in this study that was found significant, showing that they don't have any role to play on the economic growth indicator GDP per capita growth. Despite the fact that the stock market development indicators have the role to play in economic growth of the 11 SSA countries, the study found that there is no long-run equilibrium relationship between the equity market development and economic growth in these countries. This is proved by the Pedroni cointegration tests we conducted, which shows the results of non-existence of cointegrating relationships. Therefore, this study confirms that there is no long-run equilibrium relationship between equity market development and economic growth in the panel of selected Sub-Sahara African countries. Our findings are not in line with the findings of the previous studies (Falahaty and Hook, 2013) who used the same method and found the equilibrium relationship between financial markets development and economic growth.

The study also used the panel vector autoregressive (PVAR) estimation technique to investigate if there is existence of a causal relationship between the equity market development and economic growth. It was found that it is only market capitalization percentage to GDP (market size) that causes economic growth (GDP per capita growth). This is a one directional relationship (unidirectional Granger causality) that flows from equity market capitalization rate to economic growth. Therefore, this study concludes that there is unidirectional granger causality between equity market development and economic growth in Sub-Saharan Africa, however, it flows from the stock market capitalization indicator to economic growth (GDP per capita growth).

Having the results that it is unidirectional granger causality, which flows from equity market capitalization rate to economic growth of the selected Sub-Sahara African countries, the study therefore recommends that policy makers of sub-Sahara African stock markets, put strong emphasis on the factors contributing to the increase of market capitalization rate (market size). These are smoothing rules and regulations to motivate both domestic and foreign companies to list in the stock exchanges, and creating awareness among the public on the importance and

benefits of investing with stock markets. Market capitalization as an equity market development indicator usually measures the size of the markets. Therefore, to facilitate its increase in the SSA stock markets will certainly increase the size of their markets, which in one way or another can spur other indicators of equity market development (such as stock traded value and turnover ratio), hence, to have their contribution to economic growth.

Appendix 3

Appendix 3a: Number of Listed Companies Trends– From 2002 to 2012

Country	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
S. Africa	450	426	403	388	401	422	379	363	360	355	348
Botswana	18	19	18	18	18	18	20	20	21	23	24
Ghana	24	25	29	30	32	32	35	35	35	36	34
Kenya	57	51	47	47	51	51	53	55	55	58	57
Mauritius	40	40	41	42	41	90	89	89	86	86	87
Namibia	13	13	13	13	9	9	7	7	7	7	7
Nigeria	195	200	207	214	202	212	213	214	215	196	192
Swaziland	5	5	6	6	6	6	7	5	5	5	-
Tanzania	5	6	6	6	6	10	14	15	11	17	17
Uganda	3	3	5	5	5	-	6	8	8	8	10
Zambia	11	12	13	15	14	16	19	19	19	20	20
Zimbabwe	76	81	79	79	80	82	78	76	76	75	76
Brazil	399	367	357	381	392	442	432	377	373	366	353
Malaysia	865	897	962	1020	1027	1036	977	960	957	941	921
Russia	196	214	215	296	309	328	314	279	345	327	276

Sources: World Data Bank; World Development Indicators (2015)

Appendix 3b: GDP per Capita Growth (Annual %) – Trend from 2005 to 2012

Country	2005	2006	2007	2008	2009	2010	2011	2012
S. Africa	3.876	4.149	3.896	1.726	-2.964	1.515	1.725	0.638
Botswana	2.971	6.553	6.327	4.224	-9.462	6.410	3.923	2.344
Ghana	3.181	3.674	1.678	6.373	2.205	5.217	11.25	6.656
Kenya	3.175	3.723	4.084	-2.372	0.609	5.557	3.314	1.794
Mauritius	0.643	8.033	5.246	5.006	3.041	4.129	3.911	3.209
Namibia	1.301	5.671	5.119	1.071	-1.412	4.043	2.909	2.701
Nigeria	0.793	5.41	4.044	3.483	4.115	4.986	2.104	1.508
Swaziland	4.252	3.800	2.527	2.713	0.841	0.137	0.278	1.812
Tanzania	5.049	1.558	5.175	2.312	2.105	3.040	4.533	1.855
Uganda	2.814	7.123	4.830	5.124	3.259	2.224	5.846	0.489
Zambia	4.404	4.958	5.314	4.684	6.040	7.052	2.428	4.373
Zimbabwe	-6.557	-4.51	-4.883	-18.87	4.242	9.360	9.694	8.212
Brazil	1.908	2.750	4.924	4.022	-1.106	6.493	2.923	0.966
Malaysia	3.437	3.707	7.513	1.546	-4.159	5.236	3.622	3.842
Russia	6.782	8.508	8.720	5.294	-7.848	4.456	4.182	3.343

Sources: World Data Bank; World Development Indicators (2015)

Appendix 3c: Results from Fixed Effects Model (REM)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(MCR)	3.212***	1.031	3.116	0.002
D(STR)	-3.796***	0.986	-3.849	0.000
D(TVR)	4.141***	1.003	4.129	0.000
D(RIR)	-0.529	0.324	-1.635	0.104
D(IFR)	0.168	0.330	0.511	0.609
D(OPR)	1.087	0.856	1.269	0.206
C	-18.06	6.396	-2.824	0.005

Note: The dependent variable is D(GDP); *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels respectively.

CHAPTER 4: MODELLING STOCK MARKET VOLATILITY IN TANZANIA: APPLICATION OF GARCH-TYPE MODELS

4.1 Introduction

Modelling and forecasting of stock return volatility has become a debatable area in financial research, and has been getting tremendous attention from both financial analysts and research/ academic specialists over the past few decades. The reason behind this might come from the fact that modelling volatility is an essential notion for many financial and economic aspects, such as in pricing equity, portfolio optimization management and in risk management. A unique characteristic of volatility (the conditional variance of the original asset returns) is that it cannot be observed directly (Tsay, 2010). Volatility as one of the crucial concepts in finance can be measured by either standard deviation or variance[40] of returns, and it is frequently applied as a basic measure of the total risk of financial assets. In the stock market, volatility may be referred to as a rise and fall of stock prices; while in relation to stock return, volatility can be referred to the interchanging bull and bear situations within the market. Subsequently, financial analysts and research/ academic specialists measure volatility to obtain very good conditional variance estimates, so as to be able to improve portfolio resource allocation and risk management.

In the stock markets, all the available information could be reflected by the equity prices, and when they absorb accurate new information as quickly as possible, then that indicates how efficient the stock market is in resource allocation. Therefore, modelling and forecasting volatility could also improve the utilization of equity prices as a pointer of intrinsic value of the company's securities; thereby facilitating possibilities for companies to raise capital in the stock market. Moreover, insight for designing investment strategies (including portfolio resource allocation) can be obtained through the detection of the trends in stock return volatility (Emenike, 2010). Also, most of investors and financial analysts have raised their concern about the stock market uncertainty of the returns on the investment assets, which caused by the volatility in speculative market prices and market risks, and therefore instability of business performance (Floros, 2008). These investors have got the attitudes towards expected returns, risks and even volatility; however, all of these need to be measured and explained well by financial econometrics with the use of accurate quantitative models that are capable of

[40] Generally, economists and financial analysts make their decisions considering how in future the random variable is distributed. Therefore, the accurate measurement of variance in financial data is highly influential and very crucial in many parts of finance.

modelling and forecasting the volatility of the stock market (Cuñado et al., 2006). Therefore, the stake holders of the markets will be aware on how to deal with risk management associated with un expected events, variability in speculative prices, and uncertainty in returns and non-constant variance in financial markets.

In finance, there are various important financial phenomena that cannot be explained by linear structural models, these features that are common to many financial data, such as stock market returns (Leptokurtosis, volatility clustering/pooling and Leverage effects/Asymmetry)[41], which can be estimated and explained well by non-linear models (Brooks, 2002, 2008). However, these stock market return features are considered as ones that demonstrate an increase of the financial risk; hence, uncertainty to investors' financial assets. For example, in the case of volatility pooling, where the recent level of volatility is positively correlated with the level it had in the immediately previous period, investors will be more unwilling to hold stocks due to insecurity of the volatility trend of financial assets to appear in bunches. Thus, in order for investors to insure themselves against such increased insecurity, they will demand a high risk premium; and a higher risk premium will result in an increase of the cost of capital, which will lead to low private physical investment in the stock market. Since the circumstances indicated above on features of stock market return are non-linear in nature, in order to capture well the relevant important characteristics of the data, the models that are commonly applied to estimate the conditional volatility of the said financial assets characteristics (non-linear), are the conditional heteroscedastic models (Abdalla & Winker, 2012).

The establishment of the GARCH model provided a method that economists and financial analyst could use to estimate the variance of the returns of financial assets that change over time, hence, to be able to improve the available information to investors. Since the introduction of the ARCH model by Angle (1982) and the GARCH model by Bollerslev (1986), we have witnessed many and different applications of volatility modelling in financial time series (e.g. financial assets) through developing and extending various specifications in the ARCH and GARCH models. Some of the work that extended the GARCH model is the IGARCH model (Engle & Bollerslev, 1986), GARCH in Mean model (Engle et al., 1987), Exponential GARCH (EGARCH) model (Nelson, 1991), Power ARCH (PARCH) model (Ding et al., 1993), GJR-GARCH model (Glosten et al., 1993) and Threshold GARCH (TGARCH) model (Zakoian, 1994).

[41] See Brooks (2008), Introductory Economics for Finance, pp 437-438; and for more information on volatility clustering, leptokurtosis as well as leverage effects, see Fama (1965) and Black (1976).

Since it is unlikely the variance of the error term not to change over time (homoscedasticity) in the financial time series, there was a need to consider models holding the assumption that the variance of the error term should change over time (heteroscedasticity), and at the same time describe the movement of the errors' variances. For example, when pricing the options on shares, the GARCH model may help in decreasing the occurrence of mispricing in unstable periods of financial markets; whereby the homoscedasticity assumption (variance is constant) tends to lead to inappropriate approximation. The idea of heteroscedasticity of variance in the financial time series sparked the eruption of different ARCH and GARCH models that extended to more family models in forecasting the volatility of financial time series (Christofi & Pericli, 1999; Engle & Patton, 2001; Brooks & Burke, 2003; Brooks et al., 2003; Balaban* & Bayar, 2005; Bali, 2007; Tully & Lucey, 2007; Tudor, 2008; Olowe, 2009; Kama et al., 2012; Kalyanaraman, 2014).

Specifically, the volatility of the stock market returns of both emerging and developed stock markets has been a topic of debate for measuring and managing estimated risks by different researchers (Fleming et al., 1995; Karolyi, 1995; Koutmos & Booth, 1995; Nicholls & Tonuri, 1995; Choudhry, 1996; Hamilton & Lin, 1996; Bekaert & Harvey, 1997; De Santis & imrohoroğlu, 1997; Henry, 1998; Aggarwal et al., 1999; Bekaert & Wu, 2000; Liu, 2000; Poshakwale & Murinde, 2001; Banerjee & Urga, 2005; Ogum et al., 2005; Shin, 2005; Frimpong & Oteng-Abayie, 2006; Bae et al., 2007; Brooks, 2007; Alberg et al., 2008; Engle et al., 2008; Floros, 2008; Mollah & Mobarek, 2009; Emenike, 2010; Srinivasan & Ibrahim, 2010; Srinivasan, 2011; Abdalla & Winker, 2012; AM Al-Rjoub & Azzam, 2012; Rahman et al., 2013; Kalyanaraman, 2014). For example, in the studies of Bekaert and Harvey (1997) and Aggarwal et al (1999), the family of ARCH and GARCH models proved to be the best techniques for forecasting volatility in emerging stock markets. In their study they highlight that the use of asymmetric GARCH in modelling emerging market volatility, can well capture asymmetry/leverage effects in stock returns series. Many other researchers (Floros, 2008; Abdallah and Winker, 2012) have also confirmed the presence of time-varying volatility (heteroscadicity) in stock returns.

The equity market volatility has been a topic of debate among economists and financial analysts in recent periods; investors, regulators and brokers have shown their concern on this issue, as they perceive that higher levels of volatility tend to decrease the confidence of investors and in the end they take away their capital from the stock exchange (Brooks, 2007). Thus, with the market participants' concern for what is happening in the market place, it is important to be able to accurately measure and predict the volatility of the stock market. The family of ARCH

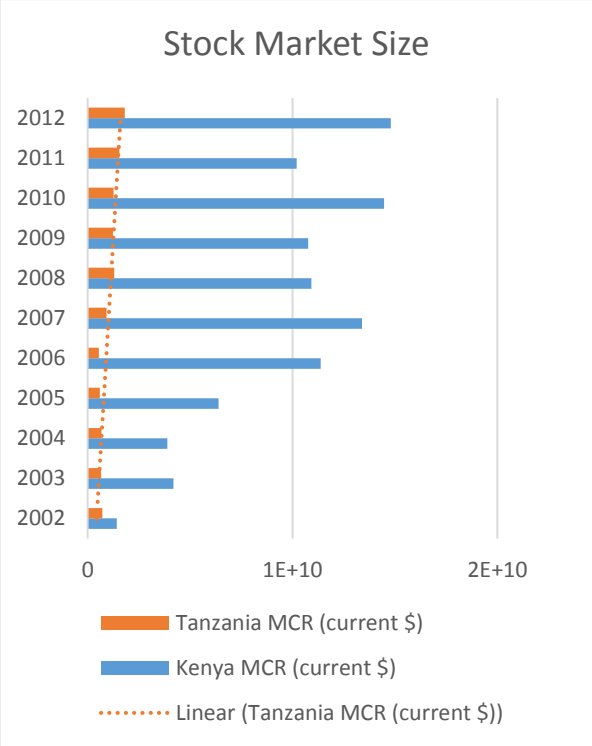
and GARCH models were deliberately intended to forecast and estimate the time-varying conditional variance (volatility) of financial time series, with the help of the preceding unexpected changes of the concerned series' returns; the models have been effectively applied by financial market researchers and have also been practically used by economists and finance researchers. According to Brooks (2002) the use of GARCH models made an important contribution towards the accurate measurement and prediction of stock market volatility and much improvement has been seen in modelling volatility in equity market.

This study, therefore, uses various GARCH-family models to measure the volatility of Stock return data for Dar-es-Salaam Stock Exchange (the Tanzanian Stock Market), using the sample of six listed companies, TOL Gases Ltd (TOL), Tanzania Breweries Ltd (TBL), Tanzania Cigarette Co. Ltd (TCC), Tanzania Tea Packers Ltd (TATEPA), Tanga Cement Co. Ltd (SIMBA) and Swissport Tanzania Ltd (DAHACO). This is done by employing asymmetric GARCH-type models to capture leverage effects, and the standard GARCH model to capture the symmetry (volatility clustering) in stock return series, using daily observations for the period from 2nd January 2005 to 31st December 2014. Unlike the other previous studies that used either monthly or annual data to model and forecast stock market volatility, this study uses daily and very recent stock return data. Therefore, the results will have significant implications for investors of the Dar-es-Salaam Stock Exchange, the Tanzanian Stock Market, in making rational decisions on their stock investment.

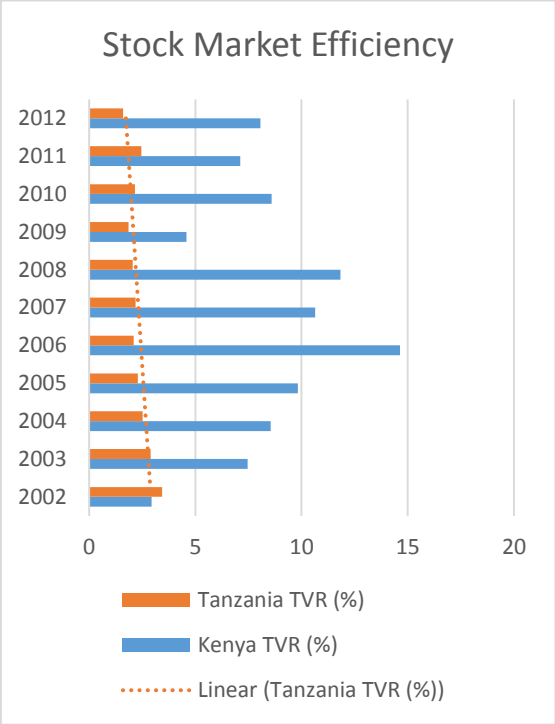
The study contributes to the literature of modelling stock market volatility researches, by providing a new empirical evidence on the fit of conditional volatility models from a very thin, small, illiquid and inefficient frontier market - Dar-es-Salaam Stock Exchange (DSE) in Tanzania. We think that the investors in this market are isolated from global developed stock markets, such that they lack ability to diversify their portfolio into international markets, hence lack of liquidity, small in size and inefficient (see Figure 4.1 below). The stock market size, which is presented by stock market capitalization, however, has been increasing from 2002 to 2012, yet is very small compared with Kenyan stock market size (see Figure 4.1A). We use East African country, Kenya, for comparison purpose. Stock market liquidity and efficiency, which are presented by stock traded value and stock traded-turnover ratio are very low in Tanzania, compared with the liquidity and efficiency of stock market in Kenya (see Figures 4.1 B and C). The small in size, low liquidity and low efficiency of the stock markets may be affected by the small number of companies listed in the respective exchanges, which in Tanzania the number is very small too compared with the domestic listed companies in Kenya (see Figure 4.1D).

Figure 4.1: Stock Market Size, Liquidity, and Efficiency in Tanzania

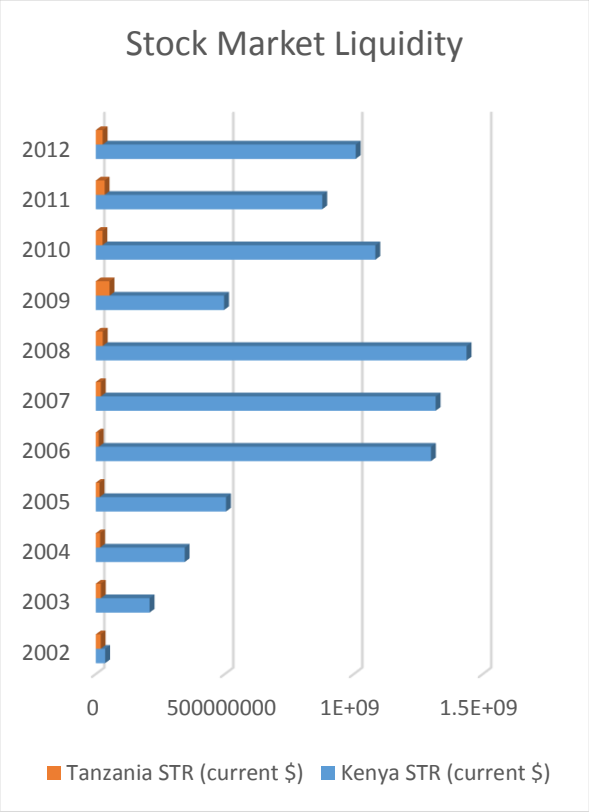
A: Stock Market Size



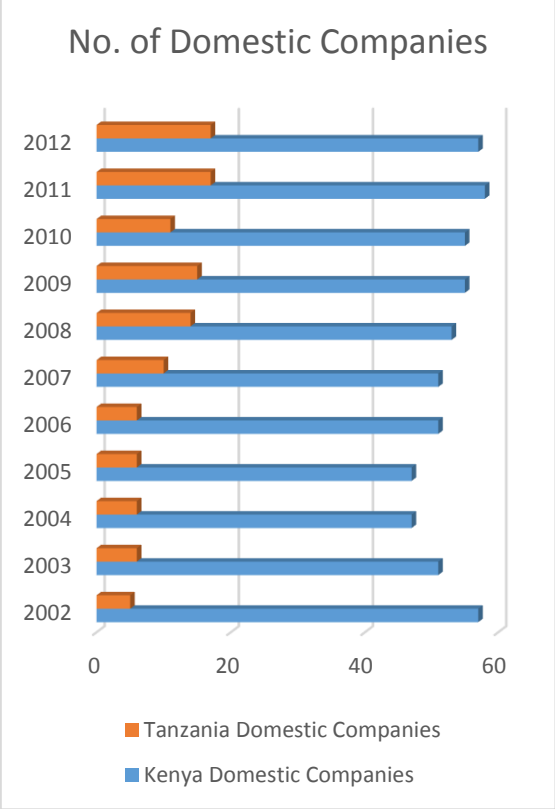
C: Stock Market Efficiency



B: Stock Market Liquidity



D: Domestic Listed Companies



In this study, some of the key findings are in line with other previous findings and others contradict previous studies. For example, this study finds that there is a positive relationship between the expected returns and the increased risks (conditional volatility) in the Tanzanian stock market (DSE) for the case of TCC. This result (in the case of TCC) supports previous studies that found the same (Ogum et al., 2005; Abdalla & Winker, 2012; AM Al-Rjoub & Azzam, 2012; Lukanima & Swaray, 2013). However, it contradicts other previous studies that found no relationship between the expected returns and the additional risks/conditional volatility (Poshakwale & Murinde, 2001; Floros, 2008). Also, the study supports the idea that there is no correlation between the higher return and the higher risks, in the cases of TBL and SIMBA, to provide mixed results for the DSE in Tanzanian Stock Market. Therefore, this study highlights that in the DSE, there are listed companies (such as TCC) that ensure the higher return to their investors who accepted the high expected risks, and there are listed companies (such as TBL and SIMBA) that do not ensure the higher returns to their investors who accepted to incur high conditional volatility.

Also, the study finds a high degree of persistence of volatility shocks in the Tanzanian stock market returns, which indicates a higher change in Tanzanian stock returns tend to be followed by high changes, while a lower change in stock returns is followed by a low change (volatility clustering). This was found in only four companies (TBL, TCC, SIMBA and DAHACO), while the other two companies, TOL and TATEPA were not found with volatility clustering behaviour; therefore, we dropped them from the sample when modelling stock return volatility. This finding (of volatility clustering behaviour) is in line with many previous studies (Ogum et al., 2005; Frimpong & Oteng-Abayie, 2006; Emenike, 2010; AM Al-Rjoub & Azzam, 2012), but also contradicts other previous studies which, due to the nature of the studies, found mixed results on volatility persistence (Poshakwale & Murinde, 2001; Abdalla & Winker, 2012; Lukanima & Swaray, 2013). Finally, the study finds that there is leverage effect/asymmetry existence in the Dar-es-Salaam (DSE) stock returns in the Tanzanian stock market using all three asymmetric GARCH models applied in this study (GJR-GARCH, EGARCH and PARCH models). However, Frimpong and Oteng-Abayie (2006) also declare the existence of mixed results in their findings, as the TGARCH model and EGARCH model suggested the existence and non-existence of leverage effects, respectively (see also Abdalla and Winker, 2012 for mixed results on asymmetries).

