FINANCIAL SYSTEM DEVELOPMENT AND ECONOMIC GROWTH IN SELECTED AFRICAN COUNTRIES: EVIDENCE FROM A PANEL COINTEGRATION ANALYSIS

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DECLARATION

Except for references specifically indicated in the text, and such help as has been acknowledged, this thesis is wholly my own work and has not been submitted to any other Tertiary Institution for degree purposes.

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ABSTRACT

Financial systems (i.e. banking systems and stock markets) can influence economic growth by performing the five key financial functions, namely: mobilising savings, allocating capital, easing of exchange, monitoring and exerting corporate governance, as well as ameliorating risk. The level of development of the financial system is a key determinant of how effectively and efficiently these functions are performed. This study examines the short-run and long-run relationships between financial system development and economic growth for a panel of seven African countries (namely: Egypt, Ivory Coast, Kenya, Morocco, Nigeria, South Africa and Tunisia) covering the period 1988 to 2008. While numerous empirical studies have researched this topic, none of the previous African empirical literature have investigated this by using three groups of financial development measures (i.e. overall financial development, banking system development and stock market development measures) as well as employing panel cointegration analyses.

The investigation of the long-run finance-growth relationship is conducted using two methods; the Pedroni panel cointegration approach and the Kao panel cointegration technique. The Pedroni panel cointegration approach is more often applied in empirical research as it has less restrictive deterministic trend assumptions, while the Kao panel cointegration technique is employed in this study for comparison purposes. Furthermore, the short-run linkages between financial development and economic growth are analysed using the Holtz-Eakin *et al.* (1989) panel Granger causality test.

The results of the Pedroni cointegration tests show that there are long-run relationships between overall financial development (measured by LOFD and OFD2) and economic growth, banking system development (measured by LPSC) and economic growth, as well as stock market development (measured by LMCP and LVLT) and economic growth. In contrast, the Kao test fails to find any cointegration between finance and growth. However, on the balance, findings largely support a conclusion of cointegration between financial development and economic growth since the Pedroni approach is more appropriate for examining cointegration in heterogeneous panels. Estimates of these long-run cointegrating relationships show that all five financial development measures have the expected positive linkages with growth. However, only four of the five financial development measures were found to have significant long-run linkages with growth, as the relationship between LOFD and growth was not found to be significant in the long-run.

The panel Granger causality results show that economic growth Granger causes banking system development in the short-run (i.e. there is demand-following finance), irrespective of the measure of banking development used. While there is bi-directional, reciprocal causality between economic growth and both of the measures of overall financial development and one measure of stock market development (i.e. LVLT).

Thus, policy makers should focus on formulating policy which promotes faster paced economic growth so as to stimulate financial development, while at the same time encourage policy that promotes the balanced expansion of the banking systems and stock markets in order to augment economic growth.

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I dedicate this thesis to my parents, Ashley and Inel Starkey. May the Lord bestow upon you many blessings and grant you everything your hearts' desire.

FINANCIAL SYSTEM DEVELOPMENT AND ECONOMIC GROWTH IN SELECTED AFRICAN COUNTRIES: EVIDENCE FROM A PANEL COINTEGRATION ANALYSIS

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CHAPTER 1:
INTRODUCTION

1.1 BACKGROUND, CONTEXT AND RATIONALE FOR RESEARCH

It has long been recognised and accepted that financial systems, i.e. financial intermediaries and financial markets, play an important role in a country's economic growth (Claus *et al.*, 2004:1)[1]. Financial systems perform the key functions of mobilising savings, allocating capital, providing an efficient payment system, and monitoring and exerting corporate governance (Aziakpono, 2008:22). A major determinant of the ability of a financial system to effectively and efficiently perform these key functions is the extent to which a country's financial system is developed. Both theoretical and empirical literature (such as Hermes and Lensink, 1996; Levine and Zervos, 1998; Goodhart, 2005; Chakraborty and Ray, 2006) suggest that financial system development is crucial for resolving agency and information asymmetry problems as well as reducing transaction costs.

African financial systems however remain largely underdeveloped due to a number of factors, which include the adoption of financially repressive policies post independence, poor macroeconomic management and political corruption, together giving rise to bank insolvencies, low savings rates and inefficient resource allocation (Yartey, 2004:14). The underdevelopment has meant that African economies struggle to accelerate economic growth and reduce poverty. Researchers commonly refer to African economies as suffering from the "growth tragedy" evidenced by average real income, investment, and savings for sub-Saharan African countries systematically declining in each decade from the 1970s to 2000 (Ndikumana, 2001:9). Several researchers (such as Odedokun, 1996; Gelbard and Leite, 1999; Allen and Ndikumana, 2000) have reported positive effects of financial system development on economic growth in Africa. Consequently, there exists a strong case for the promotion of financial development in Africa.

From a theoretical viewpoint, in the course of executing the key functions alluded to above; financial systems positively influence factor accumulation, innovation, and play a crucial role in understanding variations in growth since economic growth is often discontinuous (Allen and Oura, 2004:3). The

[1] Financial markets refer to institutions organised for the creation and trading of financial assets, such as a stock exchange. Financial intermediaries refer to the institutions carrying out the market function of matching providers of funds with users of funds, such as banks.

literature also distinguishes between the effects of these key functions on economic performance when performed by financial intermediaries (i.e. banks) and when performed by the financial markets (i.e. stock markets) (Aziakpono, 2008:22). This matter has gained considerable attention and is commonly termed the "bank-based versus market-based" debate. Contributors to this debate explore the separate effects of the banking system and stock markets on the promotion of economic growth and investigate issues such as: "Do financial systems perform different functions or are they doing the same thing in different ways?" "Can one say that either a bank-based system or a market-based system is 'better' than the other?" (Allen and Oura, 2004:11). There exists no uniform definition of what constitutes a bank-based system or a market-based system (Levine, 2002:9). However, a bank-based system principally refers to a financial system dominated by the banking sector performing the key growth enhancing functions, while a market-based system is characterised by the stock market predominantly stimulating economic growth (Beck and Levine, 2002:148).

The theoretical arguments in favour of the bank-based view emphasises the significance of financial intermediaries in the processes of (i) improving the information flow, (ii) identifying high-quality projects, (iii) mobilising and allocating capital, (iv) monitoring corporate managers, and (v) providing risk management (Chakraborty and Ray, 2006:332). Conversely, the market-based view highlights the role of stock markets in (i) channelling savings towards firms to satisfy capital needs, (ii) enhancing corporate governance by easing takeovers, (iii) amplifying information availability for all participants in the market, and (iv) diversifying and managing risk (Levine, 2002:3; Law, 2004:10). Supporters of each view further underline the deficiencies associated with the opposing view. Stiglitz (1985:136) argues that advanced stock markets reduce an individual investor's incentive to obtain information as stock markets publicly divulge information rapidly, while Bhide (1993:31) stresses that liquid markets create a myopic investor climate where cost of 'exit' of unhappy stockholders is low, hence there are less incentives for implementing rigorous corporate control. In opposition to the bank-based view, Rajan (1992:1367) asserts that financial intermediaries hinder innovation and efficient corporate governance as they acquire inside information about firms which is used to extract information rents and protect larger firms from competition. Furthermore, government owned banks are utilised as political tools which are more inclined to channel credit to labour intensive industries whilst neglecting strategic projects (La Porta *et al.*, 2002:265).