The remainder of this chapter includes the following: Section 4.2 provides the brief history of Dar-es-Salaam Stock Exchange (DSE), which is the Tanzania stock market, and its sub-section highlights the motivation, contribution and objectives of this study. Section 4.3 reviews relevant theoretical and empirical literature on modelling stock market volatility. Data, source and description of the data is given in section 4.4, whereas section 4.5 displays the research methodology in general. Section 4.6 gives the empirical results of GARCH model types used in this study. Section 4.7 provides the best fitted asymmetric GARCH models for the DSE stock return volatility in Tanzania. The summary and conclusion of the chapter are given in section 4.8.

4.2 Brief History of Tanzanian Stock Market

The stock market that is operating in Tanzania is known as Dar-es-salaam Stock Exchange (DSE), which was incorporated in 1996 as a private limited company by guarantee without a share capital under the Companies Ordinance (Cap. 212). The market is a non-profit making organization that was brought into existence as one of the tools of the government towards economic reforms. The Dar-es-Salaam Stock Exchange is also a member of the African Stock Exchanges Association. DSE's vision is to be a stock exchange that is sustainable and an engine for the economic growth of the country.

The formation of the DSE came after the establishment of the Capital Markets and Securities Authority (CMSA), which was introduced after the enactment of the Capital Markets and Securities Act of 1994. The Capital Markets and Securities Authority (CMSA) is the instrument which monitors and supervises all the activities that are taking place on the Exchange. The market waited for two years after its incorporation as DSE commenced its operations with listing and trading of the very first share equity in 1998; in that year, the market listed only two companies[42], TOL Gases Ltd (TOL) on 15th April 1998 and Tanzania Breweries Ltd (TBL) on 9th Sept 1998. In 1999 the market listed the first corporate debt, and in the same year on 17th Dec 1999 the third company known as Tanzania Tea Packers Ltd (TATEPA)[43] was listed in the exchange. Also in 1999 the deployment of the central depository system took place in the stock market. In DSE the Central Depository System is used for custody of the various securities which are deposited into it to smoothen deliveries for DSE trades; the

[42] TOL Gases Ltd which was the first company to be listed in the new market, deals with the production and distribution of industrial gases, welding equipment and medical gases; while TBL deals with the production, marketing and distribution of malt beer in Tanzania.
[43] It is a listed company in the market which deals with growing, processing, blending, marketing and distribution of tea and instant coffee.

settlement of DSE trades are facilitated through delivery of the securities, from which the electronic book entries are applied over the physical exchange of certificates/script. In 2000 November 16th the fourth company which deals with manufacturing, marketing, distribution and sell of cigarettes, Tanzania Cigarette Co. Ltd (TCC) was listed in DSE. The listing of Treasury bonds in DSE took place in 2002. And in the same year, the fifth local company, Tanga Cement Co. Ltd (SIMBA) was listed in DSE on 26th September 2002.

In 2003, the Exchange saw the listing of one more company in the market, DAHACO, which is also known as Swiss port Tanzania Ltd (SWISSPORT) on 26th September 2003. In 2004, the DSE was cross-listing the first foreign company in the Tanzanian stock market. The Tanzania Portland Cement Co. Ltd (TWIGA) listed in the DSE on 29th September 2006. In the same year, the DSE saw the Deployment of Automated Trading System was linked with a new three tier Central Depositary System. Therefore, since 2006, trading in DSE has been conducted through an Automated Trading System whereby the bids and offers are matched with the use of an electronic matching engine. On 16th September 2008 the Exchange listed Dar-es-Salaam Community Bank Ltd (DCB) as a first commercial bank to be listed in the Exchange, and two months later on 6th November 2008 another commercial bank National Microfinance Bank (NMB) was also listed in the Exchange. In 2009 June the Exchange was listing another commercial bank CRDB Bank in the market. The Precision Air Services Plc (PAL) was the first airline company to be listed in the Exchange on 21st December 2011. Maendeleo Bank Plc (MAENDELEO), another commercial Bank, was listed in the DSE, on 4th November 2013.

In 2014, the DSE saw the listings of two more domestic companies, Swala Gas and Oil Company and Mkombozi Commercial Bank, and one more cross-listed company, Uchumi Supermarket ltd. Swala Gas and Oil Company was listed on 11th August 2014 to be the 13th domestic company and the 19th company to list in the market; however, four days later on 15th August 2014, the DSE listed another cross-listed company (Uchumi Supermarket ltd) in the market to make it the 7th foreign company and the 20th company in total to list on the exchange. Mkombozi Commercial Bank was the fifth commercial bank to list in the DSE after four other commercial banks (DCB Commercial Bank, National Microfinance Bank, CRDB Bank PLC and Maendeleo Bank PLC) on 29th December 2014.

In 2015, the Dar-es-Salaam Stock Exchange received another guest company in the market. This time it was Mwalimu Commercial Bank, which listed on 27th November 2015 to make the sixth commercial bank to list in the market. It was the 15th domestic company, to make a

total of 22 companies listed in the DSE. On 10th March 2016 another firm joined with DSE to make it the 16th domestic company and the 23rd company in total to list in the Tanzanian stock market of Dar-es-Salaam Stock Exchange.

Table 4.1: Domestic Listed Companies (16)

Company	Date Listed	Number of Shares Issued
TOL Gases Ltd. (TOL)*	15th April, 1998	37,223,686
Tanzania Breweries Ltd. (TBL)*	9th September, 1998	294,928,463
Tanzania Tea Packers Ltd. (TATEPA)*	17th December, 1999	17,857,165
Tanzania Cigarette Co. Ltd. (TCC)*	16th November, 2000	100,000,000
Tanga Cement Co. Ltd. (SIMBA)*	26th September, 2002	63,671,045
Swissport Tanzania Ltd. (DAHACO)*	26th September, 2003	36,000,000
Tanzania Portland Cement Co. Ltd. (TWIGA)	29th September, 2006	179,923,100
DCB Commercial Bank Plc (DCB)	16th September, 2008	32,393,236
National Microfinance Bank (NMB)	6th November 2008	500,000,000
CRDB Bank (CRDB)	17th June 2009	2,176,532,160
Precision Air Services Plc (PAL)	21st December 2011	193,856,750
Maendeleo Bank Plc (MAENDELEO)	4th November 2013	9,066,701
Swala Gas and Oil	11th August 2014	99,954,467
Mkombozi Commercial Bank	29th December 2014	20,615,272
Mwalimu Commercial Bank	27th November 2015	61,824,920
YETU Microfinance PLC	10th March 2016	6,223,380

Note: * shows companies that are included in this study to measure stock return volatility of Dar-es-Salaam Stock Exchange (DSE) in Tanzanian stock market. The selection of these six companies based on the presence of daily data from 2nd January 2005. The source of the information in Table 4.1: website (www.dse.co.tz)

Table 4.2: Cross Listed Companies (7)

Company	Exchanges
Kenya Airways	Nairobi Stock Exchange and Uganda Securities Exchange
East African Breweries Ltd	Nairobi Stock Exchange and Uganda Securities Exchange
Jubilee Holdings Limited	Nairobi Stock Exchange, Uganda Securities Exchange and Rwanda Over the Counter Exchange
Kenya Commercial Bank Group Ltd (KCB)	Nairobi Stock Exchange, Uganda Securities Exchange and Rwanda Over the Counter Exchange
Acacia Mining PLC (African Barrick Gold)	NYSE Euronext, London Stock Exchange (LSE), and Over The Counter Bulletin Board (OTCBB)
National Media Group Plc (NMG)	Nairobi Stock Exchange, Uganda Securities Exchange and Rwanda Over the Counter Exchange
Uchumi Supermarket Ltd	Nairobi Stock Exchange

Source: Dar-es-Salaam Stock Exchange (DSE) website (www.dse.co.tz)[44]

It is almost two decades since DSE saw the first listing, yet there is a slow pace in listing activities in the market, with the DSE listing only one company or no company in a year. By the end of year 2011, there were only 17 companies listed on the exchange, although in that year, the DSE managed to list three companies. Two of these companies were cross-listed companies, Acacia Mining PLC and the Nation Media Group, while the other company was a domestic company, Precision Air Services. The addition of these three companies in the Exchange not only gave investors a wider selection of areas of investment, but also increased the liquidity of the market. In 2013 that the DSE launched the second tier market, the Enterprise Growth Market (EGM) and the same year saw the first company (Maendeleo Bank Plc) listed on the Enterprise Growth Market. The trading in the Exchange is done for only five days in a week, from Monday to Friday, between 10.00 am -14.00 pm. The securities that are currently traded in DSE are Ordinary Shares of the listed companies, six corporate bonds and over a hundred bonds of the Tanzanian Government. Currently there are 23 listed companies (see Table 4.1 and Table 4.2), of which 16 are domestic and seven are cross listed companies.

[44] For more information, one can see (DSE, 2012)

4.2.1 Motivation and Contribution of the Research

This study is conducted in Tanzania, a country situated in East Africa, along with four other countries, Kenya, Uganda, Rwanda and Burundi. In East Africa, there are a few studies on modelling and forecasting volatility of stock market that have been conducted in Kenya (Hassan et al., 2003; Ogum et al., 2005), but none have been done for the other countries in East Africa such as Tanzania and Uganda. This may be due to the long presence of the Kenyan stock market (Nairobi Stock Exchange), compared with the stock markets of other countries in the region. We consider that it is time now to conduct such a study of the stock markets that have a short presence in East Africa (in our case the Tanzanian stock market, i. e, Dar-es-Salaam Stock Exchange).

This study will enable investors in both domestic companies and cross-listed companies to measure the certainty of the returns of their investment assets, market risks and instability of business performance in DSE. The results of this study will help the investors and market participants to be aware of the possible risks related to volatility of stock returns in DSE, and therefore to learn how to manage those risks associated with volatility.

The study of the volatility of the Tanzanian stock market in DSE is interesting for a number of reasons. First, the economy of Tanzania is very small compared to the economies of many of emerging countries with emerging stock markets, where many of the similar studies have been conducted. Tanzanian companies have no influence on global trading conditions, and they are extremely prone to react to conditions imposed by developed nations. This is different from the stock markets that are situated in emerging economies, such as Brazil, Russia, India and China, where companies may represent a fair proportion of the global economy. Therefore, in the Tanzanian stock market, there could be unique observations and volatility trends that are interesting to analyse.

Second, there are few cross listed companies (see Table 4.2) in the Dar-es-Salaam Stock Exchange. There is only one company (Acacia Mining PLC) that is cross listed in both a frontier stock market (Tanzanian stock market) and developed stock markets, which are NYSE Euronext, London Stock Exchange (LSE), and Over the Counter Bulletin Board (OTCBB). Therefore, studying the volatility behaviour of this thin, small and new established market is subsequently of interest to many participants, such as shareholders of this cross listed company (Acacia Mining PLC), management of both DSE and the company (ies) and other stakeholders of the stock market, including the government.

In the past few years, several attempt to model volatility have been conducted in many emerging financial markets all over the world (see Table 4.3 below) but very few or none have been conducted for frontier markets. The Tanzanian stock market is one of the frontier stock markets, with a very small number of listed companies (see Table 4.1 and Table 4.2) either domestic or cross-listed. This makes the Tanzanian stock market (DSE) a very thin market compared with many of the stock markets where such studies have been conducted (see Figure 4.1 for more evidence). The results of this study will give another insight into thin stock markets with very few listed companies to the investors and modellers who deal with international financial markets, and will as well add empirical evidence to the studies on modelling, measuring, and forecasting volatility in the financial markets.

When Engle (1982) developed the Autoregressive Conditional Heteroscedastic (ARCH) model, he considered a disadvantage that the Autoregressive Integrated Moving Average (ARIMA) holds; which is that the disturbance terms in the ARIMA model do not change over time, and therefore, the variance is constant throughout the given period. The ARCH model considers that the conditional variance could change over time (non-constant) so as to be accurate for modelling the volatility of financial time series data. Developing on the original ARCH model, the Generalised Autoregressive Conditional Heteroscedastic (GARCH) model was proposed by Bollerslev (1986); the author argued that the GARCH model can give an accurate statistical fit with no need for estimating a big number of parameters. Since the development of the GARCH model by Bollerslev (1986), the literature has seen the generation of various GARCH models that aim to allow for the negative asymmetry that usually characterises in financial time series data. Among this new generation of models are asymmetric GARCH models; these are models that attempt to solve the problem of asymmetry on the conditional variance structure imposed by both ARCH and GARCH models, said to be inaccurate for modelling and forecasting stock market return volatility.

With the use of asymmetric models[45] in modelling stock market volatility, Henry (1998) concludes that the models were fitted to the observed daily stock returns data of the Hong Kong Stock Market. In modelling stock market volatility in Australia, Nicholls and Tonuri (1995) used asymmetric models to conclude that the asymmetric EGARCH (1, 1) model was found to explain well the variance of the stock returns data. The asymmetric GARCH models have the capability of capturing asymmetric feature of the stock market return series; this is confirmed

[45] Henry (1998), used the EGARCH (1, 1) model to find that the model was sensitive to highly large negative and positive shocks; the other asymmetric models used in this study are the GJR model and Generalized Quadratic ARCH (GQARCH) model, which was found to be the most sufficient characterisation of the given data.

in the studies of Bakaert and Harvey (1997) and Aggarwal et al (1999). Also Alberg et al (2008) used asymmetric GARCH models when modelling the stock market volatility of Tel Aviv Stock Exchange. In their conclusion they admit that the asymmetric EGARCH model is the best model in forecasting the volatility of the given stock market data. The ARCH type models have largely been used to model stock market volatility, and a simple GARCH (1,1) model has been found to be suitable for capturing the volatility clustering of the financial time series; however, fat-tails and asymmetry were found to be difficult to capture by this model (Emenike, 2010). It is only through Asymmetric models such as EGARCH and GJR-GARCH that the asymmetry/leverage effects in the stock return series were commonly captured.

Therefore, unlike other previous studies that used monthly data, this study uses both standard and asymmetric GARCH models to model the volatility of the daily stock returns of the TBL, TCC, SIMBA and DAHACO in Dar-es-Salaam Stock Exchange from 2nd Jan 2005 to 31st Dec 2014. The stock return data are described as very recent data that will give a true picture of what has recently been happening in the volatility of stock returns in the DSE – Tanzanian stock market. The objectives of this study are: (i) to apply various GARCH models to investigate and explain the behaviour of stock market return volatility in Tanzania; and (ii) to examine the performance of the asymmetric GARCH models in explaining stock market risks related to volatility. Moreover, we also use the GARCH (1, 1)[46] model to capture the volatility clustering/volatility pooling, since the asymmetric GARCH models are usually used to capture asymmetries/leverage effects in the stock return series data.

4.3 Review of Literature on Modelling Stock Market volatility

4.3.1 Theoretical Review and Model Development

In finance, most of studies on the relationships of series are said to be non-linear (Brooks, 2008). It is also said that the payoffs to options in some input series are non-linear, therefore, the willingness of the investors to trade off stock returns and risks could also be considered as non-linear. Due to these observations, Brooks (2008) advises careful consideration of nonlinear models in different circumstances, so as to better capture the significant features of financial data. For example, there are various important financial phenomena that cannot be explained by linear structural models, but a number of features that are common to many financial data,

[46] The GARCH (1, 1) model is said to be suitable enough to capture the volatility clustering in the stock return series data (Brooks; 2008 & Emenike; 2010,). The model is also said to be parsimonious and provides significant results (Floros; 2008).

such as stock market returns (Leptokurtosis, volatility clustering/pooling and Leverage effects/Asymmetry), can be estimated and explained well by non-linear models.

Leptokurtosis refer to the tendency for financial assets (stock returns) to give the result of distributions that exhibit fat-tails. Alternatively, Leptokurtosis connotes high probability for higher values than the normal law forecasts in a series. Volatility clustering, also known as volatility pooling, can mean the tendency for stock market volatility to emerge in groups, whereby, large changes (of both signs) in stock prices are expected to follow large stock prices, and small changes (of both signs) in stock prices are expected to follow small stock prices. Leverage effects, also known as Asymmetry, can be explained as a tendency for stock market volatility to rise more following a large decrease in price than following a price rise of the same scale; this shows that more stock prices walk far from the estimated average tendency in a collapse-period than in a bubble-period, due to greater observed insecurity (Fama, 1965; Black, 1976).

In volatility pooling, where the recent level of volatility is positively correlated with the level it had in the immediately previous period, investors will be more unwilling to hold stocks due to insecurity of the volatility trend of financial assets to appear in bunches. Therefore, in order for investors to insure themselves against such increased insecurity, they will demand a high risk premium; and a higher risk premium will result in an increase of the cost of capital, which will lead to low private physical investment in the stock market. Since the circumstances indicated above on features of stock market return are non-linear in nature, in order to capture well the relevant important characteristics of the data, the models that are commonly applied to estimate the conditional volatility of the said financial assets characteristics (non-linear), are the conditional heteroscedastic models (Abdalla and Winker, 2012; Brooks, 2008, 2002).

In finance, a number of models on conditional volatility (variances) have been developed to estimate the conditional volatility of financial assets, especially stock market returns. According to Brooks (2002, 2008) the Autoregressive Conditionally Heteroscedastic (ARCH) or Generalized Autoregressive Conditionally Heteroscedastic (GARCH) models are the preferred non-linear financial models that are applied for modelling and forecasting volatility, and switching models that allow the performance of a series to trail different processes at different points in time. The ARCH model by Engle (1982) was the first non-linear conditional variance model to be proposed in the empirical research area.

In this useful class of models, the assumption is that there is homoscedasticity if the variance of the errors is constant ($\text{var}(\varepsilon_t) = \sigma^2$), and heteroscedasticity if the variance of the error term changes over time. The assumptions of many of the earlier studies before the development of the GARCH proved that variance does not change over time. The introduction of ARCH models was for the purpose of modelling volatility through the relationship between conditional variance of the disturbance error term and the linear combination of the squared error disturbance terms of the immediate preceding periods (Engle, 1982). However, the Generalized Autoregressive Conditionally Heteroscedastic (GARCH) model (Bollerslev, 1986), was developed later to model the conditional variance on its lagged values and the squared lagged values of the disturbance error term.

Nicholls and Tonuri (1995) argued that for any statistical or econometric model proposed for measuring the given financial data, its quality has to be judged on its capability to explain and account for all observations of the given financial data. According to Fama (1965) and Black (1976) the data for stock returns are characterized by the following; first, the returns data are seriously correlated, showing that there is no independence among successive returns (volatility clustering), second, the squares of returns feature serial correlation, which indicates different periods of volatility and stability, third, in the distribution of returns there is negative asymmetry that poses a question on the presence of an underlying normal distribution assumption; last, in the distribution of returns there is leptokurtosis (fat-tails) when compared with the normal distribution, having many values near the mean and the tails of the distribution.

Box and Jenkins (1976) developed the Autoregressive Integrated Moving Average (ARIMA) model that came to be highly used and accepted in various financial data measurements. The model was found to have an advantage of estimating the unknown parameters and forecasting the future values of a given process. ARIMA holds an assumption that the variance of the disturbance term does not change over time (Box & Jenkins, 1976). This was found to be a constraint of the ARIMA model. Most of studies conclude that the said assumption does not prevail in stock market returns and therefore models that are flexible, are required to explain the volatility of financial time series data (Campbell & Hentschel, 1992; Brooks, 2002; 2008). Brooks (2002) goes even further to criticize the assumption of homoscedasticity (variance of the error term is constant) by indicating that its implication will give incorrect standard error estimates.

Apart from non-existence of constant variance in financial time series, especially in stock returns, there have been un-expected events that in one way or another may cause a lack of certainty in price and return on investment. Thus, economists and financial analysts started to think of modelling, forecasting and describing volatility and stock returns behaviour using time series economic models. In the context of financial time series, there is no possibility of having constant variance of the disturbance term; thus economists and financial analysts considered a model that assumes heteroscedasticity (variance of the error term is not constant). To solve a constraint of the stated assumption that the variance of the disturbance/error term is constant in the ARIMA model, Engle (1982) introduced a model to explain time-varying variance. The model, known as the Autoregressive Conditional Heteroscedastic (ARCH) model, proved to be especially useful in modelling the variances of financial time series data. According to Nicholls and Tonuri (1995) the ARCH-model measures the variances of the given data as a function of current values of the given data, and the model became widespread in financial data applications. The ARCH-model is appropriately used for volatility clustering collectively observed in financial time series. The ARCH (q) model can be given as hereunder: -

$$\sigma_t^2 = \alpha_0 + \alpha_1 \mu_{t-1}^2 + \alpha_2 \mu_{t-2}^2 + \cdots + \alpha_q \mu_{t-q}^2 \qquad (4.1)$$

Where σ_t^2 is the conditional variance that in most of the literature has been termed as h_t instead of the term σ_t^2. Therefore, the ARCH (q) model can be again written as follows:

$$h_t = \alpha_0 + \alpha_1 \mu_{t-1}^2 + \alpha_2 \mu_{t-2}^2 + \cdots + \alpha_q \mu_{t-q}^2 \qquad (4.2)$$

Bollerslev (1986) with the use of the basic ARCH model, developed a model which known as a Generalized Autoregressive Conditional Heteroscedastic (GARCH). The GARCH model was found to have more flexibility in the structure of the lags, while the previous conditional variances and the previous squared disturbances could be included in the conditional variance function. Financial time series features, such as volatility clustering (volatility pooling) and fat tails[47] could easily be captured by the GARCH-type model. Financial time series with low volatility in certain periods of time and high volatility in other periods of time, are said to be characterized by volatility clustering. According to Floros (2008) the clustering of the variance of the disturbance term over time can be taken as volatility clustering; they mean that if in one period the variance of the disturbance term is small, then in the following period the variance of the error term will be small too. Having an error term that shows unconditional standard

[47] Since the stock return data may hold sharp modes and fat tails, the GARCH-type model can fit them and they will later show various degrees of leptokurtosis with the same variances.

deviations varying (time-varying heteroscedasticity) also indicates volatility clustering in other words. The GARCH (*p, q*) model is usually written as hereunder with the function of the conditional variance:

$$\sigma_t^2 = \alpha_0 + \sum_{i=1}^{q} \alpha_i \mu_{t-i}^2 + \sum_{j=1}^{p} \beta_j \sigma_{t-j}^2, \quad \alpha_i \geq 0;\ \beta_j \geq 0 \tag{4.3}$$

The GARCH model has an advantage that the most parsimonious description of the time series is allowed by the model. Bollerslev (1986) argued that the GARCH model can give an accurate statistical fit with no need for estimating a big number of parameters. To ensure that the equation of the conditional variance (σ_t^2) given is stationary, that is, it cannot hold a negative value, Bollerslev (1986) also developed the following condition:

$$\sum_{i=1}^{q} \alpha_i + \sum_{j=1}^{p} \beta_j < 1 \tag{4.4}$$

Therefore, in any study that involves stock market returns (this study is one of them), the application of the GARCH (*p, q*) model can allow the characteristics of serial correlation in both the stock returns and the squares of the stock returns. However, in ARCH and GARCH models the individual error terms μ_t are shown as holding a conditionally normal distribution, the GARCH (*p, q*) result is always leptokurtic which relates with the empirical feature of leptokurtosis observation in a given set of stock return data (Bollerslev, 1986). With the ability of the GARCH family models to capture the empirical characteristics of stock return series in the given data, the model has proven an important tool in modelling, forecasting and explaining volatility of stock market returns.

4.3.2 Empirical Review

Empirically, the literature has seen myriad works on modelling and estimating stock market volatility all over the world evidenced from both emerging and developed economies. Following the success of GARCH type models in capturing various features of volatility behaviour, such as volatility clustering, asymmetry and leptokurtosis, Stock Market Returns data have been applied by academics, economists and financial analysts to explain and forecast volatility, so as to be able to measure and control risks in emerging and developed financial markets. The study provides the summary of some of studies with objective, econometric

models used in modelling and forecasting stock market volatility, and the major results obtained in either emerging or developed stock markets (see Table 4.3 below).

This study considers that it is important to review what has been done elsewhere in other emerging markets with a similar research objective. In Nigeria, Emenike (2010) used GARCH (1, 1) and GJR-GARCH (1, 1) to scrutinize the behaviour of stock return volatility in the Nigeria Stock Exchange, using monthly share indices data from January 1999 to December 2008. His findings confirm the evidence of volatility pooling and the existence of asymmetries in the stock return series. Henry (1998), used the daily data from Hong Kong stock Exchange (1415 observations from 1st January 1990 to 12th June 1995) to study the natural behaviour of stock market volatility. He applied asymmetric GARCH models to conclude that the models (EGARCH, GJR-GARCH and GQARCH) were found fitted to the data to explain the volatility of the daily stock returns series for Hong Kong Stock Market. He added that the GQARCH model happens to be the most sufficient structure to capture the asymmetric characteristics in the given data when compared with other models used.

With the use of the daily stock return data from two countries of the Middle East, Egypt and Israel, Floros (2008) employed various time series methods such as simple GARCH, Threshold GARCH, Component GARCH, Power GARCH and Asymmetric GARCH models, for modelling volatility and describing the risk of the financial market. In his findings, he concludes that the GARCH family models can suitably explain stock returns, and the increased risk will not necessarily cause an increase in returns for both markets. In their study Abdallah and Winker (2012) used Khartoum stock exchange of Sudan and the Egyptian stock market (Alexandria and Cairo stock exchanges) to model and estimate stock market volatility applying different univariate GARCH models (with the daily stock return series from January 2006 to November 2010). They concluded that the conditional variance of the stock return series in Sudan is characterized by an explosive process, and it is volatility persistence in the Egyptian stock exchanges. However, their finding that an increase in risk is linked with increase in return for the case of Egypt, is not in line with the results found by Floros (2008), that an increase in risk is not linked with an increase in returns in Egypt.

Frimpong and Oteng-Abayie (2006) modelled and forecasted the volatility of stock return of Ghana stock exchange (GSE) using both linear (Random Walk) and non-linear (symmetric and asymmetric). In their results they found that there is a high degree of volatility persistence in GSE. The market also features volatility clustering, leptokurtosis and leverage effects associated with stock returns. In the linear random walk model, the hypothesis was rejected for

the Ghana stock exchange (GSE). Another recent study that not only shows volatility persistence, but also shows time varying (heteroscedastic) volatility that is predictable as well, is the study of Kalyanaraman (2014). In his study, Kalyanaraman (2014) estimates the conditional variance of the Saudi stock exchange in Saudi Arabia using univariate GARCH model types; he found that the stock returns in the Saudi stock exchange are strongly characterized by the volatility clustering, and their distributions are not normal (non-normal distribution).

On the other hand, Am Al-Rjoub and Azzam (2012) who examined both the behaviour of the stock returns and the volatility in Jordan stock exchange during the financial crisis, found that the stock prices dropped severely during the global financial crisis of 2008-2009 and there was high persistence in volatility. Lukanima and Swaray (2013) went further to investigate the cyclical nature of the stock market return series in relation to major economic events, with a high concentration on stock return volatility, information asymmetry and the risk premium. They conclude that there is a positive relationship between stock returns and risk premium during good economic cycle, whereby is the higher the stock returns, the higher the risk premium. Moreover, in a period of a good economic environment, the overall risk tends to decrease and influences the impact of bad news (they call it information asymmetry) as well as volatility persistence; and converse occurs when there are bad times (bad economic cycle) (Lukanima & Swaray, 2013).

Ogum et al. (2005) empirically investigated the autoregressive behaviour of stock return volatility, the predictability of the stock return in relation to past observations, the asymmetric shock of conditional variance to innovations, and the volatility risk premium in Kenya and Nigeria. The model used to arrive at the results of this study was EGARCH (1,1)-M. It was found that in Kenya, the volatility tends to be high when there are positive shocks and less when there are negative shocks of same magnitude. Their study also found that the expected returns were predictable in both Kenya and Nigeria, and that there was existence of volatility persistence in both emerging markets.

Table 4.3: Summary of Previous Empirical Studies on Modelling Stock Market Volatility

Authors	Countries/Stock Market	objective	Econometric Models	Major Results
Kalyanaraman (2014)	Saudi Arabia	To estimate the volatility of Saudi Arabia stock exchange.	Univariate GARCH models	GARCH (1,1) model is appropriate in estimating the volatility of Saudi stock exchange.
Lukanima and Swaray (2013)	Global stock exchanges	To examine the cyclicality nature of the stock return volatility in Global context.	EGARCH-M model	The higher the stock returns in a good economic cycle, the higher the risk premium and the converse is true in a bad economic cycle
Abdallah and Winker (2012)	Sudan and Egypt	To model and estimate stock return volatility in Khartoum and Egyptian stock exchanges.	Univariate GARCH type models.	Volatility is persistent in the Egyptian market and there is an explosive process in Sudan stock exchange.
Emenike (2010)	Nigeria	To investigate the behaviour of stock return volatility	GARCH (1,1), GJR-GARCH (1,1) and GED test	Volatility persistence, fat-tail distribution and leverage effects.
Floros (2008)	Egypt and Israel	To study the application of GARCH-type models for modelling	GARCH-type models	GARCH-type models can well explain the daily returns; and the higher risk should

		volatility and clarifying financial market risk.		not necessarily result in higher returns.
Tudor (2008)	Romanian Stock Market	To investigate the Trade-off of the risk return	Simple GARCH model, GARCH-in-Mean and EGARCH	E-GARCH is the best fitting model for index volatility of the market.
Alberg et al (2008)	Tel Aviv Stock Exchange (TASE)	To estimate the stock market volatility of TASE	Asymmetric GARCH models	EGARCH model is most effective in forecasting the indices of the market.
Frimpong and Oteng-Abayie (2006)	Ghana Stock Exchange (GSE)	To model and forecast stock return volatility in GSE.	Random walk and GARCH(1,1), EGARCH(1,1) and TGARCH(1,1)	Volatility persistence, the rejection of the random walk and GARCH (1,1) is the more effective model.
Balaban and Bayar (2005)	Philippines and Thailand	To derive the volatility expectation	Symmetric and Asymmetric ARCH-type Models	Positive effect on expected volatility.
Ogum et al (2005)	Nigeria and Kenya	To investigate the emerging market volatility	Exponential GARCH model	Positive and significant time-varying risk premium for Nigeria and the converse for Kenya.

Jayasuriya (2002)	15 emerging countries	To examine the effect of stock market liberalization in stock return volatility	Asymmetry GARCH model	Cyclical type behaviour with changes in stock price and not volatility clustering.
Nicholls and Tonuri (1995)	Australia	To evaluate the applicability of asymmetric GARCH models in Australia	GARCH (1, 1) and Asymmetric GARCH-type models	EGARCH (1,1) model gives suitable explanations of the variances.

Source: Researcher's Collections of Reviewed Literature

Empirically, in the past few years, studies on modelling stock returns volatility have been conducted in most of emerging financial markets all over the world (see Table 4.3 above), however, very few or none have been conducted in frontier markets. The Tanzanian stock market is one of the frontier stock markets, with a very small number of listed companies (see Table 4.1 for domestic listed companies and Table 4.2 for cross-listed companies). This makes the Tanzanian stock market (DSE) a very thin, small, illiquid and even inefficient market compared with most of the stock markets where such studies have been conducted, for example, one of East African neighbour country Kenya (see Figure 4.1 above). Therefore, the results of this study will give another insight into thin stock markets with very few listed companies to the investors and modellers who deal with international financial markets, and will as well add empirical evidence to the literature on modelling, measuring, and forecasting volatility in the financial markets.

4.4 Data, Data Source and Description

The selected data for this study comprise 2704 daily observations of the composite share index obtained from the DSE in Tanzania, covering the period 2nd January 2005 to 31st December 2014. The composite share prices of six companies (TOL, TBL, TCC, TATEPA, DAHACO and SIMBA) were obtained from DSE (data source)[48], and then transformed to stock market returns as an individual time series variable. The computation of the daily stock market returns

[48] See Market Reports of Dar es Salaam Stock Exchange on www.dse.co.tz for more information on share indices.

applied in this study is based on logarithmic difference change in share prices of the selected companies in DSE, which is expressed as follows:

$$RI_t = LN(PI_t \,/\, PI_{t-1}) \qquad (4.5)$$

Where RI_t is the daily stock market return at time *t*, *PI* is the daily stock price at time *t* and $t\text{-}_1$, and LN is the natural logarithm. The descriptive statistics for stock return for the DSE can be seen in Table 4.4 below.

The descriptive statistics in Table 4.4 below display the values of different statistical measures, such as the value of the mean, maximum, minimum, skewness, kurtosis, Jarque-Bera and standard deviation statistics. The average daily returns in four selected companies, TBL, TCC, DAHACO and SIMBA is 0.0004 approximately, and zero for the other two companies, TOL and TATEPA. The skewness statistic measures the asymmetry of the distribution of the given series around its mean. In a series with normal distribution, the value of skewness is 0. It can be seen that the skewness statistics from those six selected companies are significantly different from zero, indicating that they are not normally distributed. In other words, these values of skewness for the return series indicate that there is the asymmetry in the particular series, and they are skewed towards positive values (except for TATEPA, whereas is skewed towards negative values to create a left tail distribution) hence depart from normal distribution to create a right tail distribution (see Table 4.4 below). Therefore, with this characteristic of the return series of these listed companies in DSE, the fitting of GARCH models is certainly required and supported to the given financial series data.

The kurtosis statistic is a measure of the flatness or peakedness of the series in the distribution. In a series with normal distribution, the value of kurtosis is 3, and any value of kurtosis greater or less than 3 indicates the flatness or peakedness in the distribution. The kurtosis statistics for the return series of the selected listed companies of DSE present the values greater than 3, implying that the return series are leptokurtic/fat-tailed and their distributions are peaked relative to normal. Moreover, the high values of the kurtosis statistic showed in the stock return series of these companies, highlighting the presence of leptokurtic (heavily tailed) and sharply peaked about the mean, especially when compared to the normal distribution. Since the characteristic of leptokurtosis is a feature of all GARCH-family models, the use of the GARCH model is at least expected to partially explain the evidence of leptokurtosis in the given financial data series of this study.

Table 4.4: Descriptive Statistics of the Stock Returns for selected Companies in DSE

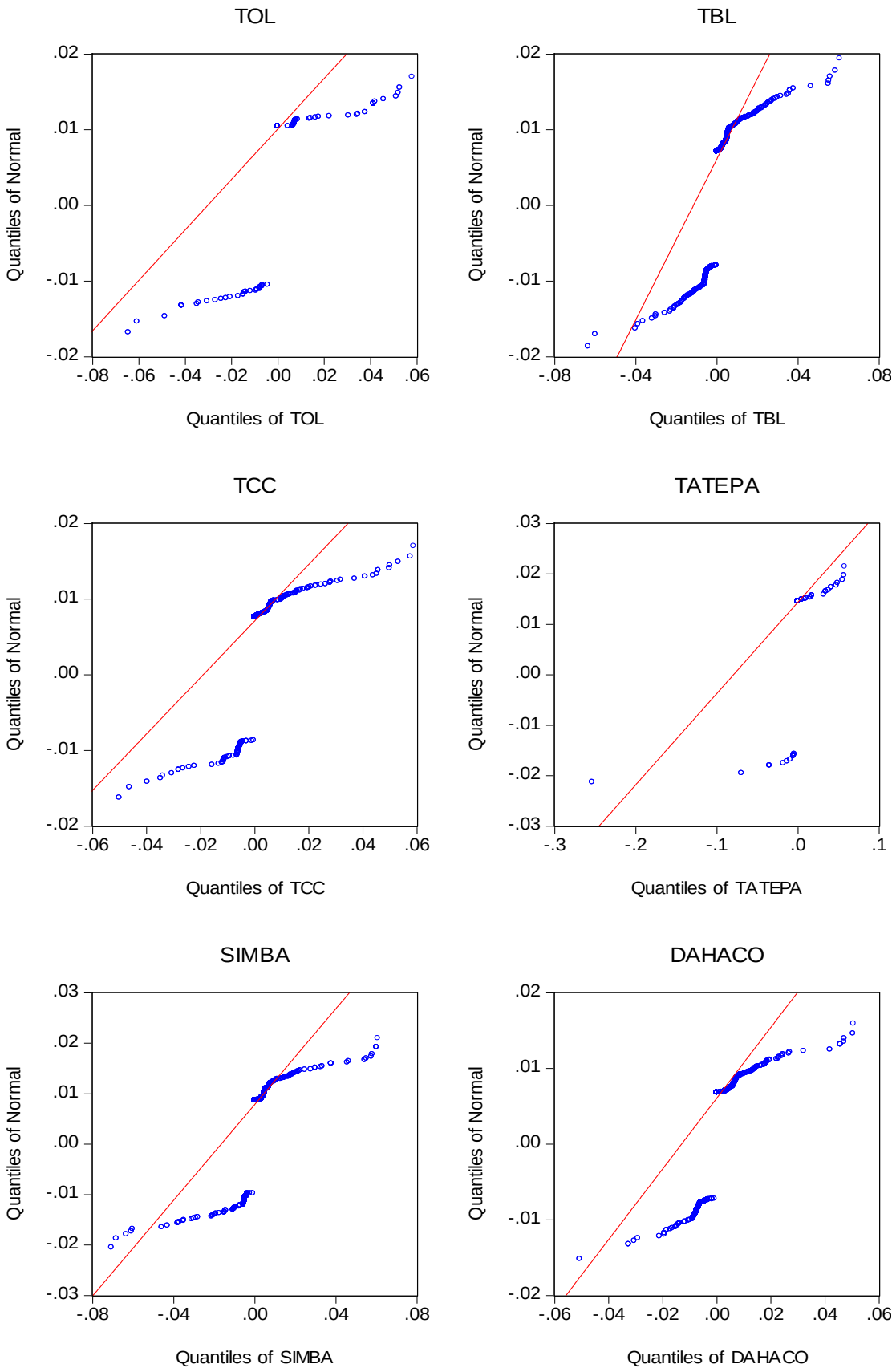
	TOL	TBL	TCC	TATEPA	DAHACO	SIMBA
Mean	8.2E-05	0.0004	0.0004	6.3E-05	0.0004	0.0004
Median	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Maximum	0.0580	0.0607	0.0588	0.0580	0.0507	0.0607
Minimum	-0.0645	-0.0634	-0.0501	-0.2534	-0.0507	-0.0706
Std. Dev.	0.0047	0.0053	0.0047	0.0060	0.0044	0.0058
Skewness	1.5106	1.8613	3.9322	-26.6140	3.3637	0.0434
Kurtosis	90.1661	53.7009	72.1391	1199.435	57.7123	68.7573
Jarque-Bera	857061.5	291180.1	545539.5	1.62E+08	342362.6	487174.0
Probability	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Sum	0.2218	1.0028	0.9782	0.1695	0.9517	0.6118
Sum Sq. Dev.	0.0607	0.0771	0.0589	0.0975	0.0515	0.0916
Observations	2704	2704	2704	2704	2704	2704

Note: Daily stock returns data for the selected companies were collected from 2nd January 2005 to 31st December 2014 from the DSE.

Jarque-Bera is a test statistic that is usually used to measure the existence of a normal distribution among the series. The value of Jarque-Bera is 0, when testing the null hypothesis of the normal distribution. The value of Jarque-Bera for the selected listed companies is greater than zero (except for TATEPA, which is approximate zero), indicating that the return series deviate from the normal distribution. In the return series of these selected companies, the standard deviation is greater than 0.2% (see Table 4.4 above), which shows that there is a high level of stock return volatility in Tanzania stock market. Therefore, the sample data (financial return series) of the DSE do not highlight the existence of a normal distribution behaviour; rather, they are characterized by skewness and leptokurtic distribution, which confirm the asymmetry characteristic of stock returns in DSE.

A proper view of distribution in the stock returns of the six selected companies listed in DSE, using quantiles of normal can be seen in Figure 4.2 below. It can be seen that the points in the QQ-plots do not lie alongside a straight in the diagonal lines, indicating that primarily both positive and negative shocks tend to move the stock returns from normality. Therefore, we conclude that the stock returns of the selected six companies listed in DSE are not normally distributed, as caused by both negative and positive shocks of the market. With the characteristics that were found in the return series data; they are skewed, leptokurtosis, deviate from normality (see Table 4.4 below), hence it appears that the best way to describe the volatility for these return series data is the use of the GARCH-family models.

Figure 4.2: Quantiles of Normal for Stock Returns of Selected Companies in DSE



Note: The QQ-plots in the Quantiles of Normal are drawn so as to indicate whether the stock returns for these companies of the DSE, are normally distributed or not. Daily returns data were collected from 2nd January 2005 to 31st December 2014.

4.5 The Modelling Framework

In stock markets, the variability of stock prices (or stock returns) goes under the name of volatility or conditional variance, which determines how much the stock prices (or stock returns) change over a given period of time. Brooks (2002, 2008) asserts that linear models are unable to explain a number of important features, such as leptokurtosis, volatility clustering, and leverage effects. This is because the assumption of homoscedasticity (or constant variance) is not appropriate when using financial data (such as our DSE stock return data), thus, in such cases, it is preferable to examine patterns that allow the conditional variance to depend upon its previous record. Therefore, this study considers to model the non-constant volatility parameter using GARCH-type models.

The reasons for employing GARCH-type models to measure the stock return volatility in Tanzanian stock market are: First, they have recently become the pillar of time-varying risk models, substituting the '*standard deviation*' and '*coefficient of variation*', which were the common measures of conditional volatility; the weakness of these previous measures is that they don't have constant range and usually overstate volatility in non-trending financial series (Engle et al. 2001). Second, they have an advantage for producing results that closely fit to the financial time series data, and they also require estimation of few parameters (Brooks, 2002, 2008). Third, they have an advantage for handling the volatility of the real stochastic process, which is non-stationary and changes over time due to heteroscedastic features of the financial time series (Bollerslev, 1986). Last, the Autoregressive Conditionally Heteroscedastic (ARCH) or Generalized Autoregressive Conditionally Heteroscedastic (GARCH) models are the preferred non-linear financial models that are applied for modelling and forecasting volatility, and switching models that allow the performance of a series to trail different processes at different points in time (Brooks, 2002 & 2008).

Since the development of the ARCH and GARCH models by Engle (1982) and Bollerslev (1986) respectively, the literature has seen the extension of their basic theories to the various GARCH-family models. The empirical features of financial time series data such as volatility clustering/pooling, leptokurtosis and leverage effects/asymmetry caused the eruption of the development of extended GARCH-type models in order to allow the capture of those financial characteristics, which failed to be captured by the original ARCH and GARCH processes (Brooks, 2002). The GARCH model makes the conditional variance of a stock return series depend on its own previous lags; so that the GARCH (p, q) model is written as hereunder:

$$\sigma_t^2 = \delta + \sum_{i=1}^{q} \alpha_i \, \mu_{t-i}^2 + \sum_{j=1}^{p} \beta_j \, \sigma_{t-j}^2 \qquad (4.6)$$

From the above model, *p* presents the order of GARCH while the order of the ARCH process is presented by *q*, the error term μ_t holds the assumption of being normally distributed with zero mean and conditional variance (σ_t^2). The return series are presented by RI_t, whose mean value (μ) is expected to be positive and small. The value of δ is also expected to be small, but($\delta > 0$) . The parameters in the conditional variance equation given above must all be positive, while the parameters α ($\alpha_1, \ldots, \alpha_p \geq 0$) + β($\beta_1, \ldots, \beta_p \geq 0$) are supposed to be less than, but nearly close to, unity, with $\beta > \alpha$. The measurement of the volatility news of the previous period can be considered as the lag of the squared residual from the ARCH process (mean equation). An important point is that the estimate of parameter β indicates the volatility persistence to a shock, in other words β shows the impact of previous news on volatility. Following the previous studies (Floros, 2008; Brooks, 2002 and 2008; Emenike 2010), a standard GARCH model is parsimonious and usually gives significant results. GARCH allows the conditional variance of the stock returns to be dependent upon previous own lags.