A large body of empirical research exists within this field investigating the relationship between financial development and economic growth (or finance-growth relationship), using either banking

system development measures or stock market development measures, albeit with focus on developed countries. Studies analysing the effects of financial development utilising banking system development indicators alone include Odedokun (1998), Allen and Ndikumana (2000), Ferreira da Silva (2002). Overall, findings indicate that banks have a positive influence on economic growth. Furthermore, developing nations are said to be largely bank-based economies as these countries have a dualistic structure – a large labour intensive low productivity sector and a smaller modern manufacturing sector – so the transition from a traditional economy to a modern economy is funded more by banks within these countries as opposed to the scarcely established stock markets. Hence, during the early stages of economic development the level of financial development, based upon bank development measures, is a good indicator of future economic growth (Ferreira da Silva, 2002).

Studies examining financial development based solely on stock market development indicators include Filer *et al.* (1999), Choong *et al.* (2005), Vazakidis and Adamopoulos (2009), among others. These studies commonly find that stock market development promotes economic growth within the respective countries, and developed countries were more likely to be classified as market-based financial systems. It was also uncovered that developed economies benefited more from stock market development than developing economies. This finding was confirmed by Singh (1997), Azarmi *et al.* (2005), and Chakraborty (2008) who examined the impacts of stock markets on economic development in India (a developing economy) and found that stock market development was unlikely to promote quicker industrialisation and long-term economic growth.

There are however fewer studies which empirically assess the relationship between financial development and economic growth by simultaneously employing banking system development and stock market development measures. The use of financial development measures representing a single aspect of the financial system, when both stock markets and banking systems are fairly developed, hinders the discovery of the overall effect of the financial system on economic growth and may lead to incorrect conclusions concerning the effects of financial development (Aziakpono, 2008:283; Beck and Levine, 2004:424). One such study using both bank and stock market development indicators was performed by Arestis *et al.* (2001) examining Germany, Japan, France, the UK and the US. Arestis *et al.* (2001:37) found that overall both banks and stock markets were able to promote economic growth, but the banking system was relatively more important. The researchers also found that the US and the UK could be classified as market-based financial systems while France, Germany and Japan were classified as bank-based financial systems. Conflicting results

are found by Corbett and Jenkinson (1996) who suggest that growth enhancing activities in Germany, the UK, and the US are predominantly financed by banks, with little stock market finance. While Beck and Levine (2002) find no support for a bank-based or market-based financial system in these countries, suggesting that distinguishing between the two is not important for growth.

Hence, of the smaller body of research which incorporates both banking system and stock market development measures, contrasting results appear with little consensus existing regarding the role played by each towards economic growth.

Most of the empirical research assessing the finance-growth relationship, using both bank and stock market development measures, employ either time series or cross country analysis. Both of these techniques however suffer from drawbacks which could explain contrasting findings across studies (Law, 2004:16). Cross-sectional data suffers from endogeneity problems and does not have the advantage of time series variations which could increase estimation efficiency (Law, 2004:16). While Aslan (2008:4) declares "it is not probable to discuss integration and cointegration properties of cross-sectional data". Time series data is often constrained by small observations hence may yield unreliable results and misguided conclusions (Christopoulos and Tsionas, 2004:57). However, panel data analyses which are sparsely conducted, exploit both cross-sectional and time-series properties, and represent an attempt to utilise the data in the most efficient manner and to control for the drawbacks of the previous two methodologies. Panel data approaches importantly control for country specific fixed effects, hence explicitly accounting for the fact that some potentially important factors of growth are unobservable and/or unmeasurable, in this way avoiding potential biases from omitted variables (Allen and Ndikumana, 2000:146). Panel data studies also correct for simultaneity and are able to estimate long-run cointegrating relationships (Apergis *et al.,* 2007:181).

In terms of studies employing panel data techniques to examine the effect of financial development on economic growth, there is a very limited number of such studies focusing on African economies. These include Ndikumana (2000), Kelly and Mavrotas (2003), and Padachi *et al.* (2007). Ndikumana (2000) examines thirty sub-Saharan African countries from 1970 to 1995 for the effects of financial development on domestic investment, while controlling for country specific fixed effects and non-financial factors of investment. Ndikumana (2000:393) found a positive relationship between

domestic investment and five banking system development indicators[2], with signals that financial development can stimulate economic growth through capital accumulation. Kelly and Mavrotas (2003) analysed the impact of financial development on private savings for a dynamic heterogeneous panel of seventeen African countries for the period from 1960 to 1997. Using three banking sector development indicators[3], Kelly and Mavrotas (2003:9) found inconclusive evidence of the impact of financial development on private savings since results were highly dependent on the financial development measure used. This indicates the importance of utilising different measures of financial development rather than a single indicator. Padachi *et al.* (2007) investigated the dynamic link between finance and growth in forty-four African countries over the period 1979 to 2002. Employing two banking system development measures[4] Padachi *et al.* (2007) results indicate that financial development has a positive and significant effect on the level of economic growth, however the contribution of financial development to growth is not as strong as other explanatory variables (such as investment ratio, measure of openness, and a proxy for quality of human capital).

Of the African panel data studies undertaken, many of these studies favour the usage of multiple banking sector development measures as seen above, while there are scanty available panel data studies of the finance-growth relationship in Africa employing both bank and stock market development measures. Hence, there is a need to fill this gap. As alluded to earlier, using a single indicator may hinder the discovery of the overall effects of financial development on economic performance, which in the context of this field of research is of critical importance to African governments. The largely underdeveloped nature of African countries means that African governments are under pressure to improve and strengthen the drivers of economic growth so as to stimulate development within their countries. In order for governments to formulate optimum growth enhancing economic policy, expert knowledge of the relative importance of the banking sector and the stock market in the financial system is vital. Therefore, the form of financial structure that is most conducive for economic growth must be determined in order to aid the formulation of sound economic policy for a country (Arestis *et al.*, 2005:1). Policy intervention should be tailored towards the promotion of the specific financial structure that more significantly contributes to

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[2] Five development indicators: (i) the ratio of liquid liabilities as to GDP, (ii) total credit to the private sector as a ratio of GDP, (iii) total domestic credit provided by the banking sector as a ratio of GDP, (iv) claims on government and other public entities as a ratio of GDP, (v) a composite index of financial development.

[3] Three development measures: (i) the relative importance of deposit money banks relative to central banks, (ii) bank liquid liabilities as a ratio of GDP, (iii) private credit by deposit money banks and other financial institutions as a ratio of GDP.

[4] Two measures: (i) liquid liabilities as a ratio of GDP, (ii) credit by financial intermediaries to the private sector as a ratio of GDP.

growth rather than promoting a second-best alternative system. Policies promoting the alternative system may be misplaced and fail to raise economic growth (Chakraborty and Ray, 2006:346).