4.5.1 Standard GARCH Model: GARCH (1, 1)

It is a model that holds only three parameters in the conditional variance structure (see Equation 4.8 below), a model that is parsimonious and its current conditional variance (σ_t^2) is structured in a way that should be affected by the infinite number of the previous squared disturbance term (μ_{t-i}^2). Brooks (2002) and (2008) confirm that the volatility clustering in the financial time series data can sufficiently be captured by the GARCH (1, 1) model, so that further lags are not necessary in the model (Brooks and Burke, 2003) Thus, a very common parameterization for the GARCH model that the study attempts to use to capture volatility pooling is the simple GARCH (1, 1) specification. It is said that when developing ARCH models, three specifications should be given, and these are specifications for conditional mean equation, conditional variance and conditional error distribution. Hereunder are the given specifications for the GARCH (1, 1):

$$RI_t = \theta + \mu_t \qquad (4.7)$$

$$\mu_t \sim N(0, \sigma_t^2)$$

$$\sigma_t^2 = \delta + \alpha_1 \mu_{t-1}^2 + \beta_1 \sigma_{t-1}^2 \qquad (4.8)$$

Where RI_t is the return mean equation, θ is a constant of the mean equation, while μ_t stands for the disturbance term of the mean equation. σ_t^2 represents the conditional variance (volatility at time *t*) equation, δ is the constant of the variance equation, $\alpha_1$stands for the first order ARCH term and it can also be used to explain news about the previous conditional variance, β_1 refers to the first order GARCH term and it is also known as volatility persistent coefficient. The GARCH (1, 1) model given above (Equation 4.8) can well capture the behaviour of symmetry in the stock return series data.

4.5.2 Asymmetric GARCH Models

Recently, in the literature, there has been an emphasis on modelling stock market volatility using Asymmetric GARCH models. Engle et al, (2008) suggest that the important component of volatility is time-varying asymmetry. Also, in this study, we consider asymmetric GARCH models to explain the volatility parameters that change over time (non-constant volatility parameters) so as to escape any misspecification of the structure of the conditional variance. The models have been found to capture the commonly observed characteristic of asymmetry in the financial time series data, through applying different formulation on the equation of conditional variance (σ_t^2)(Nelson; 1991, Glosten et al; 1993, Henry; 1998, Nicholls and Tonuri; 1995). The situation of enforcing a symmetric response of volatility to positive and negative shocks is said to be a big problem of GARCH models. For example, in the standard GARCH (p, q), the conditional variance (σ_t^2) in the equation (4.6) above depends only on the magnitudes of the lagged residuals and not on the sign of the previous random error term μ_t. This is simply because having the lagged error term squared (μ_{t-i}^2) in equation (4.6) the sign is lost. However, the argument prevails that the volatility tends to rise when the financial time series hold negative shock and falls in response to positive shock of similar magnitude (Brooks 2002, 2008).

This argument can be extended in the case of the levered company with equity returns, where such asymmetries are wholly attributed to leverage effects, whereby the decrease in the value of stocks of the firm will increase the value of the debts of the firm; hence the rise of the firm's debt to equity ratio. The situation will make shareholders who hold the firm's residual risk to perceive that their future returns are at risk. It is only through using asymmetric models, that features can absolutely be allowed. According to Henry (1998) both ARCH and original GARCH models express symmetry characteristics on the structure or function/equation of conditional variance, which cause inaccuracy in modelling and forecasting the volatility of the

stock return series data. The only limitation of the asymmetric models is that they possess complicated behaviour in their structure, which is said to cause difficulties in identifying, estimating and testing for the actual model. This study uses three popular asymmetric GARCH formulations, which have been applied in different studies of modelling stock market volatility (see Alberg et al; 2008)[49], these are; the Exponential GARCH (EGARCH) model (Nelson; 1991), the GJR-GARCH model (Glosten et al; 1993) and the Power ARCH (PARCH) model (Ding et al; 1993).

4.5.2.1 The GJR-GARCH Model

This is an asymmetric GARCH model which extends the standard GARCH with an additional term that was added to account for possible asymmetries in the financial time series data. The GJR-GARCH model is said to be an accurate model for modelling stock market volatility (Glosten et al, 1993). The equation of the conditional variance as per the GJR-GARCH (p, q) is given:

$$\sigma_t^2 = \delta + \sum_{i=1}^{q} \alpha_i \, \mu_{t-1}^2 (1 + \gamma S_{t-i}) + \sum_{j=1}^{p} \beta_j \, \sigma_{t-j}^2 \qquad (4.9)$$

Where $S_t = 1$ if $\mu_t < 0$; and $S_t = 0$ otherwise.

The structure of GJR-GARCH looks as almost the same as the structure of the simple GARCH model. The presence of the $(1 + \gamma S_{t-i})$ factor in the lagged square residual of the conditional variance equation (4.9) above, is found to be the only difference between GJR-GARCH and the simple GARCH model. The presence of this addition factor shows that asymmetry is allowed, simply because all negative residuals are weighted for $\gamma<0$ and therefore produce a volatility that is high in following periods to compare with the volatility generation of positive residuals using the same magnitude. However, this study attempts to use simple GJR-GARCH (1, 1) to account for possible leverage effects (asymmetries).

[49] In their study, in which they used asymmetric GARCH, EGARCH, GJR-GARCH and APARCH models to capture asymmetric characterise volatility, they suggest that the overall estimation can be improved by the application of asymmetric GARCH models with leptokurtosis densities for conditional variance's measurement; they also conclude that with all four models used, the one that was found to be better predictor than others, is the asymmetric EGARCH model.

The structure of the conditional variance is now given by:

$$\sigma_t^2 = \delta + \alpha_1 \mu_{t-1}^2 + \beta_1 \sigma_{t-1}^2 + \gamma \mu_{t-1}^2 s_{t-1} \quad (4.10)$$

Where $s_{t-1} = 1$ if $\mu_{t-1} < 0$; and $s_{t-1} = 0$ otherwise

In this model, information on good news ($\mu_t > 0$) and that on bad news ($\mu_t < 0$), tend to have different effects on the volatility (conditional variance). The impact of α_1 corresponds to good news and the impact of $\alpha_1 + \gamma$ corresponds to bad news. Since the parameter γ stands for leverage effect, therefore, to account for asymmetry (leverage effect), we expect that $\gamma > 0$, and that will mean bad news tends to increase conditional variance (volatility), while as the condition for non-negativity it is assumed that $\delta \geq 0$, $\alpha_1 \geq 0$, $\beta_1 \geq 0$ and $\alpha_1 + \gamma \geq 0$; and if the news impact is leverage effect then $\gamma \neq 0$.

4.5.2.2 The Exponential GARCH (EGARCH) Model

This is also an asymmetric GARCH model that is designed to model the observed features of asymmetry that actually characterise stock market returns data. The EGARCH was one of the initial variations of the GARCH model that was proposed by Nelson (1991). According to Floros (2008) the EGARCH model attempted to capture the leverage effect feature in stock market return data, as noted in the study of Black (1976). The conditional variance equation can be expressed in different ways under EGARCH, but we use the following conditional variance specification to model volatility by the EGARCH model:

$$\log \sigma_t^2 = \delta + \beta \log(\sigma_{t-1}^2) + \gamma \frac{\mu_{t-1}}{\sqrt{\sigma_{t-1}^2}} + \alpha \left[\frac{|\mu_{t-1}|}{\sqrt{\sigma_{t-1}^2}} - \sqrt{\frac{2}{\pi}} \right] \quad (4.11)$$

The EGARCH model holds some advantages compared to the original GARCH model. First, having the conditional variance in the logarithmic form (Equation 4.11) indicates the exponential leverage effect; thus, there is positive variance (σ_t^2) for all possible signs of the parameters (even though the parameters are all negative). Therefore, the parameters of the EGARCH model do not require the constraints of non-negativity to be estimated as used in ARCH and original GARCH specifications. Second, the required assumptions of asymmetries are allowed for under the EGARCH model; since when the volatility relates to returns in a negative direction, then parameter γ will also be negative (bad news), $\mu_t < 0$, producing more volatility than good news. The hypothesis that $\gamma < 0$ can be used to test the presence of

asymmetries (leverage effects), and when it is found that $\gamma \neq 0$ then there is asymmetric impact. As a founder of this model, Nelson (1991) offered a Generalised Error Distribution (GED) to be followed by the error term μ_t. Brooks (2002) considers a GED[50] as a very wide distribution family that may be applied for many different series. He added that despite GED's ease of computation and instinctive interpretation, many of the EGARCH model applications attempt the use of conditionally normal distribution errors. This study attempts to use the conditionally normal distribution as suggested by Brooks (2002), instead of applying GED (Emenike, 2010) or Student's t-distribution.

4.5.2.3 The Power ARCH (PARCH) Model

This model that was proposed by Ding et al (1993) is generalised from the standard deviation GARCH model (Taylor, 1986; Schwert, 1989), in which it is not the variance that is modelled; rather it is the standard deviation. Therefore, the standard deviation GARCH model together with various other models, with the specification of the Power ARCH are generalised by Ding et al (1993) to generate the Power ARCH (PARCH) model. In this model (see Equation 4.12), the power parameter (ω) of the standard deviation can be estimated instead of being imposed, while the optional (γ) parameters are put to capture asymmetry of up to order r. The structure of the Power ARCH (PARCH) model is given hereunder:

$$\sigma_t^{\omega} = \delta + \sum_{j=1}^{q} \beta_j \, \sigma_{t-j}^{\omega} + \sum_{i=1}^{p} \alpha_i \, (|\mu_{t-i}| - \gamma_i \mu_{t-i})^{\omega} \qquad (4.12)$$

Where $\omega > 0$, $|\gamma_i| \leq 1$ for $i = 1, \ldots, r$, while $\gamma_i = 0$ for $i > r$, and $r \leq p$. The symmetric model sets $\gamma_i = 0$ for all i. Remember that if $\omega = 2$ and $\gamma_i = 0$ for all i, the Power ARCH model will simply be a standard GARCH specification. Like other models, asymmetric/leverage effects are present if $\gamma_i \neq 0$.

[50] Emenike (2010) used GED to account for non-normal density function of Nigerian stock return series. In his study, he insists that when the conditional normality assumption is not maintained, then the GED becomes a powerful alternative. According to him, a normal distribution, fat tail (leptokurtic) distribution and even the thin tails can all be assumed by the GED. He concludes that the hypothesis of the independent and identical normal distribution process for the GARCH process innovations, can be allowed by the GED.

4.5.4 The GARCH-in-Mean Model

Since one of theory in finance asserts that the higher the risk, the higher the expected return, most financial models suggest that investors in assets are to be rewarded for incurring excess risk by earning a higher return (Brooks 2002, 2008). A very possible way to put this concept into practice is to allow the return of the financial asset to be partly related to its own risk. In this study the assumption is that, since the Tanzania stock market (DSE) is a frontier market that is isolated from global developed markets, therefore investors of the stock exchange have no ability to diversify their portfolio into international markets; hence, they must be rewarded for accepting the country-specific risks by earning higher returns. We, therefore, expect the existence of a positive relationship between conditional expected return and conditional expected variances.

The ARCH-M model (Engle et al, 1987) or GARCH-in-Mean model (Kim & Kon, 1994), whereby the expected return of the security is related to the expected security risk is used most frequently in the financial application. Thus, the following is the GARCH-in-Mean model used in financial studies:

$$RI_t = \theta + \gamma\sigma_t^2 + \mu_t$$

$$\mu_t \sim N(0, \sigma_t^2) \qquad (4.13)$$

$$\sigma_t^2 = \delta + \alpha_1\mu_{t-1}^2 + \beta_1\sigma_{t-1}^2$$

However, in our GARCH-in-Mean model where the conditional variance of the return is also included as specified on equation (4.13) above, we use the log of the conditional variance to replace the original conditional variance. Hence, our GARCH-in-Mean equation is now given by:

$$RI_t = \theta + \gamma log\,(\sigma_t^2) + \mu_t \qquad (4.14)$$

Where, if γ is positive and significant as well, then increased risk as a result of the increase in the conditional variance, will lead to a rise in the mean return (where the risk premium can be defined as γ).

4.5.5 Estimations and Hypothesis Testing

As mentioned earlier, this study uses the daily stock return data (from 2nd January 2005 to 31st December 2014) for the selected six companies listed in Dar-es-Salaam Stock Exchange (DSE), a stock market operating in Tanzania. However, before the estimation of the GARCH family models, the data for stock returns (RI) must be stationary. If the stock return data are found not stationary, then they should be converted into stationary so that the GARCH family models can be estimated. Therefore, the Augmented Dickey-Fuller (ADF) unit root test is conducted and we reject the null hypothesis that stock return series has a unit root (non-stationary), while we accept the alternative hypothesis that the stock return series are stationary, when tested at level data. The lag length selection (with maximum of 27 lags) was based on Schwarz Info Criterion (SIC) in the level data. The results of the ADF unit root test for the stock return series on the selected listed companies in DSE is distributed in Table 4.5 below, which also shows the decisions we have had after revealing the stationarity of the return series at level data.

Table 4.5: Unit Root Results for Stock Return Series on Selected Companies in DSE

Companies	*t*-Statistic	*P*-Values	Decision (at Level data)
TOL	-51.72	0.0001	Reject Null
TBL	-52.64	0.0001	Reject Null
TCC	-16.25	0.0000	Reject Null
TATEPA	-51.60	0.0001	Reject Null
SIMBA	-19.81	0.0000	Reject Null
DAHACO	-54.01	0.0001	Reject Null

Note: The P-values are from MacKinnon (1996) one-sided p-values. The null hypothesis is that the stock return series of the companies (TOL, TBL, TCC, TATEPA, SIMBA and DAHACO) have a unit root.

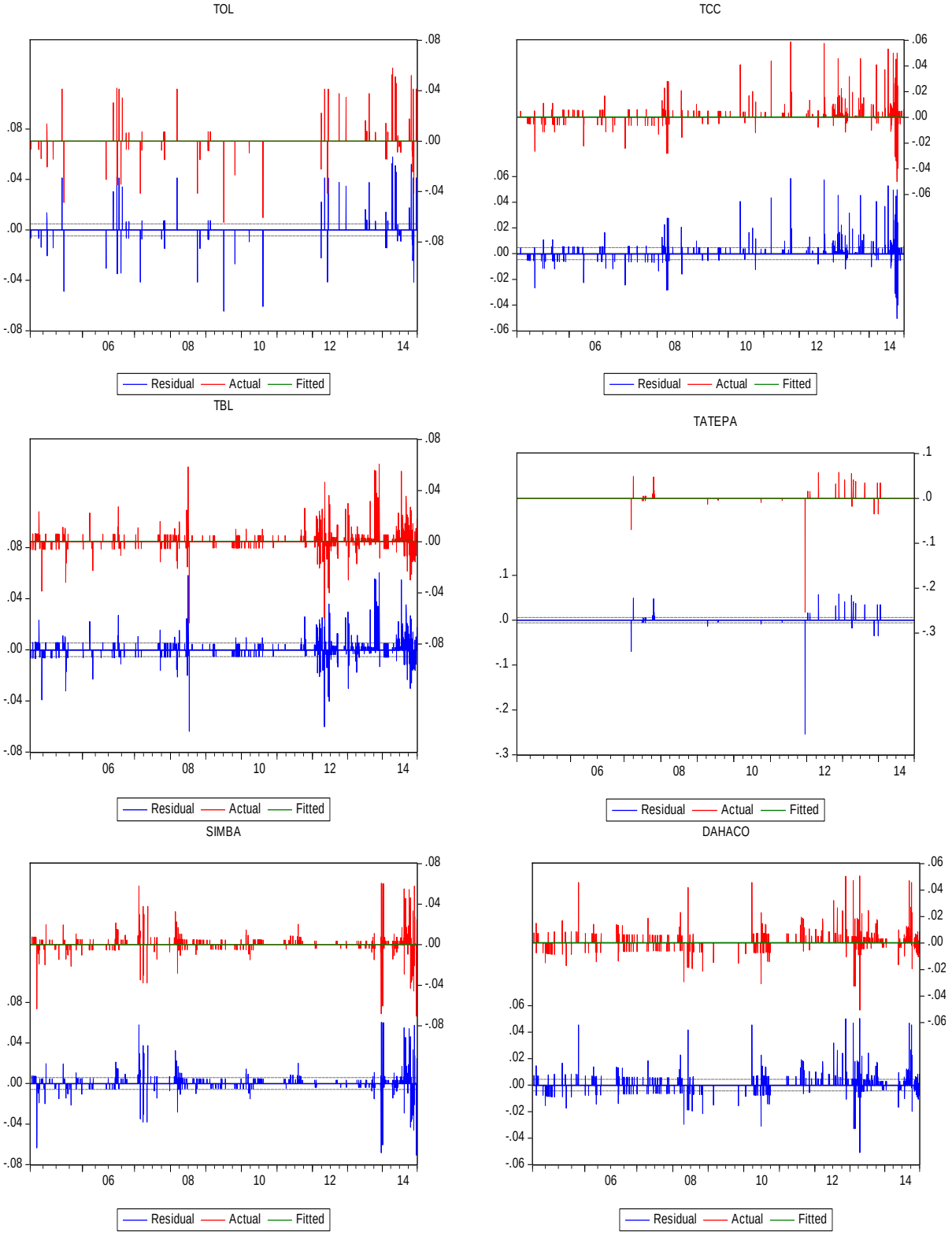
After testing the unit root of the stock return series for DSE, we now regress the stock return series using least squares (ARMA) to see how the residuals are fluctuating (see Figure 4.3 below). To do this, we use the following Mean equation: -

$$RI_t = \theta + \mu_t \qquad (4.15)$$

$$\mu_t \sim N(0, \sigma_t^2)$$

Where RI_t is the return mean equation, θ is a constant of the mean equation, while μ_t stands for the disturbance term of the mean equation.

Figure 4.3: Residuals of Stock Returns Series for Selected Companies in DSE



Note: Diagnostic checking for the residuals is made so as to indicate whether the stock returns of these companies have a volatility clustering behaviour or not. Daily stock returns data were collected from 2nd January 2005 – 31st December 2014.

The results in Figure 4.3 above indicate that the residuals fluctuating for a number of the periods given in the data. This implies that periods with low volatility tend to be followed by periods of low volatility for the lengthened period, while the reverse is true, that high volatility periods tend to be followed by the high volatility periods in the prolonged period (volatility clustering). This declares that the residual or the error term is conditionally heteroscedastic (i.e. they have ARCH effects). Having the residual behave in that way after regressing the stock returns for the selected listed companies in DSE using least squares (ARMA), therefore, the estimations of the GARCH family models can now be introduced. However, volatility clustering is not found in both TOL and TATEPA (see Figure 4.3 above), indicating that the companies' return series have no ARCH effects; this implies that we do not have to measure the stock return volatility for these companies, using various GARCH-type models.

Though the test of the residuals in Figure 4.3 above can provide this study with justification of the estimations of the ARCH and GARCH family models, we decide to make another test, the heteroscedastic - ARCH test, on whether the estimations on the stated GARCH family models to be used in this study can be done or not. The null hypothesis of our test is that there is no ARCH effect, while the alternative hypothesis of our test is that there is an ARCH effect. The ARCH test regresses the squared residual term (dependent variable) on the lagged squared residuals and a constant term. After regressing the dependent variable (the squared residual term), the probability Chi-square (p-values) for TBL, TCC, SIMBA and DAHACO was found to be highly significant at the 1% level of significance, compared with the p-values of TOL and TATEPA, which were not significant (see Table 4.6 below). Therefore, we reject the null hypotheses that there is no ARCH effect and we accept the alternative hypothesis that there is an ARCH effect in TBL, TCC, SIMBA and DAHACO, while we failed to reject the null hypothesis that there is no ARCH effect in TOL and TATEPA. Thus, the estimation of the GARCH family models can proceed with only four companies that were found with an ARCH effects, while there is no need for TOL and DAHACO, as no ARCH effects found with them (see both Table 4.6 below and Figure 4.3 above).

Table 4.6: Heteroscedasticity Test: The Presence of ARCH-Effects

Residuals	Coefficient	Std. Error	t-Statistic	P-Value
TOL	-0.0074	0.0192	-0.3858	0.6997
TBL*	0.0718	0.0191	3.7403	0.0002
TCC*	0.2081	0.0188	11.0577	0.0000
TATEPA	-0.0007	0.0192	-0.0368	0.9707
SIMBA*	0.2049	0.0188	10.8795	0.0000
DAHACO*	0.1819	0.0189	9.6122	0.0000

Note: the residual diagnostic was made using Heteroscedasticity test-ARCH; dependent variable was the squared residual; and the p-values are from Probability Chi^2 (1). * shows the residuals of the companies that the null hypothesis was rejected against an alternative hypothesis.

4.6 Empirical Results from GARCH Model Types

Since this study is applying the GARCH models as explained earlier, we provide specifications for the conditional mean equation, the conditional variance and the conditional error distribution. The GARCH (1, 1) model presented in Equation 4.8, shows the specification for the conditional mean equation (RI_t) and the conditional variance (σ_t^2) as required for anyone who wants to develop a GARCH model. The specification for the conditional error distribution (μ_t) employed in this study is assumed to be a normal (Gaussian) distribution. Considering the assumption of the normal (Gaussian) distribution, also, we attempt to estimate all our GARCH models by the maximum likelihood method.

4.6.1 GARCH-in-Mean Estimation Results

The GARCH-M structure is estimated using the DSE stock returns data for TBL, TCC, SIMBA and DAHACO, and provides the results that can be seen in Table 4.7 below. The stock return data used was first tested for unit root and found to be stationary (see Table 4.5 above), therefore, the return series for these four listed companies in DSE that are applied for the rest of all GARCH models estimations in this study have proved to be stationary at level data.

Table 4.7: GARCH-M Estimation Results

Parameters	TBL	TCC	SIMBA	DAHACO
Log(GARCH)($\boldsymbol{\gamma}$)	-0.0002 (-4.847) **	0.0004 (1.723)*	-5.45E-05 (-4.453)**	0.0001 (0.810)
Constant ($\boldsymbol{\theta}$)	-0.0023 (-4.933) **	0.0051 (1.806)*	-0.0007 (-4.568)**	0.0016 (0.915)
ARCH ($\boldsymbol{\alpha_1}$)	0.139 (45.705) **	0.355 (20.451)**	0.309 (93.237)**	0.034 (44.373)**
GARCH ($\boldsymbol{\beta_1}$)	0.916 (1193.95)**	0.564 (57.69)**	0.883 (1268.51) **	0.955 (1529.87)**
Constant ($\boldsymbol{\delta}$)	1.48E-07 (67.693) **	4.89E-06 (43.216)**	1.05E-07 (52.375)**	2.98E-07 (53.245)**

Note: ** shows significance at the 1% level. Figures in parenthesis are z-Statistics. Sample is the DSE Daily stock returns from 2nd January 2005 to 31st Dec 2014.

From Table 4.7 above, Log (GARCH) and constant (θ) present the results for the mean equation of the GARCH-in-Mean model. The coefficient of the conditional variance, γ, as shown in the mean equation of GARCH-in-Mean structure (see equation 4.13 above) provides mixing results in these four companies, TBL, TCC, SIMBA and DAHACO. For example, TCC is the only company, which has a positive sign of coefficient γ and is statistically significant at the 10% level of significance. This indicates that the increased risk of the TCC's stock returns, which is defined here by the increase in the log conditional variance, leads to an increase in the mean return. In other words, the higher the log conditional variance, the higher the risk, and therefore the higher the returns expected to investors.

The result of the mean equation for GARCH-in Mean model on TCC, indicates that the study confirms the ideas of other studies that higher returns to investors are associated with the increase in additional risks they incur (Ogum et al., 2005; Abdalla & Winker, 2012; AM Al-Rjoub & Azzam, 2012; Lukanima & Swaray, 2013). Also Brooks (2002) suggests that most of the models used from a finance perspective, highlight that there should be a reward of higher return to investors for taking excess risk. However, the coefficient of the conditional variance, γ, was found with negative sign, but significant at the 1% level, on TBL and SIMBA. This indicates that there is no relation between the additional risk and the increased returns, therefore, the investors of TBL and SIMBA are not rewarded higher return for taking higher risk of the market. The result of the mean equation for GARCH-in Mean model on TBL and SIMBA,

means that we confirm the ideas of other studies (Floros, 2008; Poshakwale and Murinde, 2001) that there is no association between the increased returns and the additional risks incurred by investors.

Therefore, this study also confirms the assumption we made earlier, that because the investors of Tanzanian stock market - Dar-es-Salaam Stock Exchange (DSE) do not diversify their portfolio in international markets (as they are isolated from international markets), the investors of TCC are now rewarded with high returns for their acceptance of country-specific risks. This shows that there is a correlation between the increased risk (increased volatility) and the high expected return in TCC. However, investors of TBL and SIMBA wrongly prove our assumption since that they are not rewarded high returns for their acceptance of country-specific risks. This agrees the results obtained by other previous studies that there is no relation between the additional risk and the increased returns (Poshakwale & Murinde, 2001; Floros, 2008).

Also in the results displayed in Table 4.7 above, one can notice that the ARCH effect (μ_{t-1}^2) that stands for the previous days return information about volatility is significant at the 1% level of significance. This shows that the volatility of the DSE stock returns, using TBL, TCC, SIMBA and DAHACO, is influenced by ARCH effects (internal shocks). Moreover, GARCH effect (σ_{t-1}^2) which stands for previous days residual variances or volatility of DSE stock returns, using TBL, TCC, SIMBA and DAHACO, is also an internal shock of the volatility of the stock return for DSE. Since both the ARCH and GARCH effects are significant at the 1% level, this indicates that both are internal causes/shocks that influence the volatility of the DSE (TBL, TCC, SIMBA and DAHACO) stock return in the Tanzanian stock market.

4.6.2 GARCH (1, 1) Model Estimation Results

The regression was conducted and produced the estimation results of the standard GARCH (1, 1) model as specified in equation 4.8 below. The estimates of the GARCH (1, 1) involves the procedure for regressing both the lagged squared residuals and the lagged conditional variance. From the results displayed in Table 4.8 below, the parameters of the conditional variance equation produced in the estimation results for the GARCH (1, 1) model are δ which stands for constant, α_1 that correspond to ARCH and β_1 that represents GARCH. It can be seen that the coefficient parameters (α_1 and β_1) on the structure of the conditional variance are statistically significant at the 1% level of significance. This is found in all four selected companies (TBL, TCC, SIMBA and DAHACO) listed in DSE (see Table 4.8). It was also

expected that the coefficient of GARCH effect (β_1) would be positive in order to ensure non-negative conditional variance. The results show that the coefficient GARCH effect (β_1) for TBL, TCC, SIMBA and DAHACO is positive with 0.8933, 0.5687, 0.7437 and 0.9536 respectively; hence, no negative conditional variance is present.

Table 4.8: Standard GARCH (1, 1) Estimation Results

Parameters	**TBL**	**TCC**	**SIMBA**	**DAHACO**
Constant ($\boldsymbol{\delta}$)	1.45E-07 (72.010) **	4.84E-06 (43.878)**	1.04E.07 (57.734)**	3.12E-07 (53.760)**
ARCH ($\boldsymbol{\alpha_1}$)	0.1025 (47.830) **	0.3515 (23.237)**	0.2108 (90.414)**	0.0337 (45.328)**
GARCH ($\boldsymbol{\beta_1}$)	0.8933 (1241.22) **	0.5687 (61.051)**	0.7437 (1232.8)**	0.9536 (1507.4)**
($\boldsymbol{\alpha_1 + \beta_1}$)	0.99	0.92	0.95	0.98

Note: ** shows significance at the 1% level. Figures in parenthesis are z-Statistics. Sample is the DSE Daily stock returns from 2nd January 2005 to 31st Dec 2014.

Having the ARCH term (α_1) parameter statistically significant, implies that the information about the previous volatility of the DSE stock returns, using TBL, TCC, SIMBA and DAHACO has an influence on the current conditional variance (volatility) in DSE stock returns of Tanzanian stock market. Moreover, the coefficient of GARCH effect (β_1) was found significantly different from zero. This implies that there is volatility clustering in TBL, TCC, SIMBA and DAHACOs' stock returns of the Tanzanian stock market. It can also be seen from the results of all four listed companies that the sum of the coefficients of the lagged squared disturbance (the ARCH), and that of the lagged conditional variance (the GARCH), that is, $\alpha_1 + \beta_1$ is almost unity (see Table 4.8 above). This indicates the high persistence of shocks to the conditional variance (volatility shocks).

With a high degree of persistence of the volatility shock in the Dar-es-Salaam Stock Exchange (DSE), using listed companies TBL, TCC, SIMBA and DAHACO shows that a higher change in Tanzanian stock returns tends to be followed by high changes, while a lower change in stock returns is followed by low changes (volatility clustering). An interesting economic contribution of this finding to the investors of the Dar-es-Salaam Stock Exchange (DSE) is that the stock returns of this Tanzanian stock market, using TBL, TCC, SIMBA and DAHACO are characterised by volatility clustering (see also Figure 4.3 above), which is said to be predictable.

The GARCH (1, 1) model is said to be more parsimonious and avoids over-fitting. The model is also said to be more likely to maintain the assumption of non-negativity constraints. To confirm the fitting of the GARCH (1, 1) model, we consider the prior expectation that we posed using the estimated parameters of the given model in equation (4.8) in relation to the results shown in Table 4.8. First, the parameters $\alpha + \beta$ were expected to be less than, but nearly close to, unity, with $\beta > \alpha$. The parameters were found to be close to unity in the estimation results and the parameter β found to be greater than α as expected (see Table 4.8 above). Second, the coefficient of GARCH effect (β_1) was expected to be positive in order to insure non-negative conditional variance, and the findings show that the GARCH effect (β_1) is positive in TBL, TCC, SIMBA and DAHACO (see Table 4.8).

4.6.2.1 Residual Diagnostic Checking for GARCH-Effects on GARCH (1, 1)

Having captured the volatility clustering, one among the characteristics of the stock return volatility, we conduct residual diagnostic checking to test whether the standardized residuals of the DSE stock returns on TBL, TCC, SIMBA and DAHACO still exhibit any additional ARCH effects. The reason behind this ARCH-LM test is to check whether the variance equation of the GARCH (1, 1) model was correctly structured, hence no ARCH effect should have been left in the residuals. The results displayed in Table 4.9 below show that there is no evidence of remaining ARCH effects in the residuals, since the probability Chi-square for TBL, TCC, SIMBA and DAHACO is greater than the 10% level of significance, indicating no statistical significance, and that the volatility structure of the GARCH (1, 1) model was well specified to capture volatility clustering in the stock returns of these listed companies in DSE.

Table 4.9: ARCH-LM Test after Volatility Clustering being captured by GARCH (1, 1)

	TBL	**TCC**	**SIMBA**	**DAHACO**
F-statistic	0.089	0.109	0.084	1.531
Obs*R^2	0.089	0.109	0.084	1.515
Prob. F(1, 2701)	0.766	0.742	0.772	0.216
Prob. $Chi^2(1)$	0.766	0.742	0.772	0.216

Note: Sample is the DSE daily stock returns from 2nd January 2005 to 31st Dec 2014. Figure, 2701, are number of observation.

Therefore, this study confirms the results of previous studies in modelling and forecasting stock market returns (Nicholls and Tonuri 1995, Henry 1998, Brooks 2002, Ogum et al. 2005; Frimpong and Oteng-Abayie 2006; Floros 2008 and Emenike 2010) that the GARCH (1, 1) model should be taken as a very good model in explaining behaviour of stock return volatility.

This study agrees that (GARCH (1, 1) is an effective model to capture the symmetric characteristics (volatility clustering) of stock return volatility of the DSE in Tanzanian stock market.

4.6.3 GJR-GARCH Model Estimation Results

To account for the asymmetry characteristics of the DSE stock returns for the Tanzanian stock market, one of the models used in this study is the GJR-GARCH model (Glosten et al; 1993). The GJR-GARCH structure is almost similar to the model introduced by Zakoian (1994), the Threshold GARCH (TGARCH) model, with the only difference that TGARCH estimates the conditional standard deviation and GJR-GARCH estimates the conditional variance. This study selects to opt for the estimation of the conditional variance. The estimation results for the GJR-GARCH model type are given in Table 4.10 below.

Table 4.10: GJR-GARCH (1, 1) Estimation Results

Parameters	**TBL**	**TCC**	**SIMBA**	**DAHACO**
Constant ($\boldsymbol{\delta}$)	1.60E-07 (59.538) **	4.28E-06 (40.949)**	1.45E-07 (48.355)**	2.91E-07 (60.359)**
ARCH ($\boldsymbol{\alpha_1}$)	0.1968 (31.912) **	0.5277 (22.181)**	0.3848 (75.307)**	0.0454 (41.362)**
Asymmetry ($\boldsymbol{\gamma}$)	0.1989 (30.531) **	0.4547 (20.424)**	0.2267 (35.764)**	0.0357 (31.428)**
GARCH (β_1)	0.9204 (885.85) **	0.6015 (66.523)**	0.8792 (857.55)**	0.9553 (1520.02)**

Note: ** shows significance at the 1% level. Figures in parenthesis are z-Statistics. Sample is the DSE Daily stock returns from 2nd January 2005 to 31st Dec 2014.

The leverage effect term (γ) produced in the GJR-GARCH estimation results (see Table 4.10 above) was found to be statistically significant at the 1% level of significance. However, for asymmetric characteristic in the stock return data of TBL, TCC, SIMBA and DAHACO, this study assumes that the value of the asymmetry parameter (γ) should be greater than zero. The estimation results in Table 4.10 display that the coefficient of asymmetric parameter (γ) is greater than zero in all four companies listed in DSE. This implies that the Tanzanian stock market returns, using TBL, TCC, SIMBA and DAHACO in DSE are characterized by asymmetric features (leverage effects). It is said that, if the estimated coefficient of the

asymmetry term (γ) is found positive, it implies that the negative residuals (bad news) will make the conditional variance higher than the positive residuals (good news) for the next period.

Therefore, the positive asymmetric term (γ) in the GJR-GARCH estimation results in Table 4.10, indicates that leverage effects exist in the DSE stock returns of Tanzanian stock market. Also, having $\gamma > 0$ implies bad news (the negative shocks) in the DSE of Tanzanian stock market influence an increase in the conditional variance (volatility) of the stock returns for the next period, compared to good news (positive shocks). This also suggests that the distribution of the conditional variance of the stock returns in the Tanzanian stock market (Dar-es-Salaam Stock Exchange) is skewed (not normally distributed). This shows that in DSE negative stock returns have a greater chance of increasing volatility than positive stock returns. With the use of the GJR-GARCH (1, 1) model, which produced a positive asymmetric term in TBL, TCC, SIMBA and DAHACO, this study provides evidence of the existence of leverage effects in DSE stock returns of Tanzanian stock market.

4.6.3.1 Residual Diagnostic Checking for GARCH-Effects on GJR-GARCH (1, 1)

After estimating the GJR-GARCH model and getting the results analysed above, we decide to check whether in the residuals there is any preserved ARCH effects. Therefore, we test for the ARCH-LM (Heteroscedasticity test). The number of lags selected is one (1) because our data are daily stock returns. The results show that there is no evidence of remaining ARCH effects in the residuals, since the probability Chi-square in all four companies of DSE is greater than the 10% level of significance, indicating no statistical significance was found (see Table 4.11 below).

Table 4.11: ARCH-LM Test-after Asymmetries being captured by GJR-GARCH (1, 1)

	TBL	**TCC**	**SIMBA**	**DAHACO**
F-statistic	0.050	0.112	0.041	1.168
Obs*R^2	0.050	0.112	0.041	1.168
Prob. F(1, 2701)	0.823	0.738	0.839	0.280
Prob. $Chi^2(1)$	0.823	0.738	0.839	0.279

Note: Sample is the DSE daily stock returns from 2nd January 2005 to 31st Dec 2014. Figure, 2701, are number of observation.

4.6.4 Exponential GARCH – EGARCH (1, 1) Model Estimation Results:

The EGARCH (1, 1) model is one among the asymmetric GARCH models used in this study to account for the existence of leverage effects in the Tanzanian stock market returns of the DSE. The EGARCH estimation results of TBL, TCC, SIMBA and DAHACO are displayed in Table 4.12 below. The asymmetric term (γ) as specified in equation (4.11) is statistically significant at the 1% level of significance. Half of the parameters in the produced estimation results, have coefficients with negative values (see Table 4.12). However, this is not a problem, since the parameters of the EGARCH model do not require the constraints of non-negativity to be estimated, as with the ARCH and original GARCH specifications. Having the parameter γ (asymmetric effect) with negative value of coefficient in all four included companies of the DSE, indicating that the relationship between the conditional variance and the stock returns is negative for DSE in the Tanzanian stock market. The hypothesis that $\gamma < 0$ is tested to acknowledge whether there are asymmetries (leverage effects) in the Tanzanian stock market returns or not. The results show that the parameter $\gamma \neq 0$ (see Table 4.12 below) implying that there is existence of asymmetry or leverage effect in the stock return of the Dar-es-Salaam Stock Exchange (DSE), using TBL, TCC, SIMBA and DAHACO in the Tanzanian stock market.

Table 4.12: EGARCH (1, 1) Estimation Results

Parameters	**TBL**	**TCC**	**SIMBA**	**DAHACO**
Constant ($\boldsymbol{\delta}$)	-0.3216 (-67.963) **	-0.8910 (-26.207)**	-0.3877 (-67.667)**	-0.3822 (-56.352)**
ARCH ($\boldsymbol{\alpha}$)	0.1623 (58.993) **	0.0833 (20.573)**	0.4221 (207.70)**	0.0924 (48.105)**
Asymmetry ($\boldsymbol{\gamma}$)	-0.1281 (-46.034) **	-0.0785 (-23.259)**	-0.0578 (-29.757)**	0.0593 (-38.878)**
GARCH (β)	0.9767 (2360.77) **	0.9214 (305.42)**	0.9770 (1745.20)**	0.9682 (1596.63)**

Note: ** shows significance at the 1% level. Figures in parenthesis are z-Statistics. Sample is the DSE Daily stock returns from 2nd January 2005 to 31st Dec 2014.

4.6.4.2 Residual Diagnostic Checking for ARCH-Effects on EGARCH (1, 1)

After estimating the EGARCH model and getting the results analysed above, we decide to check whether in the residuals there is still any preserved ARCH effects. Therefore, we perform the ARCH-LM test (Heteroscedasticity test), whereby the dependent variable in the regression equation is the squared residual μ^2 against the regressors of the lagged squared residuals and constant. The results displayed in Table 4.13 below show that there is no evidence of remaining ARCH effects in the residuals, since the probability Chi-square in all four companies of DSE is greater than the 10% level of significance, indicating no statistical significance was found in these companies listed in DSE of Tanzanian stock market.

Table 4.13: ARCH-LM Test-after Leverage effects being captured by EGARCH (1, 1)

	TBL	TCC	SIMBA	DAHACO
F-statistic	0.020	0.017	0.179	1.263
Obs*R^2	0.020	0.017	0.179	1.264
Prob. F(1, 2701)	0.887	0.897	0.672	0.261
Prob. $Chi^2(1)$	0.887	0.897	0.672	0.261

Note: Sample is the DSE daily stock returns from 2nd January 2005 to 31st Dec 2014. Figure, 2701, are number of observation.

4.6.5 Power ARCH (PARCH) Estimation Results

Another asymmetric model used to capture the leverage effects in the Tanzanian stock market returns is the Power ARCH (PARCH) model as specified in the equation (4.12) of this study. The results of the estimated PARCH (1, 1) model are provided in Table 4.14 below. As was expected, the results show that parameter $\omega > 0$ (ω is approximately equal to 2, but not equal to 2), parameter $|\gamma| \leq 1$, was expected to be less than 1, and the results displayed in Table 4.14 below show that $\gamma < 1$. The study assumed that if $\omega = 2$ and $\gamma = 0$, then the Power ARCH model would simply be a standard GARCH specification. Of course the displayed results in Table 4.14 below show that the parameter ω is approximately equal to 2 in TBL, TCC, SIMBA and DAHACO, but the parameter $\gamma \neq 0$ as it was assumed; therefore, the Power ARCH (PARCH) model applied in this study cannot be simply taken as a standard GARCH specification. Like any other asymmetry models presented in this study, we assumed that asymmetric/leverage effects are present if $\gamma \neq 0$.

Table 4.14: PARCH (1, 1) Estimation Results

Parameters	TBL	TCC	SIMBA	DAHACO
Constant ($\boldsymbol{\delta}$)	0.0001 (4.8526) **	3.33E-05 (3.8521)**	9.72E-05 (5.4601)**	2.25E-05 (1.7662)*
ARCH ($\boldsymbol{\alpha}$)	0.3223 (6.0307) **	0.0570 (3.8125)**	0.2005 (7.5682)**	0.120852 (1.7716)*
Asymmetry ($\boldsymbol{\gamma}$)	0.1568 (4.6249) **	0.2066 (4.3105)**	0.0533 (1.3448)	-0.1811 (-5.1293)**
GARCH (β)	0.6140 (59.616) **	0.4262 (24.201)**	0.5448 (40.521)**	0.5866 (65.195)**
Parameter (ω)	2.08 (76.081) **	2.03 (124.85)**	2.10 (40.521)**	2.00 (65.195)**

Note: ** and * show significance at the 1% and 10% levels. Figures in parenthesis are z-Statistics. Sample is the DSE Daily stock returns from 2nd January 2005 to 31st Dec 2014.

The estimation results in Table 4.14 above show that the value of asymmetric term ($\gamma \neq 0$) is relatively greater than zero and significant at the 1% level of significance in TBL and TCC, is relatively greater than zero but statistically insignificant in SIMBA, and is less than zero (with negative coefficient) but significant at the 1% level of significance in DAHACO. However, the mixing results are provided from four companies of DSE, they simply indicate that there is existence of asymmetric/leverage effects in the stock returns for Dar-es-Salaam Stock Exchange (DSE) in the Tanzanian stock market, using TBL, TCC, SIMBA and DAHACO. Our results are quite similar to the results of Floros (2008) who used the PARCH (1, 1) model to capture the asymmetric characteristics of the Middle East stock markets in Egypt and Israel. In his study, he asserts that there is existence of asymmetric effects in both Egyptian Stock Exchange and Tel Aviv Stock Exchange with the use of the PARCH (1, 1) model.

4.6.5.1 Residual Diagnostic Checking for ARCH-Effects on PARCH (1, 1)

After estimating the Power ARCH (PARCH) model and getting the results that we have analysed above, we conduct diagnostic checking to determine whether the standardized residuals still exhibit any additional ARCH effects. The purpose behind this ARCH test is to check whether the variance equation was correctly structured, and if it was structured correctly by the PARCH model, then no ARCH effect should have been left in the residuals. The results displayed in Table 4.15 below show that there is no evidence of any additional ARCH effect left in the standardized residuals. The probability Chi^2 in TBL, TCC, SIMBA and DAHACO

was found to be greater than the 10% level of significance, which indicates not statistical significance.

Table 4.15: ARCH-LM Test-after Leverage effects being captured by PARCH

	TBL	TCC	SIMBA	DAHACO
F-statistic	0.0516	0.1072	0.0334	0.1002
Obs*R^2	0.0516	0.1073	0.0334	0.1003
Prob. F(1, 2701)	0.8203	0.7433	0.8550	0.7516
Prob. $Chi^2(1)$	0.8202	0.7432	0.8549	0.7515

Note: Sample is the DSE daily stock returns from 2nd January 2005 to 31st Dec 2014. Figure, 2701, are number of observation.

4.7 Best Fitted GARCH Type Model for the DSE Stock Returns Volatility

There are different kind of criteria that can be applied to make comparison among the models fitted in the modelling stock returns volatility for Dar-es-Salaam Stock Exchange (using TBL, TCC, SIMBA and DAHACO) in Tanzanian stock market; however, this study considers the approaches of comparing the values of log likelihood functions, the Akaike Information Criterion (AIC) and Schwarz Criterion (SC) in all four GARCH-family models used. From the GARCH models that were fitted, the one that appears to be the best among others, is the one with the lowest values of AIC and SC statistics. However, in the case of the log likelihood criteria, the model that holds the highest value of log likelihood is the one that is said to be the most suitable. Table 4.16 provides the values of the AIC, SC and log likelihood. It can be clearly seen from the results that the PARCH model holds the lowest values of both Akaike Information criteria and Schwarz Criteria compared to the values of AIC and SC of other GARCH-type models that are fitted in this study (GARCH (1, 1), EGARCH (1, 1) and GJR-GARCH models). Thus, the PARCH (1, 1) structure is declared to be the best fitted asymmetric GARCH model by virtue of having the lowest value of Akaike Information criteria-AIC and Schwarz Criteria-SC, and the highest log likelihood criteria. Therefore, this study declares that of the all the GARCH-family models that are fitted in different estimations, the Power ARCH (1, 1) formulation is found to be the best fitted model in capturing volatility characteristics (asymmetry) of the company's stock returns series for Dar-es-salaam Stock Exchange in the Tanzanian stock market.