Against this backdrop, this study will investigate the impact of financial system development on economic performance in African countries by employing the more 'efficient' approach of panel data analysis and will utilise both banking system and stock market development measures.

1.2 OBJECTIVES OF THE RESEARCH

The broad objective of this study is to determine what the impact is of financial system development on economic growth within the seven selected African countries based on the relative contributions of the banking systems, stock markets and overall financial systems. To achieve this, the following specific sub-objectives will be pursued:

- To analyse the structure, state of affairs and development of the financial systems in each of the seven countries;
- To determine the overall effect of the financial system on economic growth using aggregate measures of financial system development;
- To analyse the relationships between banking system development and economic growth, and between stock market development and economic growth in the seven countries;
- To determine the direction of causality which prevails between the various measures of financial development and economic growth; and
- Based on the findings of the study proffer policy advice that could assist in stimulating the development of the financial system.

1.3 METHODOLOGY

This section briefly describes the systematic structure that will be followed in order to achieve the objectives and sub-objectives of this study, while a full discussion of the econometric methodologies employed in this study will be expanded on in Chapter 4. Firstly, a detailed literature review of both theoretical and empirical literature will be performed in order to provide an in-depth understanding of the finance-growth relationship. Secondly, a brief overview of the study countries' banking

systems and stock markets, in terms of size and liquidity, will serve to achieve the first sub-objective. For the empirical analysis, the study will use annual panel data for Egypt, the Ivory Coast, Kenya, Morocco, Nigeria, South Africa and Tunisia from 1988 to 2008. The chosen study period is considered due to data availability constraints, since it is the only period wherein all seven countries had stock market data available for.

Thirdly, formal econometric tests begin by employing the method of principal component analysis (PCA) and by applying the Findex formula, in order to create two aggregate measures of financial development, representative of both banking system and stock market development. The new aggregate financial development indexes will be used as measures of overall financial development and will be employed in the empirical analysis to achieve the second sub-objective. In order to address the third sub-objective two panel cointegration techniques, proposed by Pedroni (1999, 2004) and Kao (1999), shall be used after employing panel based unit root tests (which include the Im, Peseran and Shin (2003) test, the Maddala and Wu (1999) Fisher-ADF based test and the Choi (2001) Fisher-ADF based approach). Furthermore, the Holtz-Eakin *et al.* (1989) panel Granger causality test shall be applied in order to determine the causal relation among the variables and thus contend with the fourth sub-objective.

In order to meet our broad objective, the panel cointegration results will be analysed to determine whether there are any long-run effects from overall financial system development, banking system development and stock market development on economic growth in the seven African countries.

1.4 STRUCTURE OF THE STUDY

This study is organised into six chapters as follows. Chapter 2 provides a conceptual understanding and a review of the existing theoretical and empirical literature concerning the relationship between financial development and economic growth. Chapter 3 provides a brief background, overview and comparison of the financial systems of the seven countries used in the analysis. Chapter 4 provides the econometric methodology used in this study, specifically the PCA, panel unit root tests, panel cointegration analysis and panel Granger causality tests. Chapter 5 reports and discusses the findings of the study. While the summary of findings, implications for policy action and conclusions are presented in Chapter 6.

CHAPTER 2:
THEORETICAL ISSUES AND SURVEY OF EMPIRICAL LITERATURE

2.1 INTRODUCTION

This chapter reviews the conceptual, theoretical and empirical literature concerning the relationship between financial system development and economic performance. Therefore, this chapter is broadly organised into four main sections. Section 2.2 discusses concepts which are central to understanding the 'financial system'. Section 2.3 reviews the key theoretical issues in the finance-growth relationship, i.e. the pioneering theoretical literature, the effects of finance on growth by means of endogenous growth theory, and the possible causal directions in the relationship. Section 2.4 examines the body of existing empirical studies which investigate linkages between financial development and economic growth using three principal categories of financial development indicators (i.e. banking development, stock market development, and bank-market development indicators). Finally, Section 2.5 concludes the chapter.

2.2 CONCEPTUAL DEFINITIONS

It is imperative that from the outset a profound understanding be obtained of the financial system and key issues pertaining to it, such as: what is referred to by a 'financial system', understanding the composition of a financial system, appreciating the important functions performed by the financial system, and the different classifications of financial systems due to their design variations.

2.2.1 DEFINITION AND COMPOSITION OF THE FINANCIAL SYSTEM

The term 'financial system' is habitually utilised in a myriad of financial literature texts, yet this expression is scarcely ever accompanied by a specific definition, giving the impression that this expression and concept is unanimously understood and without great difficulty. According to Goodspeed (2008:4), the financial system is comprised of "the financial markets, financial

intermediaries and other financial institutions which execute the financial decisions of households, businesses and governments". Howells and Bain (2005:4) define the financial system as "a set of markets for financial instruments, and the individuals and institutions that trade in those markets, together with the regulators and supervisors of the system." Combining these two definitions, the financial system hence describes the arrangements (i.e. financial markets, financial intermediaries and control systems) which allow for the exchange of financial instruments (i.e. financial contracts), so that funds may flow between participants (i.e. lenders and borrowers). From the foregoing definitions, the financial system is composed of four common elements.

Participants – the participants in the financial system are the ultimate lenders and ultimate borrowers. Ultimate lenders are surplus economic units, hence are non-financial entities whose savings exceed their real consumption, whilst ultimate borrowers are deficit economic units whose incomes are insufficient for financing their current spending plans (Howells and Bain, 2005:7). Consequently, the financial surpluses of lenders are transferred to deficit units either by way of direct financing or indirect financing so to put surpluses into productive usage (Black *et al.*, 2000:238). Direct financing is a financial transaction which occurs between a lender and a borrower to bring about the direct transfer of the lender's surplus funds to the borrower using the financial markets, and in exchange the lender receives a financial instrument (such as a bond or share) (Black *et al.*, 2000:238). Direct financing occurs only when a lender's requirements regarding risk, return and liquidity are identical to a borrower's needs in terms of cost and term to maturity, such as financing by means of a new share issue or long-term bond issue. Indirect financing is a financial transaction in which the lender and borrower have no direct contact; instead financing occurs through third party financial intermediaries (such as banks) that are willing to bear the risk of the financial transactions (Black *et al.*, 2000:238). Hence, surplus economic units place their savings in financial intermediaries in exchange for financial instruments (such as savings deposits, insurance policies etc.) while the financial intermediaries loan the lenders' funds to deficit economic units.

Financial Instruments – financial instruments are "evidences of claims against other economic units or of ownership in them" (Goldsmith, 1969: 4) and are issued by ultimate borrowers or financial intermediaries. These issuers are confronted with very diverse combinations of transactional, enforcement and informational frictions which motivates the creation of a variety of financial instruments with differing characteristics such as the duration, marketability, security, contract nature, and yield of the instruments. According to Fourie *et al.* (1996:13), marketability is the most

essential and attractive characteristic of financial instruments, hence the ease with which holders of financial claims can recover their investments either from the issuer or in a secondary market is of great importance. Financial instruments issued by ultimate borrowers, such as companies (issuing shares, promissory notes etc.) and governments (issuing treasury bills, government bonds etc.), for the purpose of direct financing are referred to as primary securities. While instruments issued by financial intermediaries (such as savings accounts, negotiable certificates of deposit etc.) in the process of providing indirect financing are called indirect securities (Goodspeed, 2008:7).