Table 4.16: The Best Fitted GARCH-Type Model for DSE Stock Return Volatility

Parameters	TBL	TCC	SIMBA	DAHACO
A. **Standard GARCH (1, 1)**				
Constant ($\boldsymbol{\delta}$)	1.45E-07 (72.010)**	4.84E-06 (43.878)**	1.04E.07 (57.734)**	3.12E-07 (53.760)**
ARCH ($\boldsymbol{\alpha_1}$)	0.1025 (47.830)**	0.3515 (23.237)**	0.2108 (90.414)**	0.0337 (45.328)**
GARCH ($\boldsymbol{\beta_1}$)	0.8933 (1241.22)**	0.5687 (61.051)**	0.7437 (1232.8)**	0.9536 (1507.4)**
($\boldsymbol{\alpha_1 + \beta_1}$)	0.99	0.92	0.95	0.98
AIC	-8.48	-8.25	-8.80	-8.30
SC	-8.47	-8.24	-8.79	-8.29
Log Likelihood	11470.27	11159.84	11908.02	11224.52
GJR-GARCH (1, 1)				
Constant ($\boldsymbol{\delta}$)	1.60E-07 (59.538)**	4.28E-06 (40.949)**	1.45E-07 (48.355)**	2.91E-07 (60.359)**
ARCH ($\boldsymbol{\alpha_1}$)	0.1968 (31.912)**	0.5277 (22.181)**	0.3848 (75.307)**	0.0454 (41.362)**
Asymmetry ($\boldsymbol{\gamma}$)	0.1989 (30.531)**	0.4547 (20.424)**	0.2267 (35.764)**	0.0357 (31.428)**
GARCH (β_1)	0.9204 (885.85) **	0.6015 (66.523)**	0.8792 (857.55)**	0.9553 (1520.02)**
AIC	-8.60	-8.27	-8.83	-8.33
SC	-8.59	-8.26	-8.82	-8.31
Log Likelihood	11633.41	11182.89	11938.95	11261.22
EGARCH (1, 1)				
Constant ($\boldsymbol{\delta}$)	-0.3216 (-67.963)**	-0.8910 (-26.207)**	-0.3877 (-67.667)**	-0.3822 (-56.352)**
ARCH ($\boldsymbol{\alpha}$)	0.1623 (58.993)**	0.0833 (20.573)**	0.4221 (207.70)**	0.0924 (48.105)**
Asymmetry ($\boldsymbol{\gamma}$)	-0.1281 (-46.034)**	-0.0785 (-23.259)**	-0.0578 (-29.757)**	0.0593 (-38.878)**
GARCH (β)	0.9767 (2360.77) **	0.9214 (305.42)**	0.9770 (1745.20)**	0.9682 (1596.63)**
AIC	-8.62	-8.28	-8.85	-8.29
SC	-8.61	-8.27	-8.84	-8.28
Log Likelihood	11663.99	11197.07	11976.72	11217.02

PARCH (1, 1)

Constant ($\boldsymbol{\delta}$)	0.0001 (4.8526)**	3.33E-05 (3.8521)**	9.72E-05 (5.4601)**	2.25E-05 (1.7662)*
ARCH ($\boldsymbol{\alpha}$)	0.3223 (6.0307)**	0.0570 (3.8125)**	0.2005 (7.5682)**	0.120852 (1.7716)*
Asymmetry ($\boldsymbol{\gamma}$)	0.1568 (4.6249)**	0.2066 (4.3105)**	0.0533 (1.3448)	-0.1811 (-5.1293)**
GARCH (β)	0.6140 (59.616)**	0.4262 (24.201)**	0.5448 (40.521)**	0.5866 (65.195)**
Parameter (ω)	2.08 (76.081) **	2.03 (124.85)**	2.10 (40.521)**	2.00 (65.195)**
AIC	-13.22	-17.95	-14.22	-19.27
SC	-13.20	-17.94	-14.21	-19.25
Log Likelihood	17873.48	24277.19	19230.76	26054.06

Notes: The results of the GARCH models are reported using the maximum likelihood, our assumption is that the errors are conditionally normally distributed in all GARCH family models. Figures in parentheses are t-Statistics. * and ** indicating significance at the 10% and 1% levels.

4.8 Summary and Conclusion

This study has examined the behaviour of Tanzanian stock market volatility using the daily data from TBL, TCC, SIMBA and DAHACO of Dar-es-Salaam Stock Exchange (DSE) over the period 2nd January 2005 – 31st December 2014. In the descriptive statistics, the values of skewness, kurtosis and Jarque-Bera statistics displayed evidence that in the DSE, there are behaviours of asymmetries/ skewness, the return series are leptokurtic and their distributions are peaked relative to normal, and that the return series deviate from the normal distribution (see Table 4.4). The stock return characteristics such as volatility pooling, leptokurtosis and asymmetric effects were investigated using the standard GARCH (1, 1), GJR-GARCH (1, 1), Exponential GARCH (1, 1) and Power ARCH (1, 1) models. In summary, this study has found strong evidence that the daily stock returns for DSE can be explained well by the GARCH family models.

To estimate the GARCH family models, the series of the data should be stationary, thus, we tested for the unit root of the return series and found stationarity at level data. The study also tested for the heteroscedasticity by the ARCH test, where we found that there are ARCH effects in return series of TBL, TCC, SIMBA and DAHACO, this allowed GARCH family model estimations to take place in these companies of the DSE. However, we found that there were no ARCH effects in return series of TOL and TATEPA, whose were dropped from the sample and we could not continue with GARCH family models. The study also confirms the assumption we made earlier, that because the investors of Tanzanian stock market - Dar-es-

Salaam Stock Exchange (DSE) do not diversify their portfolio in international markets (as they are isolated from international markets), the investors of TCC are now rewarded with high returns for their acceptance of country-specific risks. This shows that there is a correlation between the increased risk (increased volatility) and the high expected return in TCC. This is shown by results of GARCH-in Mean model, which declares that the study confirms the ideas of Brooks (2002), Ogum et al. (2005) and Lukanima and Swaray (2013) that the increase in stock returns to investors is associated with the increase in excess risk. However, investors of TBL and SIMBA are wrongly prove our assumption since that they are not rewarded high returns for their acceptance of country-specific risks. This agrees the results obtained by other previous studies that there is no relation between the additional risk and the increased returns (Floros, 2008; Poshakwale and Murinde, 2001). Therefore, the volatility fluctuation in emerging markets such as the Tanzanian stock market is very important as it is in the developed capital markets (Wang et al., 2009)

The results from GARCH (1, 1) show that volatility clustering exists in Tanzanian stock market returns. This is confirmed by the GARCH effect (β_1), which was found significantly different from zero. Also the persistence of volatility shocks in stock returns was found to exist in the DSE (using TBL, TCC, SIMBA and DAHACO). This is due to the reason that the sum of the parameters ($\alpha_1 + \beta_1$) was very close to unity (see Table 4.8). This study also confirms the words of different experts in modelling and forecasting stock market return that the GARCH (1, 1) model is a very good model in explaining the symmetry behaviour of stock return volatility (Emenike 2010; Frimpong and Oteng-Abayie 2006). The results from GJR-GARCH (1, 1) model reveals that the leverage effects exist in the DSE stock returns of Tanzanian stock market; in the other words, this study has found that bad news (negative shocks) reflects an increase in the conditional variance (volatility) of DSE stock returns for the next period compared to good news (positive shocks). This shows that in the DSE (through TBL, TCC, SIMBA and DAHACO) the negative stock returns (bad news) have got greater chances to increase the volatility than that of positive stock returns (good news).

The existence of asymmetries in the stock returns of these companies of the DSE is also explained by the results of the EGARCH (1, 1) model. It is from this estimation of EGARCH (1, 1) that the study found the negative relationship between the conditional variance and the stock returns of DSE in Tanzanian stock market. The PARCH (1, 1) model also asserts that there is existence of asymmetric/leverage effects in the Dar-es-Salaam Stock Exchange (DSE) stock returns of the Tanzanian stock market. The PARCH (1, 1) result is in line with the findings of Floros (2008) who used the same model to capture asymmetries of the Egyptian

stock market returns and Tel Aviv Stock Exchange (TASE). In his study, he asserts that there is existence of asymmetric effects in both Egyptian Stock Exchange and Tel Aviv Stock Exchange with the use of the PARCH (1, 1) model.

This study finds that of all the asymmetric GARCH models that are used in estimation results, the Power ARCH (PARCH) model is the best fitted model in explaining the behaviour of asymmetries characteristics for the DSE stock returns in Tanzanian stock market. The Power ARCH (PARCH) structure was declared to be the best fitted asymmetric GARCH model by virtue of having the lowest value of Akaike Information criterion-AIC and Schwarz Criterion-SC. Also, the value of the log likelihood function had a higher value with Power ARCH (PARCH) model, compared to log likelihood values of EGARCH (1, 1) model and GJR-GARCH model, to prove the best fit of GJR-GARCH model. Therefore, this study concludes that volatility clustering/pooling, leptokurtic features and asymmetric characteristics exist in the DSE stock returns. In this study, we used GARCH (1, 1) to capture volatility clustering that characterizes the stock return series of DSE. To capture the asymmetric characteristics in the stock return series of the DSE, the study used GJR-GARCH (1,1), EGARCH (1,1) and PARCH, whereby the Power ARCH (PARCH) formulation was declared the best fitted model in capturing asymmetric characteristics of the stock returns series for Dar-es-salaam Stock Exchange (DSE) in the Tanzanian stock market.

CHAPTER 5: CONCLUSION AND POLICY IMPLICATIONS

5.1 Introduction

This chapter of the study provides the general conclusions for the all three empirical investigations that have been conducted, policy implications obtained from every empirical chapter, limitations of the study and recommendations for further studies. In the general conclusions, this chapter highlights in brief the objectives of the researches, the data used, the methodology used and the findings of all three empirical studies included in this thesis. In the policy implications section, this chapter provides policy recommendations that can be taken as lessons by the policy makers of the countries involved in the research, for the development of their financial markets (financial sector development, stock markets and foreign exchange markets) and the economic growth of their respective countries. In the limitation of the study, this chapter declares the areas that in one way or another challenged the completion or the efficiency of this research. Finally, in the recommendations for further research, this chapter highlights the areas that further researchers can use to fill gaps in relation to the same identified problem.

5.2 General Conclusions

To respond to the research objectives that were highlighted in Chapter One of this study, the research had to examine financial development and economic growth nexus in East African Countries, the effects of equity markets developments on economic growth in eleven Sub-Sahara African countries. Moreover, the research had to measure the volatility of Stock Return data for Dar-es-Salaam Stock Exchange (Tanzanian stock Market) using various GARCH models. To produce meaningful results, the study applied different quantitative methods (econometric techniques) that seemed appropriate in each empirical chapter of this research, in order to be able to achieve all three objectives highlighted above.

On **Financial Development and Economic Growth nexus in East African Countries**, the motivation behind this research was established from two conflicting theoretical ideas (*supply leading phenomenon* and *demand following phenomenon*) and four conflicting empirical results of the previous researches, *first*, supply-leading results whereby it is financial development that spurs economic growth; *second*, demand-following results whereby it is economic growth that promotes financial development; *third*, financial development and economic growth have a bi-directional relationship and *lastly*, there is no causal relationship

between financial development and economic growth. The debate has also taken place in Africa but yet to produce a consensus; for example, among the East African countries included in this study are Kenya and Tanzania, which in the previous studies (Khalifa Al-Yousif, 2002; Ghirmany, 2004; Odhiambo, 2007) were found to have different results that conflict with each other. Therefore, this study wanted to shed light on the conflicting results for both Kenya and Tanzania by re-examining the causal relationship between financial development and economic growth; however, the study included another three countries in East Africa (Burundi, Rwanda and Uganda)[51] so as to give results on a regional basis as suggested by Vaona (2008).

Specifically, to attain this objective, we highlighted the following research questions that were answered in Chapter Two of this thesis:

- *Is there a long-run relationship between the proxies of both financial development and economic growth in East African countries*?
- *Does financial development play any role in economic growth of in East African countries?*
- *What is the direction of causality relationship that exist between financial development and economic growth in East African countries? Is it a supply-leading or demand-following (for unidirectional) or bi-directional relation*?

This research used GDP per capita growth to represent economic growth, while the proxies of financial development were domestic credit provided by banking sector, domestic credit to private sector and money & quasi money (broad money or M2). However, to avoid simultaneous biasness (Gujarati, 1995) in the regression results; the study included the additional variables FDI (% of GDP), Government consumption expenditure (% of GDP) and Inflation, consumer price (annual %) as control variables. It was considered that having them in the regression model as additional variables brought non-biased directions on the causal link between financial development and economic growth of the panel countries. The study used the Generalized Method of Moment (GMM) estimators to control for the key problems (endogeneity bias, simultaneity bias and omitted variable bias), which affected many of previous studies. The GMM approach solved the said problems by using exogenous instrument variables.

[51] There are studies in the same matter for the case of Rwanda and Burundi (Egbetunde and Akinlo, 2014; Ghirmay, 2004; Ahmed, 2010); but there is no such kind of studies for the case of Uganda.

To answer the question that: *Is there a long-run relationship between the proxies of both financial development and economic growth in East African countries*? The study applied combined individual tests, which are the Fisher-type and Johansen panel cointegration tests suggested by Maddala and Wu (1999). In the estimation process, we found two cointegrating results that are insignificant and four cointegrating relations that are significant; therefore, having four significant results that show cointegrating relations, this study confirms the existence of cointegrating relations between financial development and economic growth in the East African countries when taken as a region, the East African Community.

To answer the question that: *Does financial development play any role in economic growth of in East African countries*? The study used one-step GMM approaches of both differenced estimators by Arellano & Bond (1991) and system estimator by Arellano & Bover (1995) and Blundell & Bond (1998) to produce results on the causal relationship between the proxies of financial development and economic growth (GDP per capita growth). The domestic credit to private sector (DCPS) as a proxy of financial development was found to have a positive relation with the proxy for economic growth. This implies that the financial development via DCPS play a positive role in economic growth of East African countries (Burundi, Kenya, Rwanda, Tanzania and Uganda). On the other hand, the domestic credit provided by banking sectors (DCPBS) as a proxy of financial development was found to have a significant but negative relationship with economic growth in East African countries. This implies that the financial development via DCPBS play a negative role in economic growth of the East African countries. The reason for this may be because of the credits being spent on non-productive materials (luxury goods) instead of being invested in areas that can boost or contribute towards economic growth.

To answer the question that: *What is the direction of causality relationship that exist between financial development and economic growth in East African countries*? the study used pairwise Dumitrescu Hurlin panel causality tests (Dumitrescu Hurlin, 2012) to test for Granger causality. In this method, the study assumed that the coefficients in the regression equations are not the same across East African countries. The results show that only financial development indicator DCPBS was found to have causality relation with GDP per capita growth. Therefore, the study declares that there is unidirectional causal relationship flowing from financial development (only via DCPBS) to economic growth (GDP per capita growth) in the Eastern Africa (Burundi, Kenya, Rwanda, Tanzania and Uganda).

The study about the **Causal Effects of Equity Markets on Economic Development** of the selected 11 Sub-Sahara African countries (Kenya, Tanzania, Uganda, Botswana, Zambia, Zimbabwe, Nigeria, Ghana, Namibia, Swaziland, and Mauritius) was mainly motivated by the fact that many previous studies were based on either developed countries or/and big emerging economies, while, few researchers have concentrated fully on sub-Saharan Africa taking account of all the characteristics of SSA stock markets, which are almost new in origin, many are still small in size compared with other emerging stock markets, inadequate or small amount of equity listed in the stock markets, they are thin in trade with low stock traded value, and they are extremely illiquid with low turnover ratios compared with other emerging markets. This study considered all the features of stock markets in the region; therefore, we included Tanzania and Uganda (which were not included in previous studies) to come out with new results to contribute to the ongoing debate.

Specifically, to attain this objective, we highlighted the following research questions that were answered in Chapter Three of this thesis:

- *Is there a long-run relation between equity market development and economic growth in selected Sub-Sahara African countries?*
- *Do equity markets in Sub-Sahara Africa play any role in economic growth of their respective countries?*
- *What is the nature of any existing causal link between equity market development and economic growth in selected Sub-Sahara African countries*?

In this study, our panel data set was unbalanced one. This is because in some countries, stock markets are young (e.g. Tanzanian and Ugandan stock markets established in 1998), while in some of the countries, their stock markets are old (e.g. Kenya, Nigeria, Zimbabwe and even Mauritius). Therefore, the availability of the data obtained differed according to the countries' year of establishment (11 years was the minimum period and 24 years was the maximum period) from 1988 to 2012. In this study the indicators for the measurements of stock market development are market capitalization (% of GDP), stock traded value (% of GDP) and stock traded-turnover ratio (% of GDP). Beck et al (1999) indicate that these variables are the three main indicators of equity market development as they measure the size, activity and efficiency of the stock market respectively. Moreover, in order to avoid simultaneous biasness (Gujarati, 1995) in our regression, the study included real interest rate (IRR), openness ratio (OR) and Inflation-GDP deflator (IR) as additional or control variables.

To respond to the question that: *Is there a long-run relation between equity market development and economic growth in selected Sub-Sahara African countries*? The study used Pedroni cointegration tests (Pedroni, 1999, 2004) that has better small sample properties (our sample is the case). In most cases, the results show that five out of seven Pedroni panel and group tests significantly failed to reject the null hypothesis of no cointegration. Therefore, the study concludes that there is no long-run equilibrium relationship between stock market development and economic growth in the panel of selected 11 Sub-Sahara African countries.

To answer the question that: *Do equity markets in Sub-Sahara Africa play any role in economic growth of their respective countries*? The study used fixed effects model, which was approved to be used by the Hausman tests (Hausman, 1978) we conducted. The fixed effects results indicate that the two proxies for equity market development, market capitalization rate percentage to GDP and stock traded-turnover ratio, play a significantly positive role in economic growth of the 11 Sub-Sahara African countries. Therefore, having these two indicators play positive role in the economic growth of SSA countries, shows that the size of the stock markets in SSA is positively correlated with the ability to mobilize capital, diversify risk and degree of trade (Levine and Zervo, 1996). However, this study found that the stock market development does play a negative role in economic growth of these SSA countries through the indicator stock traded value percentage to GDP.

To respond to the question that: *What is the nature of any existing causal link between equity market development and economic growth in selected Sub-Sahara African countries*? The study used the panel vector autoregressive (PVAR) estimation technique to investigate if there is a causal relationship between the equity market development and economic growth. It was found that it is only market capitalization percentage to GDP (market size) that causes economic growth (GDP per capita growth), with unidirectional Granger causality flowing from equity market capitalization rate to economic growth. Therefore, this study concludes that there is unidirectional Granger causality between stock market development and economic growth in Sub-Saharan Africa; however, it flows from the equity market capitalization indicator to economic growth (GDP per capita growth).

On **Modelling stock market volatility in Tanzania** using the GARCH-type models; the motivation behind this empirical investigation came from the fact that many of the previous works considered only developed and emerging markets, and a very little or no concentration have been considered in frontier markets. This study reflects all the characteristics of SSA stock markets, such that they are thin in trade, small in size, and have a short life presence and in some cases their investors are isolated from global developed stock markets (so that they find difficult to diversify their portfolio into global stock markets). The study was intended to fill that gap by measuring the volatility of Stock return data of the Tanzanian stock market, using six listed companies (TOL, TBL, TCC, TATEPA, SIMBA, and DAHACO)[52] listed in Dar-es-Salaam stock exchange (DSE), which is characterized by all features mentioned above. The study provides new empirical evidence on the fit of conditional volatility models for a very thin, small and new stock market (DSE-Tanzanian Stock Market) to the existing literature.

The study employed standard GARCH model to capture the symmetry (volatility clustering), and various asymmetric GARCH models to capture leverage effects in stock return series of TBL, TCC, SIMBA and DAHACO. Unlike other previous studies that used either monthly or annual data to measure and forecast stock market volatility, this study used daily and very recent stock return data from 2nd January 2005 to 31st December 2014. Mixed results was found in DSE (Tanzanian stock market); for example, in TCC, was found that there is a positive relationship between the expected returns and the increased risks (conditional volatility), indicating that investors in this company are rewarded high returns for their acceptance of country-risk effects of being isolated from global markets. This finding is in line with ideas of the other previous studies (Lukanima and Swaray, 2013; Ogum et al., 2005; AM Al-Rjoub and Azzam, 2012; Abdalla and Winker, 2012). However, we found that there is no relation between the expected returns and the additional risks/conditional volatility in TBL and SIMBA, indicating that their investors are not rewarded extra returns for accepting high risk investment in the Tanzanian stock market. This finding is in line with the findings of the other previous studies (Floros, 2008; Poshakwale and Murinde, 2001).

The study also found that in the stock returns of all four companies of the DSE investigated, there is a high degree of persistence of volatility shocks, which indicates that a higher change in DSE stock returns tend to be followed by high changes, while a lower change in DSE stock

[52] Among these six companies, TOL and TATEPA were dropped from the sample, as were not found with ARCH effects after conducting the residual diagnostic check (Heteroscedasticity test) for stock return series of all six companies. Therefore, the study measured stock return volatility, using GARCH type models in TBL, TCC, SIMBA and DAHACO to represent the DSE in the Tanzanian Stock Market.

returns is followed by lower changes (AM Al-Rjoub and Azzam, 2012; Ogum et al., 2005; Emenike, 2010; Frimpong and Oteng-Abayie, 2006). Finally, the study found the existence of leverage effect/asymmetry in the stock returns of all four companies of the Dar-es-Salaam (DSE) in the Tanzanian stock market, using all three asymmetric GARCH-type models applied in this study.

In brief, this study has found that from all the asymmetric GARCH models that were used in estimation results; the Power ARCH (PARCH) model was the best fitted model in explaining the behaviour of asymmetries for the stock returns of all four companies of the DSE in the Tanzanian stock market (with the help of Akaike Information criterion-AIC, Schwarz Criterion-SC and log likelihood function). Therefore, this study concluded that volatility clustering/pooling, leptokurtic features and asymmetric characteristics exist in the DSE stock returns. In this study, the standard GARCH (1, 1) was used to capture volatility clustering that characterizes the stock return series of DSE. To capture the asymmetric characteristics in the stock return series of the DSE, the study used GJR-GARCH (1,1), EGARCH (1,1) and PARCH, whereby the PARCH (1, 1) formulation was declared the best fitted model in capturing asymmetric characteristics of the stock returns series for Dar-es-salaam Stock Exchange (DSE) in the Tanzanian stock market.