Financial Intermediaries - financial intermediaries are institutions which intermediate between lenders and borrowers, as the financial middlemen, and thus facilitate the flow of funds from savers to borrowers (Goodspeed, 2008:6). These institutions arise to provide indirect finance, thus ameliorate the conflicts which exist between lenders and borrowers regarding their requirements in terms of risk, return, and term to maturity relating to the extension and acquisition of financing (Levine, 1997:691). Financial intermediaries are broadly categorised into depository intermediaries and non-depository intermediaries. (i) Depository intermediaries, commonly referred to as banks, expedite the flow of funds from lenders to borrowers by accepting deposits from individuals and institutions, and making loans with the deposited funds (Fourie *et al.*, 1996:10). These intermediaries include central banks, commercial banks, land and agricultural banks, credit unions, mutual savings banks, and savings and loan associations. (ii) Non-depository intermediaries are financial intermediaries that do not accept deposits instead receive contractual contributions from lenders and invest the funds. Therefore, altering the composition and nature of lenders portfolios and this way allows borrowers to access funds more readily (Goodspeed, 2008:6). Non-depository financial intermediaries include insurance companies, pension and provident funds, unit trusts, hedge funds, exchange traded funds, finance companies, and investment trust/companies.

Financial Markets – financial markets are the conventions which exist allowing for direct financing, the direct transfer of excess funds of surplus units to finance deficit units requiring funds (Fourie *et al.*, 1996:15). These conventions serve to bring together buyers (lenders) and sellers (borrowers) of financial instruments and to determine the price of these instruments (Goodspeed, 2008:7). Financial markets include the equity market, bond market, money market and the derivatives market. The foreign exchange market is however not truly a financial market as there is no flow of surplus funds to deficit units, rather this market serves as a conduit for locals undertaking transactions in a foreign country or to foreigners undertaking transactions in the domestic economy (Faure, 2008:8).

2.2.2 FUNCTIONS OF THE FINANCIAL SYSTEM

The need for a financial system stems from the fact that there are costs associated with acquiring information, making transactions and enforcing contracts. Existence of these frictions, in turn, creates incentives for the establishment of distinct financial instruments, financial intermediaries and financial markets (Levine, 1997:690). Hence, financial systems arise in order to minimise the problems of information asymmetry, enforcement of contracts and transactions costs.

A cross reading of the literature (which includes Merton and Bodie, 1995; Levine, 1997; Montiel, 2003; Levine, 2004; Aziakpono, 2008; Demirgüç-Kunt and Levine, 2008; Goodspeed, 2008) reveals that the financial system more closely performs five key functions. The five key functions include, (i) Savings mobilisation and the channelling of savings to investments: financial systems perform the key task of collecting and pooling capital received from savers, and allocating these funds to qualified participants and prospectively profitable projects as financial intermediaries and markets have the ability to overcome high transaction costs and information asymmetries which are barriers to financial transactions.(ii) Providing information and allocating capital: by collecting, processing and evaluating information about firms, management and market conditions, financial systems are able to provide, otherwise high cost and inaccessible, information about prospective profitable investments that savings can be allocated towards. (iii) Monitoring and exerting corporate governance: financial intermediaries and markets perform a delegated monitoring role as they are able to economise on the benefits of aggregate monitoring costs, in this way reducing incentive problems, credit rationing, and capital mismanagement. (iv) Ameliorating risk: financial systems provide mechanisms to manage uncertainty and risk, such as trading, risk sharing and risk diversification. (v) Easing of exchange: financial systems are importantly responsible for the clearing and settling of payments, ensuring these processes occur swiftly and at the lowest possible costs, so to ease the exchange of goods and services.

Therefore, interactions between the four elements of the financial system serve to perform the five essential functions which are aimed at mitigating market frictions. From a functional perspective[5], how well financial systems perform these crucial functions determines how well they will reduce market frictions and consequently the degree of influence the financial system will have on savings rates, technological innovation, investments, and economic growth rates. In light of the importance

[5] Merton and Bodie's (1995) functional perspective of the financial system suggests that the key aspect of the financial system is its reliance on the functions it performs rather than the individual institutions and markets.

of the financial system functions, these functions will be examined in greater detail in Section 2.3.2b where the impact of each function on economic growth will be closely evaluated.

2.2.3 FINANCIAL SYSTEM ARCHITECTURE

Early proponents of the finance-growth nexus, such as Gurley and Shaw (1955) and Goldsmith (1969) amongst others, acknowledged the existence of diverse financial systems across countries. Financial system architectures differ with respect to the types and relative size of financial instruments, financial markets and financial intermediaries in existence. Similarly, many economists have perceived a relationship between financial structural differences and variations in real activity. As a result, there has been a plethora of research in the area of financial system design in an attempt to uncover the combinations of regulatory and disclosure requirements, and, institutional and market details which may be responsible for specific levels of economic activity. According to Thakor (1996:918), "different financial system designs will manifest themselves in different divisions of activities between financial institutions and markets". In light of this and since stock markets and banks are viewed as substitute sources of corporate finance (Arestis *et al.*,2001:19), economists commonly differentiate between two types of financial systems, namely, bank-based financial systems and market-based financial systems. The bank-based and market-based financial systems will be briefly discussed below from an institutional perspective (i.e. the institutions that make up each financial system).

a) Bank-based financial systems

According to Vitols (2001:1), a bank-based system refers to a financial system in which "the bulk of financial assets and liabilities consist of bank deposits and direct loans". Sjogren (1994:317) suggests that a bank-based financial system is characterised by financial intermediaries performing the principal credit supplier role to firms, providing indirect finance and exhibiting extensive co-operation with firms. However, as noted by Levine (2002:9), there is no uniform definition of what constitutes either a bank-based or market-based financial system. Since this section is primarily concerned with the institutional design of a financial system, from here on, the expression 'bank-based financial system' refers to a financial system in which a dominant role is assigned to depository

financial intermediaries, in particular commercial banks, land and agricultural banks, credit unions, post banks, and mutual savings banks. In a bank-based financial system these depository intermediaries predominantly perform the key functions of the financial system which promote growth, while a lesser role is due to the functions of financial markets in the economy.

b) Market-based financial systems

Sjogren (1994:317) defines a market-based system as a financial system with a relatively lower debt/equity ratio, where the role of internal financing is important, and financial markets are more active in corporate reorganisation and mergers than banks. Vitols (2001:1) acknowledges that the dominant forms of financial assets in market-based systems are tradable securities. While Trehan (2008:1) suggests that in market-based financial systems the majority of financial power is held by stock markets and economic performance is dependent on the performance of stock markets. Hereafter the expression 'market-based financial system' will be used to describe a financial system wherein the stock market is the chief growth enhancing financing mechanism. Despite some literature acknowledging bond markets along with stock markets as crucial financial mechanisms in fostering growth within market-based financial systems, the wide spread underdevelopment and often absence of bond markets in Less-Developed-Countries (LDCs) motivates the inclusion of only stock markets in a classification of market-based financial systems, for the purpose of this study.

2.3 THEORETICAL ISSUES IN THE FINANCE-GROWTH NEXUS

For over a century, a range of theoretical propositions regarding the role played by finance in the process of economic development have amassed. As early researchers attempted to validate these claims, further competing viewpoints regarding the importance of financial systems for growth and the possible casual relationships emerged. Hence, this section aims to review literature on the early finance-growth linkages, the importance of financial system functions for economic growth, and the possible causal linkages, with the purpose of uncovering the key theoretical issues underlying the relationship between finance and growth.

2.3.1 LINKAGES BETWEEN FINANCE AND ECONOMIC ACTIVITY

The early work of Bagehot (1873), Schumpeter (1911), Fisher (1933) and others provides an outlook wherein finance is an important factor for variations in economic activity. Bagehot (1873) acknowledged that the mobilisation of capital by the financial system was pivotal to the industrial revolution in England, while Schumpeter (1911) argued that the development of financial institutions directly influenced technological improvement and productivity growth.

Other early literature acknowledging linkages between the financial system and real activity can be traced back to a strand of literature termed 'Financial Crises literature' which closely analyses various booms, busts and general financial activity around specific time periods. A constituent of this area of literature is the 'debt-deflation theory of Great Depressions' which was advanced by Fisher (1933) while analysing the Great Depression of 1929. Fisher (1933:341) identified two chief financial disturbances which underlie the severity of the downturn, namely, debt disturbances and price-level disturbances. Prior to the Great Depression the stability of the economy was compromised due to debt disturbances which commonly arose when borrowers endeavoured to earn unusually large prospective profits from new investment opportunities in new inventions. This resulted in a great volume of over-indebtedness (Fisher, 1933:348). The severity of over-indebtedness lead to distress selling as debtors and/or creditors were forced into initiating liquidation, resulting in price-level disturbances, hence deflation. Fisher (1933:341) states that these two major factors (i.e. deflation and over-indebtedness) that were behind the downturn gave other factors (such as over-investment, over-confidence and over-speculation) some of their importance. Hence, Fisher (1933) argued that a poorly functioning financial system was responsible for the severity of the economic downturn.

The period that followed Fisher's (1933) work saw the explicit role of the financial system in influencing real activity down-played by an array of economists such Keynes in his theory of output determination, Hicks (1937), Modigliani (1944), and Friedman and Schwartz (1963). These economists rather shifted emphasis to money as the financial variable most relevant to aggregate economic behaviour, than understating the role of all other aspects of the financial system (Gertler, 1988:562). The seminal work of Gurley and Shaw (1955) however provided some of the most influential theoretical insights into the finance-growth relationship and was an attempt to divert attention back towards the overall linkages between financial structure and growth. Gurley and Shaw (1955:515) emphasised that financial aspects were important for economic development and not a

"goods" (wealth, labour, output, income) aspect alone. Central to Gurley and Shaw's (1955) work was a prominent role played by financial intermediaries in economic development, specifically the credit provision role of financial intermediaries, moving attention away from the money supply role. The theory postulates that the money stock is an adequate proxy for finance only when the financial system is in its infancy stages of development (Gurley and Shaw, 1955:520). However, as financial systems expand there is significant growth in the number of non-bank financial intermediaries which offer varieties of differentiated financial products that are close substitutes for money (Gurley and Shaw, 1955:520). The availability of diverse financial products enhances the promotion of the institutionalisation of savings and investment, which crucially expands credit availability and so, allows borrowers to accumulate debt without having to reduce spending. Hence, Gurley and Shaw (1955) argue that financial intermediaries (bank and non-bank), through their debt issuing role, influence real activity and thus financial aspects are important for economic development. Consequently, considering the money supply alone will not provide a reliable measure of intermediary debt issue and therefore imprecise conclusions about the relationship between financial and real activities (Gurley and Shaw, 1955:522).

2.3.2 THE IMPACTS OF THE FINANCIAL SYSTEM ON ECONOMIC GROWTH: ENDOGENOUS GROWTH THEORY

Much of the initial work on the linkages between finance and economic activity, although ground-breaking, was criticised for a lack of analytical foundations (Pagano, 1993:613). Consequently, endogenous growth models emerged as an analytical framework for investigating the much proclaimed relationship between financial development and growth. Endogenous growth models demonstrate that in the absence of exogenous technological progress there can be self-sustaining growth, and economic growth rates are associated with preferences, technology, income distribution and institutional arrangements (Pagano, 1993:613). Hence, these models indicate that finance not only has level effects (i.e. improves the level of capital stock and the level of productivity) but also growth effects (i.e. influences the growth rates of capital stock and productivity). Furthermore, there exists differing specifications of endogenous growth models distinct as to the financial mechanism included in the model accounting for the role of finance. Accordingly a variety of endogenous growth models have been used to provide theoretical analysis of the finance-growth relationship (e.g. Greenwood and Jovanovic, 1990; Bencivenga and Smith, 1991; Levine, 1991; Boyd and Smith,

1992; Saint-Paul, 1992; Pagano, 1993; Becsi and Wang, 1997; Greenwood and Smith, 1997). However, a simple 'AK' endogenous growth model will be specified below in order to illustrate the role of financial development in the economic growth process.

a) Endogenous Growth Model

The AK endogenous growth model used by Pagano (1993) to discuss the effects of financial development on growth will be utilised below, where output is a linear function of capital, such that:

$$Y_t = AK_t \qquad \text{..... (2.1),}$$

where Y_t is total output in an economy, K_t is capital stock, and A is a constant (referring to the level of technology in the economy, or factor productivity).

This simple AK endogenous growth model provides a setting wherein only capital (K_t) is used in production and it exhibits constant returns to scale. Capital depreciates at a constant rate of δ and there is no population growth so that:

$$K_{t+1}=I_t+(1-\delta)K_t \qquad \text{..... (2.2),}$$

where I_t is gross investment and δ is the rate of depreciation.

It is also assumed that a proportion of savings, the size of $1-\phi$, is lost during the process of financial intermediation. This savings leakage indicates inefficiency in the financial systems, thus only the fraction ϕ of total savings can be used to finance investments. Therefore, in a closed economy the investment-saving relationship can be described as:

$$I_t=\phi S_t \qquad \text{..... (2.3),}$$

where S_t indicates gross saving and ϕ is the proportion of savings available for investment.

If s denotes the gross savings rate, so that:

$$s=\frac{S_t}{Y_t}=\frac{S_t}{AK_t} \qquad \text{..... (2.4),}$$

Then the steady-state growth rate, g, is expressed as:

$$g = \frac{K_{t+1} - K_t}{K_t} = \frac{I_t + (1-\delta)K_t - K_t}{K_t} = \frac{\phi S_t}{K_t} - \delta$$

$$g = A\phi s - \delta \qquad \text{..... (2.5),}$$

So, Equation (2.5) reveals three ways in which financial development can influence growth: (i) it may improve [A] the marginal productivity of capital; (ii) it can increase [ϕ] the proportion of savings channelled to investments; and (iii) it can enhance [s] the private savings rate.

b) Role of the Financial System

As alluded to in Section 2.2.2, the financial system performs five key functions. Next, it will be illustrated how the performance of these financial functions may influence economic growth by means of altering the elements of the steady-state growth rate (in Equation (2.5) above).