5.3 Policy Implications

This section provides recommendations to the policy makers of the Sub-Sahara African countries included in all three empirical studies in this thesis;

On ***Financial Development and Economic Growth*** nexus in East African Countries (Burundi, Kenya, Rwanda, and Tanzania and Uganda), the study has found that domestic credit provided to private sector (DCPS) contributes towards the economic growth of East African countries. Also, on the other hand, having a positive role that domestic credit to private sectors play to GDP per capita growth shows the availability of positive rate of domestic investments and financial system development, hence economic growth (Hassan, et al, 2011). Therefore, the policy makers of East African countries should put a lot of emphasis on promoting the increase of domestic credits to private sectors, which will later promote economic growth (GDP per capita growth) of their respective countries.

The indicator of financial development DCPBS was found with a negative coefficient (-6.6 percent). It is inconsistent with the idea of Hassan, et al. (2011) who asserted that when DCPBS

tends to be higher, the degree of dependence on the banking sector for financing becomes higher; in other words, it indicates that the financial development becomes high because banks are in a position to perform all important financial functions, as indicated in the study of Levine (1997). Therefore, in order not to affect the GDP per capita growth, the governments of these countries should establish policies that affect the domestic credit provided by the banking sector towards economic growth. For instance, banks that provide domestic credits should conduct more research on borrowers' firms, make use of corporate control, provide education on risk management control, make transactions more facilitated and encourage mobility of savings (Levine 2005). Lastly, they should make sure that the concerned credit is given and utilized for the purpose applied for (for investment purposes) so as to contribute to the GDP per capita growth (economic growth) of the selected countries in East Africa.

On the ***Causal Effect of Equity Markets on Economic Development*** of the selected Sub-Sahara African countries (Kenya, Tanzania, Uganda, Botswana, Zambia, Zimbabwe, Nigeria, Ghana, Namibia, Swaziland, and Mauritius), the study has found that there are unidirectional Granger causality flows from equity market capitalization rate to economic growth of the selected Sub-Sahara African countries. Therefore, this study recommends that the policy makers of the stock markets of sub-Sahara African countries, should put a lot of emphasis on the factors that facilitate the increase of market capitalization rate; such as rules and regulations that will motivate both domestic and foreign companies to list, creating awareness among the public on the importance and benefits of investing with stock markets. The equity market development indicator market capitalization measures the size of the markets; therefore, to facilitate its increase will definitely increase the size of the markets, which in one way or another can promote the contribution of other stock market development indicators (such as stock traded value and turnover ratio), hence, to produce their contribution to economic growth of the 11 SSA countries.

Generally, this study recommends that in order to have more powerful stock markets that can ensure an attractive market capitalization, stock market liquidity and stock market efficiency, the policy makers of Sub-Saharan stock markets have to consider jointly connecting their stock exchanges (stock market integration), which will attract more savings, liquidity and investments from local and international investors, and hence facilitate economic growth in their respective countries. For, example Kenya, Rwanda, Tanzania and Uganda have jointly integrated to establish an East African Stock Exchange (EASE), which will unite the investors from each country to participate in the trading activities of the market. Therefore, the study

calls for other regions in Sub-Saharan Africa to imitate what is being done with the stock market integration of East African countries.

On ***Modelling Stock Market Volatility in Tanzania*** using the GARCH-family Models; the results from what was found to be the best fitted asymmetric model, PARCH (1, 1), revealed that in the stock returns of all four companies (TBL, TCC, SIMBA and DAHACO) of the DSE in the Tanzanian stock market there is existence of leverage effects. In the other words, this study has found that bad news (negative shocks) is reflected in greater conditional variance (volatility) of DSE stock returns for the next period than good news (positive shocks). This shows that in the DSE, negative stock returns (bad news) have a greater chance of increasing volatility than positive stock returns (good news). In connection with this result, this study recommends to the policy makers and investors of DSE that volatility increase which reflects bad news usually forces the adjustment of the expected risk to market participants by increasing the requirement for high stock return (Lukanima and Swaray, 2013). Therefore, it is suggested by this study that the investors in the DSE to forget about immediate compensation for the risks incurred in bad news (negative shocks), and instead they should diversify their resources into different portfolios in other stock markets that respond to any economic shocks (positive or negative) in order to reduce the risks.

Moreover, since the tendency of having bad news increases volatility in the DSE more than that of good news, the policy makers should be able to understand the reason for that reactions. It is suggested because there are so many factors leading to the tendency of 'bad news increases volatility' such as behavioural factors that are influenced by the nature of information flow and trading noise, stock markets institutional characteristics, the value of the currency used in trade transactions, the extent of the negative shock (bad news) to the stock market and financial leverage effects (Lukanima and Swaray, 2013). Therefore, this study recommends to the regulators of Dar-es-Salaam stock markets that they should not generalize the measures for volatility without prior information on the possible reason for the volatility mentioned above. This will make it easy to overcome the nature of the problem that caused such volatility and if possible to prevent it from happening in the future, to the advantage of the investors of DSE.

5.4 Limitations of the Study and Areas for Further Research

In this study, the researcher wanted to investigate as many variables as possible so as to be able to attain the key objectives of the study. While the study managed to answer the key questions posed in different empirical chapters included in this thesis, this research encountered a number of limitations in different ways, such as technical, time and budget problems. Here the researcher acknowledges various general limitations encountered when conducting different empirical chapters (Chapter Two to Chapter Four) of this study:

First; in many Sub-Sahara African countries (except for South Africa) there is no data or a lack of adequate data, in almost all databases that are widely used to search for data. For example, in Chapter Two of this study, the researcher wanted to collect data from 1980 for the series selected to measure the financial development, but only Kenya was found to have data that matched the requirements. Other included countries, Burundi, Rwanda, Tanzania and Uganda did not have data from 1980 to 1987, which necessitated collecting the data from 1988 to 2010 to be able to accommodate all five countries in the East African community. In Chapter Three of this study, because the researcher wanted to include Tanzania (with only 14 years) and Uganda (with only 11 years) in the ongoing debate on the causal relationship between equity market development and economic growth in SSA for the first time, the unbalanced panel approach was used to accommodate them as well as Swaziland (with only 12 years) compared with Botswana, Kenya, Nigeria and Zimbabwe (with more than 20 years). This is because there were no data on the selected variables to match other selected countries. Other Sub-Saharan African countries were dropped from the sample because of having insufficient or lack of data in the respective series required.

Second; in general, there is limited empirical literature in respect of Sub-Saharan Africa, particularly in the area of financial markets (foreign exchange markets, capital markets, commodity markets, and derivatives markets). With regard to the previous studies conducted in emerging market economies that reviewed in this research, most were conducted in Asian continent and very few were conducted in SSA, especially in the western part of Africa, to include Nigeria or Ghana, but other parts of Africa such as Central Africa, East Africa and some parts of Southern Africa (except for South Africa) are represented in very few empirical studies in research records. That is why this study identifies this limitation as one of the gaps that needs to be filled by other researchers. For example, in Chapter Four of this study, we found that many previous empirical studies were conducted in developed and emerging economies and very little studies have ever been conducted in frontier SSA stock markets.

Therefore, Chapter Four of this study fills this gap by empirically modelling stock market returns volatility in Tanzania.

Third, in this study, we applied various econometric techniques to attain the objectives set in every empirical chapter. For example; in Chapter Two, the researcher applied the Generalized Method of Moment (GMM) dynamic instrument variable approach, Levin-Lin-Chu and Breitung tests of unit root, Johansen Fisher-type test of cointegration, pairwise Dumitrescu Hurlin causality tests and Granger causality tests. In Chapter Three, we used Im-Pesaran-Shin, Fisher-ADF and Fisher-PP tests of unit root, Pedroni cointegration tests, Fixed Effect Model, Hausman test and Panel Vector autoregressive (PVAR) approach. We also used both standard GARCH and asymmetric GARCH models to measure stock returns volatility in Chapter Four of this study. The researcher had to consume a lot of time to understand the basics and the uses of all these techniques, as he was previously not familiar with any of them (his previous degrees were based on accounting as a major). Moreover, the researcher had a constraint on the usage and application of different statistical packages (software). The researcher also consumed a lot of his time learning the applications and interpretation techniques of the main statistical software (EViews and STATA) used in this study.

This study was conducted in Sub-Saharan Africa, where it is suggested that very few studies have been conducted, especially in financial markets. The study focused only on the indicators of financial development, equity market development and to some extent the stock returns in all three empirical chapters included in this study. There is a need for similar or different studies that include other segments of financial markets, such as derivative markets (what lessons can Sub-Saharan Africa capture from other derivatives markets in both emerging economies and developed economies), commodity markets and money markets in Africa and particularly Sub-Saharan Africa.

References

Abdalla, S. Z. S. & Winker, P. (2012) Modelling stock market volatility using univariate GARCH models: Evidence from Sudan and Egypt. *International Journal of Economics and Finance*, 4(8), 161-176.

Abu-Bader, S. & Abu-Qarn, A. S. (2008a) Financial development and economic growth: Empirical evidence from six MENA countries. *Review of Development Economics*, 12(4), 803-817.

Abu-Bader, S. & Abu-Qarn, A. S. (2008b) Financial development and economic growth: The Egyptian experience. *Journal of Policy Modeling*, 30(5), 887-898.

Acaravci, S. K., Ozturk, I. & Acaravci, A. (2011) Financial development and economic growth: literature survey and empirical evidence from sub-Saharan African countries. *South African Journal of Economic and Management Sciences*, 12(1), 11-27.

Acemoglu, D. & Zilibotti, F. (1997) Was Prometheus unbound by chance? Risk, diversification, and growth. *Journal of Political Economy*, 105(4), 709-751.

Adelegan, O. J. (2009) The derivatives market in South Africa: Lessons for Sub-Saharan African countries, *International Monetary Fund Working Paper-WP/09/196.* USA: Monetary and Capital Markets Department-International Monetary Fund, 1-19.

Adenikinju, A. F. & Oyeranti, O. (1999) *Characteristics and Behavior of African Factor Markets and Market Institutions and Their Consequences for Economic Growth*.Citeseer

Adjasi, C. K. D. & Biekpe, N. B. (2006) Stock market development and economic growth: The case of selected African countries. *African Development Review*, 18(1), 144-161.

Afego, P. N. (2015) Market efficiency in developing African stock markets: What do we know? *The Journal of Developing Areas*, 49(1), 243-266.

AFMI (2015) *African financial markets initiative: 2014 yearly report.* Available online: http://www.africanbondmarkets.org/en/publications/ [Accessed 27/05/2016].

AFMI (2016) *African financial markets database (AFMD): Medium and long term bonds.* Available online: http://dataportal.africanbondmarkets.org/ [Accessed 27/05/2016].

Aggarwal, R., Inclan, C. & Leal, R. (1999) Volatility in emerging stock markets. *The Journal of Financial and Quantitative Analysis*, 34(1), 33-55.

Ahmed, A. D. (2010) Financial liberalization, financial development and growth linkages in Sub-Saharan African countries: An empirical investigation. *Studies in Economics and Finance*, 27(4), 314-339.

Ahmed, A. D. & Wahid, A. N. M. (2011) Financial structure and economic growth link in African countries: A panel cointegration analysis. *Journal of Economic Studies*, 38(3), 331-357.

Ahmed, S. M. & Ansari, M. I. (1998) Financial sector development and economic growth: The South-Asian experience. *Journal of Asian Economics*, 9(3), 503-517.

Ake, B. (2010) The role of stock market development in economic growth: Evidence from some Euronext countries. *International Journal of Financial Research*, 1(1), 14-20.

Ake, B. & Ognaligui, R. (2012) Financial stock market and economic growth in developing countries: The case of Douala Stock Exchange in Cameroon. *International Journal of Business and Management*, 5(5), 82-89.

Akinlo, A. E. & Egbetunde, T. (2010) Financial development and economic growth: The experience of 10 sub-Saharan African countries revisited. *The Review of Finance and Banking*, 2(1), 17-28.

Al-Malkawi, H. A. N., Marashdeh, H. A. & Abdullah, N. (2012) Financial development and economic growth in the UAE: Empirical assessment using ARDL approach to co-integration. *International Journal of Economics and Finance*, 4(5), 105-115.

Alberg, D., Shalit, H. & Yosef, R. (2008) Estimating stock market volatility using asymmetric GARCH models. *Applied Financial Economics*, 18(15), 1201-1208.

Alfaro, L., Chanda, A., Kalemli-Ozcan, S. & Sayek, S. (2004) FDI and economic growth: the role of local financial markets. *Journal of International Economics*, 64(1), 89-112.

AM Al-Rjoub, S. & Azzam, H. (2012) Financial crises, stock returns and volatility in an emerging stock market: The case of Jordan. *Journal of Economic Studies*, 39(2), 178-211.

Andersen, T. B. & Tarp, F. (2003) Financial liberalization, financial development and economic growth in LDCs. *Journal of International Development*, 15(2), 189-209.

Antonios, A. (2010) Stock market and economic growth: An empirical analysis for Germany. *Business and Economics Journal*, 2010 (BEJ-1), 1-12.

Apergis, N., Filippidis, I. & Economidou, C. (2007) Financial deepening and economic growth linkages: A panel data analysis. *Review of World Economics*, 143(1), 179-198.

Arellano, M. & Bond, S. (1991) Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations. *The Review of Economic Studies*, 58(2), 277-297.

Arellano, M. & Bover, O. (1995) Another look at the instrumental variable estimation of error-components models. *Journal of Econometrics*, 68(1), 29-51.

Arestis, P. & Demetriades, P. (1997) Financial development and economic growth: Assessing the evidence*. *The Economic Journal*, 107(442), 783-799.

Arestis, P., Demetriades, P. O. & Luintel, K. B. (2001) Financial development and economic growth: The role of stock markets. *Journal of Money, Credit and Banking*, 33(1), 16-41.

Aron, J. & Elbadawi, I. (1994) *Foreign exchange auction markets in sub-Saharan Africa: Dynamic models for the auction exchange rates*, *1396*. The World Bank, Washington: World Bank Publications.

Aryeetey, E. (2003) Recent developments in African financial markets: Agenda for further research. *Journal of African Economies*, 12(2), 111-152.

Aryeetey, E., Hettige, H., Nissanke, M. & Steel, W. (1997) Financial market fragmentation and reforms in Ghana, Malawi, Nigeria, and Tanzania. *The World Bank Economic Review*, 11(2), 195-218.

ASEA (2014) *African Securities Exchanges Association: 2014 Year book*. ASEA. Available online: http://www.african-exchanges.org/ [Accessed 02/06/2015].

Atje, R. a. & Jovanovic, B. (1993) Stock markets and development *European Economic Review*, 37, 632–640.

Augustine, U. & Pius, S. (2010) Stock market development and economic growth: Evidence from Nigeria *European Journal of Economics, Finance and Administrative Sciences*, 44(25), 46-53.

Bae, J., Kim, C.-J. & Nelson, C. R. (2007) Why are stock returns and volatility negatively correlated? *Journal of Empirical Finance*, 14(1), 41-58.

Bailey, R. E. (2005) *The economics of financial markets*. New York, United States of America: Cambridge University Press.

Balaban*, E. & Bayar, A. (2005) Stock returns and volatility: Empirical evidence from fourteen countries. *Applied Economics Letters*, 12(10), 603-611.

Bali, T. G. (2007) Modeling the dynamics of interest rate volatility with skewed fat-tailed distributions. *Annals of Operations Research*, 151(1), 151-178.

Baltagi, B. H., Bresson, G. & Pirotte, A. (2007) Panel unit root tests and spatial dependence. *Journal of Applied Econometrics*, 22(2), 339-360.

Baltagi, B. H., Demetriades, P. O. & Law, S. H. (2009) Financial development and openness: Evidence from panel data. *Journal of Development Economics*, 89(2), 285-296.

Baltagi, B. H. & Liu, L. (2008) Testing for random effects and spatial lag dependence in panel data models. *Statistics & Probability Letters*, 78(18), 3304-3306.

Banerjee, A. (1999) Panel data unit roots and cointegration: An overview. *Oxford Bulletin of Economics and Statistics*, 61(S1), 607-629.

Banerjee, A. & Urga, G. (2005) Modelling structural breaks, long memory and stock market volatility: An overview. *Journal of Econometrics*, 129(1), 1-34.

Bangake, C. & Eggoh, J. C. (2011) Further evidence on finance-growth causality: A panel data analysis. *Economic Systems*, 35(2), 176-188.

Beck, T., Demirgüç-Kunt, A. & Levine, R. (2000) A new database on the structure and development of the financial sector. *The World Bank Economic Review*, 14(3), 597-605.

Beck, T. & Levine, R. (2002) Industry growth and capital allocation: Does having a market- or bank-based system matter? *Journal of Financial Economics*, 64(2), 147-180.

Beck, T. & Levine, R. (2004) Stock markets, banks, and growth: Panel evidence. *Journal of Banking & Finance*, 28(3), 423-442.

Bekaert, G. & Harvey, C. R. (1997) Emerging equity market volatility. *Journal of Financial Economics*, 43(1), 29-77.

Bekaert, G. & Wu, G. (2000) Asymmetric volatility and risk in equity markets. *Review of Financial Studies*, 13(1), 1-42.

Bencivenga, V. R. & Smith, B. D. (1993) Some consequences of credit rationing in an endogenous growth model. *Journal of Economic Dynamics and Control*, 17(1), 97-122.

Bencivenga, V. R., Smith, B. D. & Starr, R. M. (1996) Equity markets, transactions costs, and capital accumulation: An illustration. *The World Bank Economic Review*, 10(2), 241-265.

Berger, A. N. & Udell, G. F. (1998) The economics of small business finance: The roles of private equity and debt markets in the financial growth cycle. *Journal of Banking & Finance*, 22(6), 613-673.

Bhattacharya, P. C. & Sivasubramanian, M. (2003) Financial development and economic growth in India: 1970–1971 to 1998–1999. *Applied Financial Economics*, 13(12), 925-929.

Blundell, R. & Bond, S. (1998) Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics*, 87(1), 115-143.

Bollerslev, T. (1986) Generalized autoregressive conditional heteroskedasticity. *Journal of Econometrics*, 31(3), 307-327.

Borensztein, E., De Gregorio, J. & Lee, J. W. (1998) How does foreign direct investment affect economic growth? *Journal of International Economics*, 45(1), 115-135.

Box, G. E. & Jenkins, G. M. (1976) *Time series analysis: Forecasting and control* [eBook]. San Francisco, CA: Holden Day: University of Wisconsin, Madison.

Breitung, J. (1999) The local power of some unit root tests for panel data, *Discussion Papers, Interdisciplinary Research Project 373: Quantification and Simulation of Economic Processes*. Berlin, Germany: Institute of Statistics and Econometrics, Humboldt University Berlin.

Brooks, C. (2002) *Introductory Econometrics for Finance*, First edition. Cambridge, United Kingdom: Cambridge University Press.

Brooks, C. (2008) *Introductory Econometrics for Finance*, Second edition. New York, United States of America: Cambridge University Press.

Brooks, C. & Burke, S. P. (2003) Information criteria for GARCH model selection. *The European Journal of Finance*, 9(6), 557-580.

Brooks, C., Burke, S. P. & Persand, G. (2003) Multivariate GARCH models: Software choice and estimation issues. *Journal of Applied Econometrics*, 18(6), 725-734.

Brooks, R. (2007) Power ARCH modelling of the volatility of emerging equity markets. *Emerging Markets Review*, 8(2), 124-133.

Campbell, J. Y. & Hentschel, L. (1992) No news is good news: An asymmetric model of changing volatility in stock returns. *Journal of Financial Economics*, 31(3), 281-318.

Capasso, S. (2006) Stock Market Development and Economic Growth. *UNU-WIDER's research on Globalization, Finance and Growth*, Research Paper No. 2006(102).

Caporale, G. M., Howells, P. G. A. & Soliman, A. M. (2004) Stock market development and economic growth: The causal linkage. *Journal of Economic Development*, 29(1), 33-50.

Chick, V. (1983) *Macroeconomics after Keynes: A reconsideration of the general theory*. MIT Press: Cambridge, United States of America: MIT Press Classics.

Choi, I. (2001) Unit root tests for panel data. *Journal of International Money and Finance*, 20(2), 249-272.

Choong, C.-K., Yusop, Z., Law, S. H. & Liew, V. K. S. (2005) Financial development and economic growth in Malaysia: The perspective of stock market. *Investment Management and Financial Innovations*(4/2005), 105-115.

Choudhry, T. (1996) Stock market volatility and the crash of 1987: Evidence from six emerging markets. *Journal of International Money and Finance*, 15(6), 969-981.

Christofi, A. & Pericli, A. (1999) Correlation in price changes and volatility of major Latin American stock markets. *Journal of Multinational Financial Management*, 9(1), 79-93.

Christopoulos, D. K. & Tsionas, E. G. (2004) Financial development and economic growth: Evidence from panel unit root and cointegration tests. *Journal of Development Economics*, 73(1), 55-74.

Collier, P. & Gunning, J. (1997) *Trade shocks in developing countries, 1: Africa*. Oxford, United Kingdom: Clarendon Press.

Creti, A., Joëts, M. & Mignon, V. (2013) On the links between stock and commodity markets' volatility. *Energy Economics*, 37(1), 16-28.

Cuñado, J., Gómez Biscarri, J. & Pérez de Gracia, F. (2006) Changes in the dynamic behavior of emerging market volatility: Revisiting the effects of financial liberalization. *Emerging Markets Review*, 7(3), 261-278.

Dailami, M. & Atkin, M. (1990) Stock markets in developing countries: Key issues and a research agenda, *World Bank's Working Papers-WPS 515*. Washington DC USA: World Bank's Financial Policy and Systems Division 1-49.

De Santis, G. & imrohoroğlu, S. (1997) Stock returns and volatility in emerging financial markets. *Journal of International Money and Finance*, 16(4), 561-579.

Deb, S. G. & Mukherjee, J. (2008) Does stock market development cause economic growth?: A time series analysis for Indian economy. *International Research Journal of Finance and Economics*, 3(21), 142-149

Demirgüç-Kunt, A. & Levine, R. (1996) Stock market development and financial intermediaries: Stylized facts. *The World Bank Economic Review*, 10(2), 291-321.

Ding, Z., Granger, C. W. & Engle, R. F. (1993) A long memory property of stock market returns and a new model. *Journal of Empirical Finance*, 1(1), 83-106.

Domanski, D. & Heath, A. (2007) Financial investors and commodity markets. *BIS Quarterly Review*. Available online: http://ssrn.com/abstract=1600058 [Accessed 02/03/2016].