(i) Mobilisation of savings and channelling towards investments. There are significant transaction and information costs involved in the process of collecting and pooling savings of diverse individuals (Levine, 2004:22). The financial system is able to minimise these frictions as financial intermediaries have scale economies in the associated costs and use numerous contracts with capital abundant units. Hence, efficient financial systems are more effective at exploiting economies of scale and thus mobilising savings of individuals, in this way have a large impact on the savings rate ([s] in Equation (2.5)) and therefore economic growth (Levine, 2004:22). The savings mobilised by financial intermediaries are then channelled to investors, thus enabling them to obtain savings at significantly lower costs than would be possible if individual investors were to mobilise savings directly from individual savers. Hence, an efficient financial system can increase the quantity of savings channelled to investment ([ϕ] in Equation (2.5)) and thus improve economic growth. The cost of intermediation, a proportion of savings ($1-\phi$), is absorbed by the financial system primarily as reward for financial services supplied and also as the spread between borrowing and lending rates (Pagano, 1993:615). However, this savings leakage may also reflect X-inefficiency of the financial intermediaries and their market power common in less competitive markets where monopolistic premiums are charged (Pagano, 1993:615; Aziakpono, 2008:25). As financial development advances

– greater competition, more financial services and financial institutions are more experienced – the cost of intermediation will decline. Smaller intermediation costs $(1-\phi)$ mean a larger proportion of mobilised savings are funnelled towards investors $[\phi]$, consequently accelerating economic growth.

(ii) Information provision and efficient allocation of capital. Investors are often unable to acquire the desired information concerning potential investments due to high information costs (i.e. costs of collecting, processing, and producing information) associated with evaluating firms, managers, and market conditions. Without reliable information individuals are reluctant to undertake investments, thus high information costs keep capital from flowing to its highest value use (Levine, 2004:7). However, financial intermediaries perform a specialist role in researching investment possibilities, producing quality information and selling this information on to investors at lower costs than otherwise obtainable (Levine, 2004:7). Hence, through the provision of high quality information, financial intermediaries thereby direct savings efficiently towards financing more sound investments. As a result financial intermediaries augment the marginal product of capital ([A] in Equation (2.5)) which in turn affects growth positively (Pagano, 1993:615).

(iii) Monitoring firms and exerting corporate governance. A firm's savings and allocation decisions are often dependent on the extent to which its shareholders and creditors can effectively enforce corporate governance. Poor governance often results in highly concentrated ownership which distorts corporate decisions and national policies, thus restricting innovation and hindering economic growth (Morck *et al.,* 2005:661). The high costs associated with enforcing effective 'direct' corporate governance often discourage potential investors and creditors. Hence, financial arrangements are established to alleviate market frictions and improve the corporate governance process. More specifically, financial markets ensure sound corporate governance by monitoring firm value and performance, reflected in the stock price variations and facilitating takeovers of undervalued firms (Ncube, 2007:20). With financial intermediaries, predominantly banks, performing the task of delegated monitoring of capital and the usage of such. Thus financial arrangements which evaluate, screen, and monitor corporations, improves the efficiency with which firms allocate resources and ensures higher productivity of capital (raises [A] in Equation (2.5)). Hence, the effectiveness of corporate governance directly impacts firm performance with potentially large implications for growth rates.

(iv) Ameliorating risk. Savers generally have lower risk preferences but seek high-return investments which tend to have higher risk. The financial system, which promotes the efficient allocation of capital to projects with the highest rates of return, also encourages the selection of projects with high returns as well as high risk since financial arrangements exist for pooling, trading and diversifying risk (Levine, 2004:16). However, there is ambiguity as to the net effect of risk alleviation for the steady-state growth rate (Levine, 2004:6). Financial arrangements like liquid stock markets allow investors to readily purchase and sell stocks while firms have permanent access to capital, in this way increase investment into illiquid, high return projects and lowers risk (Levine, 1997:692). Thus, the financial system enables people to diversify away this risk which induces a portfolio modification toward investments with higher expected returns which can alter resource allocation, enhance the productivity of capital ([A] in Equation (2.5)) and improve the growth rate (Levine, 2004:15). In contrast, there is an ambiguous response of savings to risk sharing. According to Pagano (1993:617), consumers – with utility functions with constant relative risk aversion – tend to save less when financial markets (such as an insurance market) are introduced as the need for precautionary savings is reduced. Hence, the financial system which promotes more efficient risk sharing can effectively reduce the savings rate ([s] in Equation (2.5)) and to a degree offset the growth-enhancing effects of improved productivity of capital.

(v) Easing exchange. The financial system, by means of various financial arrangements of the payment system[6], plays an important role in the facilitation of the exchange of goods and services. An efficient payment system reduces the transaction and information frictions which are inherent in a barter exchange economy, where goods and services are evaluated for fair exchange, saving participants both time and energy (Berthelemy and Varoudakis, 1996a:8; Ncube, 2007:19). As a result of the time and energy savings, the payment system promotes specialisation – division of labour – amongst economic units so that they have opportunities to concentrate on production processes. Greater concentrated attention of economic units encourages innovation and thus the labour force is more likely to invent better equipment and production processes which promote productivity improvements (Smith, 1776:3). Levine (2004:24), in reviewing Greenwood and Smith (1997:164), states that "More specialisation requires more transactions. Since each transaction is costly, financial arrangements that lower transaction costs will facilitate greater specialisation. In this

[6] Payment system refers to the instruments (e.g. currency etc.), the institutional and organisational structures, the operational procedures, and the communication networks that facilitate exchange of assets and services between economic units (Aziakpono, 2008:22).

way, markets that promote exchange encourage productivity gains." Accordingly, the financial system by promoting exchange encourages specialisation, productivity gains ([A] in Equation (2.5)) and thus the progression of economic growth.

2.3.3 COMPETING CAUSAL VIEWS REGARDING THE FINANCE-GROWTH NEXUS

The theoretical insights provided so far show that a relationship exists between financial system development and economic growth. As previously noted the early work of Bagehot (1873) and Schumpeter (1911) are amongst a collection of authors who view finance as a leading factor in stimulating output growth and enhancing economic development. In contrast, Joan Robinson (1952) suggested that it was economic development that produced demands for financial arrangements and the financial system responded automatically to these demands. Hence, according to Robinson (1952:86), "By and large, it seems to be the case that where enterprise leads finance follows". Patrick (1966) provides a detailed explanation of the causal relationship between financial development and economic growth. Patrick (1966:175) refers to them as 'demand-following phenomena' and 'supply-leading phenomena'.

Patrick's (1966) 'demand-following' view emphasised the demand side of the economy from which he believed the need for financial factors emerged, reinforcing the earlier views of Robinson (1952). According to Patrick (1966:174), demand for financial services emanating from savers and investors in an economy was the leading factor in the formation of financial institutions, financial assets and liabilities. Moreover, this demand for financial services was dependent on the rate of growth of output, commercialisation and monetisation of traditional sectors of the economy. Hence, as declared by Patrick (1966:174), "the evolutionary development of the financial system is a continuing consequence of the pervasive, sweeping process of economic development". In light of the above, the activities of the financial system are somewhat of an automatic response process, widening and developing as a consequence of real economic development, playing a passive role in the growth process. Evidently in this context, causality flows from economic growth to financial development. On the other hand, the 'supply-leading' view acknowledges finance as a leading factor in the growth process, as similarly suggested by Schumpeter (1911). In this view, financial institutions and their financial services are established, not in response to demand, but rather in advance of demand for them, to serve two functions (Patrick, 1966:175). Firstly, financial

institutions are established to facilitate the transfer of resources from traditional sectors to modern, growth-inducing sectors. This occurs through wealth collection, savings and credit creation. Secondly, these financial intermediaries promote and stimulate an entrepreneurial response in the modern sectors, by assisting with mergers, in the establishment of new firms and with other lending to the modern sector (Patrick, 1966:176). In this view, causality runs from financial development to economic growth.

Patrick's (1966) 'demand-following' and 'supply-leading' phenomena therefore formed the two components of a sequential development framework similar to the Kuznets (1955) hypothesis. The sequential development process was firstly characterised by the supply-leading process playing a more significant role at the beginning of the growth process by inducing real-innovation-type investment. However, as the process of real growth occurs the supply-leading processes become less important and demand-following processes become more dominant. Hence, an economic system would be characterised by both of these causal relationships, however, only one particular causal state (relationship) could exist at a point in time in an economic system. Although Patrick (1966:177) does acknowledge that there is likely to be interaction between the two phenomena, little attempt is made to incorporate such ideas into the sequential development explanation.

A third view, known as the 'compliments view', studies the interactions between the two Patrick (1966) phenomena. This view suggests that a two-way reciprocal causal relationship exists between financial development and economic growth. In this framework, finance and growth are complimentary and mutually reinforcing. Greenwood and Jovanovic (1990:25) identify economic growth as a catalyst for financial structure development, while in turn financial structure allows for high growth through investment efficiency improvements. Similarly, Berthelemy and Varoudakis (1996b:300) explain that real sector growth causes expansions in financial markets, in turn, enhancing competition and efficiency in the banking sector. In return, these banking advancements augment the yield on savings, thus improving capital accumulation and growth (Berthelemy and Varoudakis, 1996b:300). These authors importantly note that such interactions between finance and growth could lead to two possible outcomes, termed virtuous and vicious circles. A virtuous circle emerges in situations where income levels were high, inducing greater development of the financial system, and in turn further stimulating economic growth (Aziakpono, 2008:28). In contrast, vicious circles develop in situations where low income levels serve to hinder financial sector development and thus impede economic growth. Hence, the results of two-way causality between finance and

growth are either a prosperous cycle or a detrimental cycle due to the mutually reinforcing nature of this relationship (Aziakpono, 2008:28).

Hence, Section 2.3 has highlighted the key issues in the finance-growth nexus in order to theoretically point out what the situation is regarding this relationship. This section indicated that (i) financial systems largely positively influence economic growth by efficiently performing the five key financial system functions, and (ii) the finance-growth relationship is not only characterised by uni-directional causality from financial development to economic growth but also uni-directional causality from economic growth to financial development and bi-directional mutual causality between finance and growth. Therefore, in Section 2.4 below, existing empirical literature will be reviewed to reveal the empirical insight into these key issues in the finance-growth relationship.

2.4 EMPIRICAL RESEARCH

The early work of Goldsmith (1969), McKinnon (1973) and Shaw (1973) is said to be the pioneering empirical research into the finance-growth relationship. Goldsmith (1969:48) found linkages between economic and financial development when examining thirty-five countries, over the period 1860 to 1963, using the financial intermediation ratio[7] (FIR) as a measure of financial development. While McKinnon (1973) and Shaw (1973) advanced the financial liberalisation argument[8] which provided support for a view that financial development had an important role in economic growth.

Although this early work elicited much attention, most of the empirical research in this area only emerged during the early 1990s. Studies such as Atje and Jovanovic (1993), King and Levine (1993), Demetriades and Hussein (1996), Demirgüç-Kunt and Levine (1996), Harris (1997), Levine and Zervos (1998) are among many which investigated the dynamics of the finance-growth relationship. Existing empirical literature can be classified into three parts based on the financial development measures used in the studies. These studies will be analysed in three sub-sections below. Studies examining the impacts of financial development on economic growth using banking system development measures alone (termed bank-based studies) will be reviewed in sub-section one, while studies employing stock market development measures alone (termed market-based studies) will be

[7] FIR is measured as the value of all financial assets divided by gross national product.

[8] McKinnon & Shaw suggested that the fragmentation of financial systems during a country's development process caused retardation of growth, while a financially liberalised economy reverses the effects of previously repressive policies and thus stimulates growth.

reviewed in sub-section two, and studies which use both banking system development and stock market development measures (termed hybrid studies) will be analysed in sub-section three.

2.4.1 BANK-BASED EMPIRICAL LITERATURE

Of the existing finance-growth empirical literature there is a relatively larger number of studies examining the role of financial intermediation in real activity than market-based studies. The crucial findings of King and Levine (1993) who examined a cross-section of eighty countries, from 1960 to 1989, to test Schumpeter's hypothesis that finance matters (the services of financial institutions stimulate long-run growth) is viewed as a fundamental piece of empirical research in this area. Using four banking system development measures[9], the authors investigated whether financial development improvements could significantly and robustly be associated with greater current and future rates of growth. King and Levine (1993) found that financial development precedes economic growth and that higher levels of financial development are positively associated with faster rates of current and future economic growth, physical capital accumulation, and economic efficiency improvements both before and after controlling for numerous country and policy characteristics. Results were thus indicative of Schumpeter's hypothesised positive linkage between financial development and long-run growth.

King and Levine's (1993) empirical work, although pioneering, was criticised (by Arestis and Demetriades, 1996; and Demetriades and Hussein, 1996) for limitations pertaining to the cross-sectional techniques used and the causal inferences concluded. The cross-sectional techniques suffer from limitations such as sample selection bias and inappropriate country weighting[10] (Demetriades and Hussein, 1996:390). Furthermore, the causal interpretation is flawed since the cross-sectional nature of the technique did not allow differing economies to display differing causality patterns (Demetriades and Hussein, 1996:391). Thus King and Levine's (1993) causality result is only applicable on average. Hence, Demetriades and Hussein (1996:391) conclude that King and Levine's (1993) results are indicative and therefore proposed standard time-series causality procedures.

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[9] Banking-system development measures included: (a.) Measure of financial depth – ratio of liquid liabilities to GDP; (b.) Measure of relative importance of financial institutions – ratio of deposit money bank domestic assets to deposit money bank domestic assets plus central bank domestic assets; Measures of domestic asset distribution – (c.) ratio of credit issued to nonfinancial private firms as to the total credit (excluding credit to banks) and (d.) ratio of credit issued to nonfinancial private firms as to GDP.