Dritsaki, C. & Dritsaki-Bargiota, M. (2005) The causal relationship between stock, credit market and economic development: An empirical evidence for Greece. *Economic Change and Restructuring*, 38(1), 113-127.

DSE (2012) *Domestic and Cross Listed Companies.* Available online: http://www.dse.co.tz/ [Accessed 28/05/2012].

Dumitrescu, E.-I. & Hurlin, C. (2012) Testing for Granger non-causality in heterogeneous panels. *Economic Modelling*, 29(4), 1450-1460.

EAC (2013) *Indicators: Economy and Finance.* Available online: www.eac.int/statistics/index [Accessed 05/06/2013].

EAX (2016) *East Africa Exchange.* Available online: http://www.ea-africaexchange.com/ [Accessed 27/02/2016].

Egbetunde, T. & Akinlo, A. (2014) Financial integration and economic growth in Sub-Saharan Africa. *Journal of Sustainable Development in Africa*, 16(6), 83-96.

Emenike, K. O. (2010) Modelling stock returns volatility in Nigeria using GARCH models, *The RePEc Information About Research Papers in Economics (RePEc).* Munich University, 15 January 2010. Germany: Munich Personal RePEc Archive (MPRA)

Engle, R. F. (1982) Autoregressive conditional heteroscedasticity with estimates of the variance of United Kingdom inflation. *Econometrica: Journal of the Econometric Society*, 50(4), 987-1007.

Engle, R. F. & Bollerslev, T. (1986) Modelling the persistence of conditional variances. *Econometric Reviews*, 5(1), 1-50.

Engle, R. F., Ghysels, E. & Sohn, B. (2008) On the economic sources of stock market volatility, *NYU Working Paper No. FIN-08-043.* Cambridge, USA: Harvard University, 1-54.

Engle, R. F. & Granger, C. W. J. (1987) Co-Integration and error correction: Representation, estimation, and testing. *Econometrica: Journal of the Econometric Society*, 55(2), 251-276.

Engle, R. F., Lilien, D. M. & Robins, R. P. (1987) Estimating time varying risk premia in the term structure: The ARCH-M model. *Econometrica: Journal of the Econometric Society*, 55(2), 391-407.

Engle, R. F. & Patton, A. J. (2001) What good is a volatility model. *Quantitative Finance*, 1(2), 237-245.

Enisan, A. A. & Olufisayo, A. O. (2009) Stock market development and economic growth: Evidence from seven sub-Sahara African countries. *Journal of Economics and Business*, 61(2), 162-171.

Erbar, P. (2014) *20 Largest Stock Exchanges in the World.* Available online: http://www.insidermonkey.com/ [Accessed 12/06/2015].

Falahaty, M. & Hook, L. S. (2013) The effect of financial development on economic growth in the MENA region. *Journal of Economic Cooperation and Development*, 34(3), 35-60.

Filer, R., Hanousek, J. & Campos, N. F. (1999) Do stock markets promote economic growth?, *CERGE-EI Working Paper Series No. 151.* University of Michigan, September 1999. USA: William Davidson Institute (WDI), 1-23.

Fleming, J., Ostdiek, B. & Whaley, R. E. (1995) Predicting stock market volatility: A new measure. *Journal of Futures Markets*, 15(3), 265-302.

Floros, C. (2008) Modelling volatility using GARCH models: Evidence from Egypt and Israel. *Middle Eastern Finance and Economics*, 2(2), 31-41.

Francis, J. C. & Ibbotson, R. G. (2002) *Investments: A global perspective*, Pck edition edition. New Jersey, United States of America: Prentice Hall.

Frimpong, J. M. & Oteng-Abayie, E. F. (2006) Modelling and forecasting volatility of returns on the Ghana Stock Exchange using GARCH models, *The RePEc Information About Research Papers in Economics (RePEc) 593.* Munich University, 7 October 2006. Germany: Munich Personal RePEc Archive (MPRA).

Ghirmay, T. (2004) Financial development and economic growth in Sub-Saharan African countries: Evidence from time series analysis. *African Development Review*, 16(3), 415-432.

Glosten, L. R., Jagannathan, R. & Runkle, D. E. (1993) On the relation between the expected value and the volatility of the nominal excess return on stocks. *The Journal of Finance*, 48(5), 1779-1801.

Greenwood, J. & Jovanovic, B. (1990) Financial development and economic development. *Economic Development and Cultural Change*, 15(2), 257-268.

Grinblatt, M. & Titman, S. (2002) *Financial markets and corporate strategy*, Second edition. New York, United States of America: McGraw-Hill Higher Education.

Guillaumont Jeanneney, S., Hua, P. & Liang, Z. (2006) Financial development, economic efficiency, and productivity growth: Evidence from China. *The Developing Economies*, 44(1), 27-52.

Gujarati, D. N. (1995) *Basic Econometrics*, Fourth Edition edition. New York, United States of America: McGraw-Hill Book Company.

Gurgul, H. & Łukasz, L. (2011) Financial development and economic growth in Poland in transition: Causality analysis. *Finance a Uver*, 62(4), 347-367.

Gurley, J. G. & Shaw, E. S. (1955) Financial aspects of economic development. *The American Economic Review*, 45(4), 515-538.

Hadri, K. (2000) Testing for stationarity in heterogeneous panel data. *The Econometrics Journal*, 3(2), 148-161.

Hamilton, J. D. & Lin, G. (1996) Stock market volatility and the business cycle. *Journal of Applied Econometrics*, 11(5), 573-593.

Harris, R. D. F. (1997) Stock markets and development: A re-assessment. *European Economic Review*, 41(1), 139-146.

Hassan, M. K., Maroney, N. C., El-Sady, H. M. & Telfah, A. (2003) Country risk and stock market volatility, predictability, and diversification in the Middle East and Africa. *Economic Systems*, 27(1), 63-82.

Hassan, M. K., Sanchez, B. & Yu, J.-S. (2011) Financial development and economic growth: New evidence from panel data. *The Quarterly Review of Economics and Finance*, 51(1), 88-104.

Hausman, J. A. (1978) Specification tests in econometrics. *Econometrica*, 46(6), 1251-1271.

Henry, O. (1998) Modelling the asymmetry of stock market volatility. *Applied Financial Economics*, 8(2), 145-153.

Ilyina, A. (2004) The Role of financial derivatives in emerging markets, in D.J. Mathieson, J.E. Roldos, R. Ramaswamy & Ilyina, A. (eds), *Emerging Local Securities and Derivatives Markets*. Washington, D.C., USA: International Monetary Fund, Publication Services, 69-90.

Im, K. S., Pesaran, M. H. & Shin, Y. (2003) Testing for unit roots in heterogeneous panels. *Journal of Econometrics*, 115(1), 53-74.

IMF (2008) *Regional economic outlook: Sub- Saharan Africa* [eBook]. Washington, D.C.: International Monetary Fund.

Irving, J. (2005) Regional integration of stock exchanges in Eastern and Southern Africa: Progress and prospects *IMF Working Paper No. 05/122.* Washington D.C, USA: International Monetary Fund (IMF), 1-41.

Kalyanaraman, L. (2014) Stock market volatility in Saudi Arabia: An application of univariate GARCH model. *Asian Social Science*, 10(10), 142-152.

Kama, Y., Haq, H., Ghani, U. & Khan, M. (2012) Modeling the exchange rate volatility, using generalized autoregressive conditionally heteroscedastic (GARCH) type models: Evidence from Pakistan. *African Journal of Business Management*, 6(8), 2830-2838.

Karolyi, G. A. (1995) A multivariate GARCH model of international transmissions of stock returns and volatility: The case of the United States and Canada. *Journal of Business & Economic Statistics*, 13(1), 11-25.

Khalifa Al-Yousif, Y. (2002) Financial development and economic growth: Another look at the evidence from developing countries. *Review of Financial Economics*, 11(2), 131-150.

Kim, D. & Kon, S. J. (1994) Alternative models for the conditional heteroscedasticity of stock returns. *Journal of Business*, 67(4), 563-598.

King, R. G. & Levine, R. (1993a) Finance and growth: Schumpeter might be right. *The Quarterly Journal of Economics*, 108(3), 717-737.

King, R. G. & Levine, R. (1993b) Finance, entrepreneurship and growth. *Journal of Monetary economics*, 32(3), 513-542.

Koutmos, G. & Booth, G. G. (1995) Asymmetric volatility transmission in international stock markets. *Journal of International Money and Finance*, 14(6), 747-762.

Kwasnicki, W. (2007) Schumpeterian modelling, in Hanusch, H. & Pyka, A. (eds), *Elgar Companion to Neo-Schumpeterian Economics* [eBook]. Cheltenham, United Kingdom: Edward Elgar Publishing Limited, 1-1209.

Kyle, A. S. (1984) *Market structure, information, futures markets, and price formation*. Boulder, United States of America: Westview Press.

Levin, A., Lin, C.-F. & James Chu, C.-S. (2002) Unit root tests in panel data: Asymptotic and finite-sample properties. *Journal of Econometrics*, 108(1), 1-24.

Levine, R. (1997) Financial development and economic growth: Views and agenda. *Journal of Economic Literature*, 35(2), 688-726.

Levine, R. (2003) Stock markets liquidity and economic growth: Theory and evidence, in Paganetto, L. & Phelps, E. (eds), *Finance, Research, Education and Growth*. United Kingdom: Palgrave Macmillan, 3-24.

Levine, R. (2005) Finance and growth: Theory and evidence, in Philippe, A. & Steven, N. D. (eds), *Handbook of Economic Growth*. North-Holland: Elsevier, 865-934.

Levine, R., Loayza, N. & Beck, T. (2000) Financial intermediation and growth: Causality and causes. *Journal of Monetary Economics*, 46(1), 31-77.

Levine, R. & Zervos, S. (1996) Stock market development and long-run growth. *The World Bank Economic Review*, 10(2), 323-339.

Levine, R. & Zervos, S. (1998) Stock markets, banks, and economic growth. *American Economic Review*, 88(3), 537-558.

Liu, M. (2000) Modeling long memory in stock market volatility. *Journal of Econometrics*, 99(1), 139-171.

Love, I. & Zicchino, L. (2006) Financial development and dynamic investment behavior: Evidence from panel VAR. *The Quarterly Review of Economics and Finance*, 46(2), 190-210.

Luetkepohl, H. (2011) Vector autoregressive models *EUI Working Papers: WP 2011-Vol. 30.* Badia Fiesolana, Italy: European University Institute, 1-28.

Lukanima, B. & Swaray, R. (2014) Market reforms and commodity price volatility: The case of East African coffee market. *The World Economy*, 37(8), 1152-1185.

Lukanima, B. K. & Swaray, R. (2013) Economic cycles and stock return volatility: Evidence from the past two decades. *International Journal of Economics and Finance*, 5(7), 50-70.

Maddala, G. S. & Wu, S. (1999) A comparative study of unit root tests with panel data and a new simple test. *Oxford Bulletin of Economics and Statistics*, 61(S1), 631-652.

Malkiel, B. G. & Fama, E. F. (1970) Efficient capital markets: A review of theory and empirical work. *The journal of Finance*, 25(2), 383-417.

Marques, L. M., Fuinhas, J. A. & Marques, A. C. (2013) Does the stock market cause economic growth? Portuguese evidence of economic regime change. *Economic Modelling*, 32(10), 316-324.

Mencinger, J. (2003) Does Foreign Direct Investment Always Enhance Economic Growth? *Kyklos*, 56(4), 491-508.

Mlambo, C. & Biekpe, N. (2007) The efficient market hypothesis: Evidence from ten African stock markets. *Investment Analysts Journal*, 36(66), 5-17.

Mollah, S. & Mobarek, A. (2009) Market volatility across countries: Evidence from international markets. *Studies in Economics and Finance*, 26(4), 257-274.

Montiel, P. J. (2011) *Macroeconomics in emerging markets*. The Pitt Building, Trumpington Street, Cambrdge, United Kingdom: Cambridge University Press.

Mullin, J. (1993) Emerging equity markets in the global economy. *Federal Reserve Bank of New York Quarterly Review*, 18(Summer 1993), 54-83.

Naceur, S. B. & Ghazouani, S. (2007) Stock markets, banks, and economic growth: Empirical evidence from the MENA region. *Research in International Business and Finance*, 21(2), 297-315.

Nazir, M. S., Nawaz, M. M. & Gilani, U. J. (2010) Relationship between economic growth and stock market development. *African Journal of Business Management*, 4(16), 3473-3479.

Nelson, D. B. (1991) Conditional heteroskedasticity in asset returns: A new approach. *Econometrica*, 59(2), 347-370.

Neusser, K. & Kugler, M. (1998) Manufacturing growth and financial development: Evidence from OECD countries. *Review of Economics and Statistics*, 80(4), 638-646.

Ngugi, R. (2001) *An empirical analysis of interest rate spread in Kenya*, *106*. Nairobi, Kenya: African Economic Research Consortium.

Nicholls, D. & Tonuri, D. (1995) Modelling stock market volatility in Australia. *Journal of Business Finance & Accounting*, 22(3), 377-396.

Nieuwerburgh, S. V., Buelens, F. & Cuyvers, L. (2006) Stock market development and economic growth in Belgium. *Explorations in Economic History*, 43(1), 13-38.

Nissanke, M. & Aryeetey, E. (2003) Comparative institutional analysis: Sub-Saharan Africa and East Asia, in Nissanke, M. & Aryeetey, E. (eds), *Comparative Development Experiences of Sub-Saharan Africa and East Asia: An Institutional approach*. United Kingdom: Ashgate Publishing Ltd, 30-70.

Nowbutsing, B. M. (2009) Stock market development and economic growth: The case of Mauritius *International Business & Economics Research Journal*, 8(2), 77-88.

NSX (2014) *Namibia Stock Exchange - 2014 Annual Report*. Exchange, N. S. Available online: http://nsx.com.na/ [Accessed 27/05/2015].

Ntim, C. G. (2012) Why African stock markets should formally harmonise and integrate their operations. *African Review of Economics and Finance*, 4(1), 53-72.

Ntim, C. G., Opong, K. K., Danbolt, J. & Dewotor, F. S. (2011) Testing the weak-form efficiency in African stock markets. *Managerial Finance*, 37(3), 195-218.

Nyasha, S. & Odhiambo, N. M. (2014) The impact of banks and stock market development on economic growth in South Africa: An ARDL-bounds testing approach. *Contemporary Economics*, 9(1), 93-108.

Obstfeld, M. (1994) Risk-taking, global diversification, and growth. *American Economic Review*, 84(4), 1310-1332.

Obstfeld, M. (1995) International capital mobility in the 1990s, in Peter, B. K. (ed), *Understanding Interdependence: The Macroeconomics of the Open Economy*. New Jersey, USA: Princeton University Press.

Odhiambo, N. M. (2007) Supply-leading versus demand-following hypothesis: Empirical evidence from three SSA countries. *African Development Review*, 19(2), 257-280.

Odhiambo, N. M. (2008) Financial depth, savings and economic growth in Kenya: A dynamic causal linkage. *Economic Modelling*, 25(4), 704-713.

Odhiambo, N. M. (2009) Finance-growth-poverty nexus in South Africa: A dynamic causality linkage. *Journal of Socio-Economics*, 38(2), 320-325.

Odhiambo, N. M. (2011a) Financial deepening, capital inflows and economic growth nexus in Tanzania: A multivariate model. *Journal of Social Science*, 28(1), 65-71.

Odhiambo, N. M. (2011b) Financial intermediaries versus financial markets: A South African experience. *International Business & Economics Research Journal (IBER)*, 10(2), 77-84.

Ogum, G., Beer, F. & Nouyrigat, G. (2005) Emerging equity market volatility: An empirical investigation of markets in Kenya and Nigeria. *Journal of African Business*, 6(1-2), 139-154.

Okeahalam, C. C. & Afful, K. B. (2006) Stock Markets, Development Indicators and Investment in Sub-Saharan Africa. *African Review of Money Finance and Banking*, 39-60.

Olowe, R. A. (2009) Modelling naira/dollar exchange rate volatility: application of GARCH and assymetric models. *International Review of Business Research Papers*, 5(3), 377-398.

Onuonga, S. M. (2014) Financial development and economic growth in Kenya: An empirical analysis 1980–2011. *International Journal of Economics and Finance*, 6(7), 226-241.

Patrick, H. T. (1966) Financial development and economic growth in underdeveloped countries. *Economic Development and Cultural Change*, 14(2), 174-189.

Pattillo, M. C. A., Gulde, M. A. M., Carey, K. J., Wagh, M. S. & Christensen, M. J. (2006) *Sub-Saharan Africa: Financial sector challenges*. Washington, D.C., USA: International Monetary Fund, Publication Services.

Pedroni, P. (1999) Critical values for cointegration tests in heterogeneous panels with multiple regressors. *Oxford Bulletin of Economics and Statistics*, 61(S1), 653-670.

Pedroni, P. (2004) Panel cointegration: Asymptotic and finite sample properties of pooled time series tests with an application to the PPP hypothesis. *Econometric Theory*, 20(3), 597-625.

Poshakwale, S. & Murinde, V. (2001) Modelling the volatility in East European emerging stock markets: Evidence on Hungary and Poland. *Applied Financial Economics*, 11(4), 445-456.

Pradhan, R. P., Arvin, M. B. & Bahmani, S. (2015) Causal nexus between economic growth, inflation, and stock market development: The case of OECD countries. *Global Finance Journal*, 27(2), 98-111.

R.B.Z (2015) *Reserve Bank of Zimbabwe: Monetary Policy Statements-2008 to 2012*. Available online: http://www.rbz.co.zw/monetary-policy.html [Accessed 28/05/2015].

Rachdi, H. & Mbarek, H. B. (2011) The causality between financial development and economic growth: Panel data cointegration and GMM system approaches. *International Journal of Economics and Finance*, 3(1), 143-151.

Rahman, M. M., Rahman, M. A. & Hossain, M. A. (2013) Volatility modeling for forecasting stock index with fixed parameter distributional assumption. *Journal of Applied Finance and Banking*, 3(1), 109-122.

Rajan, R. G. & Zingales, L. (2003) The great reversals: The politics of financial development in the twentieth century. *Journal of Financial Economics*, 69(1), 5-50.

Riman, H. B., Esso, I. E. & Eyo, E. (2008) Stock market performance and economic growth in Nigeria: A causility investigation. *Global Journal of Social Sciences*, 7(2), 85-91

Rousseau, P. L. & Wachtel, P. (2000) Equity markets and growth: Cross-country evidence on timing and outcomes, 1980–1995. *Journal of Banking & Finance*, 24(12), 1933-1957.

Sarno, L. & Taylor, M. P. (2001) *The microstructure of the foreign-exchange market: A selective survey of the literature, 89*. Prenston, New Jersey: International Economics Section, Department of Economics, Princeton University.

Schwert, G. W. (1989) Why does stock market volatility change over time? *The journal of finance*, 44(5), 1115-1153.

Shahbaz, M., Ahmed, N. & Ali, L. (2008) Stock market development and economic growth: ARDL causality in Pakistan. *International Research Journal of Finance and Economics*, 14(1), 182-195.

Shin, J. (2005) Stock returns and volatility in emerging stock markets. *International Journal of Business and Economics*, 4(1), 31-43.

Singh, A. (1997) Financial liberalization, stock markets and economic development. *The Economic Journal*, 107(442), 771-782.

Srinivasan, P. (2011) Modeling and forecasting the stock market volatility of S&P 500 index using GARCH models. *IUP Journal of Behavioral Finance*, 8(1), 51-69.

Srinivasan, P. & Ibrahim, P. (2010) Forecasting stock market volatility of BSE-30 Index Using Garch Models. *Asia Pacific Business Review*, 6(3), 47-60.

Stiglitz, J. E. & Uy, M. (1996) Financial markets, public policy, and the East Asian miracle. *The World Bank Research Observer*, 11(2), 249-276.

Swaray, R. B. (2002) Volatility of primary commodity prices: Some evidence from agricultural exports in Sub-Saharan Africa, *Discussion Paper in Economics No. 2002/06.* Wentworth College, University of York, Helslington, UK: Department of Economics and Related Studies-University of York, 1-23.

Taylor, S. J. (1986) *Modelling financial time series*, First edition. New York, United States of America: John Wiley & Sons.

Tsay, R. S. (2010) *Analysis of financial time series*, 3rd Edition edition. New York, United States of America: John Wiley & Sons, Inc.

Tudor, C. (2008) An empirical study on risk-return tradeoff using GARCH-class models: Evidence from Bucharest Stock Exchange, *International Conference on Business and Economy ICBE Constanta.* Bucharest, 14/10/2008. Romania: Spiru Haret Universitaty.

Tully, E. & Lucey, B. M. (2007) A power GARCH examination of the gold market. *Research in International Business and Finance*, 21(2), 316-325.

Vaona, A. (2008) Regional evidence on financial development, finance term structure and growth. *Empirical Economics*, 34(1), 185-201.

Vazakidis, A. & Adamopoulos, A. (2009) Stock market development and economic growth. *American Journal of Applied Sciences*, 6(11), 1933-1941.

Wang, J., Meric, G., Liu, Z. & Meric, I. (2009) Stock market crashes, firm characteristics, and stock returns. *Journal of Banking & Finance*, 33(9), 1563-1574.

Wolde-Rufael, Y. (2009) Re-examining the financial development and economic growth nexus in Kenya. *Economic Modelling*, 26(6), 1140-1146.

WorldBank (2012) *World dataBank: World development indicators and global development finance.* Available online: http://databank.worldbank.org/data/home.aspx [Accessed 01/05/2012].

Yartey, C. A. (2007) Well-developed financial intermediary sector promotes stock market development. *Journal of Emerging Market Finance*, 6(3), 269-289.

Yartey, C. A. (2008) The determinants of stock market development in emerging economies: Is South Africa different?, *IMF Working Paper No. 08/32*. Washington D. C, USA: International Monetary Fund, 1-31.

Zakoian, J.-M. (1994) Threshold heteroskedastic models. *Journal of Economic Dynamics and control*, 18(5), 931-955.

Zhang, K. H. (2001a) Does Foreign Direct Investiment Promote Economic Growth? Evidence From East Asia and Latin America. *Contemporary Economic Policy*, 19(2), 175-185.

Zhang, K. H. (2001b) How does foreign direct investment affect economic growth in China? *Economics of Transition*, 9(3), 679-693.

Zivengwa, T., Mashika, J., Bokosi, F. K. & Makova, T. (2011) Stock market development and economic growth in Zimbabwe. *International Journal of Economics and Finance*, 3(5), 140-150.