[10] Criticism is due to small and large countries receiving equal weighting, which is inherent in the technique.

Odedokun (1996) used cross-country regressions to examine seventy-one LDCs over differing periods spanning from the 1960s to the 1980s in order to evaluate the effects of financial intermediation on real GDP growth. Models used accounted for the external effects of the financial sector on the real sector and for effects of the financial sector on the productivities of factor inputs engaged therein. Odedokun (1996:131) found that financial intermediation promoted economic growth in about eighty-five percent of the countries. Furthermore, Odedokun (1996:133) found the growth enhancing effects of financial intermediation were more predominant in low-income LDCs than in high-income LDCs, and these growth promoting intermediation effects were equally as significant as other key growth promoting factors (such as export expansion, capital formation and labour force growth).

Beck *et al.* (2000) also assess the relationship between financial intermediation and overall economic growth, and the sources of growth (i.e. total factor productivity (TFP) growth, physical capital accumulation, and private savings rates). However, Beck *et al.* (2000) used a cross-country instrumental variable estimator and a dynamic Generalised Method of Moments (GMM) panel estimator to control for unobserved country-specific effects, simultaneity bias, and omitted variables bias. Beck *et al.* (2000:296) found robust, positive links between financial intermediation and both real *per capita* GDP growth and TFP growth, while failing to find any robust relations between financial intermediation and physical capital accumulation or private savings. Hence, financial intermediaries influence economic growth by influencing TFP growth.

More recent studies, such as Aslan (2008) and Kiran *et al.* (2009), employ panel cointegration analysis to investigate the effects of financial development on growth. Aslan (2008) examined nine Middle Eastern countries[11] from 1990 to 2003, using the ratio of the liquid liabilities of banks to GDP (BLL) as the measure of financial development. Aslan (2008) employs Pedroni (1999) panel cointegration and Dynamic OLS (DOLS) estimation. A positive, statistically significant relationship is found between finance and growth for these countries. Similarly, Kiran *et al.* (2009) employ Pedroni (1999) panel cointegration and Fully Modified OLS (FMOLS) methods to empirically study a panel of ten emerging countries[12] over the period from 1968 to 2007. Three measures of financial development were used, (i) the ratio of total domestic bank credit to GDP (BDC), (ii) the ratio of credit by deposit money banks and other financial institutions to private sector as to GDP (PSC), and (iii)

[11] Nine Middle East countries: Egypt, Iran, Israel, Jordan, Lebanon, Saudi Arabia, Syrian, Yemen and Turkey.

[12] Ten emerging countries: Egypt, India, Israel, Malaysia, Mexico, Pakistan, Peru, Philippines, Thailand, Tunisia.

BLL. Kiran *et al.* (2009) results show that financial development has a significant, positive effect on economic growth.

a) Purely African Bank-based Empirical Literature

Since the early empirical work there has been vast expansion of this research area to uncover the dynamics of the finance-growth relationship in a developing country setting, and more specifically in an African context. Hence, as with the studies previously reviewed, a greater number of African studies exist exploring the finance-growth nexus using banking system development measures compared to the smaller number of market-based African studies. Many of these studies will be reviewed below.

Ghirmay (2004) assessed the long-run finance-growth relationship in thirteen sub-Saharan African (SSA) countries[13] over varying periods from 1965 to 2000. Employing Johansen (1988) cointegration analysis, Ghirmay (2004:423) finds evidence of a long-run relationship between financial development (measured by PSC) and economic growth in almost all (twelve out of thirteen) of the countries. Ghirmay's (2004:424) causality results indicate that in eight countries financial development has a long-run causal effect on economic growth.

The relationship between financial intermediation and growth is also examined in four Southern African Customs Union (SACU) countries[14] by Aziakpono (2005a). Financial intermediation is measured by BLL and PSC, and Zellner seemingly unrelated regressions estimation (SURE) is employed on quarterly data from the first quarter in 1980 (or 1980:Q1) to 2000:Q1. Results show that South Africa derives the greatest benefits from financial intermediation, while Botswana also derives gains but a lack of strong evidence led Aziakpono (2005a:156) to suggests that 'demand following' finance might hold in Botswana. In Lesotho no significant positive intermediation effects on growth were found, while finance is interpreted as inhibiting Swaziland's growth. Aziakpono (2005a:155) therefore finds weak positive effects of financial intermediation on growth in the SACU.

[13] The 13 sub-Saharan African countries: Benin, Cameroon, Ethiopia, Ghana, Kenya, Malawi, Mauritius, Nigeria, Rwanda, South Africa, Tanzania, Togo, and Zambia.

[14] SACU countries include: Botswana, Lesotho, Namibia (excluded from Aziakpono (2005a) estimations), South Africa and Swaziland.

Odhiambo (2007) investigated the dynamic causal relationship between financial development and economic growth in Kenya, South Africa and Tanzania. Johansen-Juselius (1990) cointegration and error correction based Granger causality tests were applied to data from 1980 to 2005. Findings indicate that all three countries have stable long-run relationships between financial development and growth, while causality is sensitive to the development measure used (Odhiambo, 2007:274). When BLL is used as the financial development indicator there is bi-directional causality in Kenya, uni-directional causality from growth to finance in South Africa, and uni-directional causality from finance to growth in Tanzania. While the use of PSC and the ratio of currency to narrow money (CC-M1) as financial development measures revealed bi-directional causality in Tanzania, and uni-directional growth led finance in Kenya and South Africa.

Aziakpono (2008) studies the same four SACU countries[15] as above (i.e. Aziakpono, 2005a) but examines annual data from 1970 to 2004 and uses a vector autoregressive (VAR) and vector error correction model (VECM) framework based on the Johansen maximum likelihood approach. By employing two banking sector development measures (i.e. PSC and BLL) Aziakpono (2008:187) finds that a long-run relationship exists for each country irrespective of the financial development measure used. Overall, causality mainly runs from financial development to output with the only exception being Lesotho where two-way causality was found to dominate. Aziakpono (2008:202) found that PSC had a largely negative long-run causal effect on output in Botswana and South Africa, while PSC also had a negative effect but not strong in Lesotho and the effect of PSC in Swaziland was ambiguous. The impact of BLL on the output level was largely ambiguous with the exception of Swaziland, where BLL was found to have a robust positive effect on the output level. Aziakpono's (2008) results as well as Table A.1 in the Appendix, which summarises a cross reading of the empirical literature, highlights that the finance-growth relationship is not only characterised by mixed results.

Acaravci *et al.* (2009) empirically study twenty-four SSA countries from 1975 to 2005 to determine the relationship between financial development and economic growth. Three banking system development measures are used, which include BLL, BDC and PSC. Acaravci *et al.* (2009) examine the finance-growth relationship using Pedroni (1999, 2004) panel cointegration and Panel GMM causality estimations. Pedroni panel cointegration results show no long-run relationship between financial development and growth, while short-run causality results differ as to the development

[15] SACU countries include: Botswana, Lesotho, South Africa and Swaziland (Namibia was excluded due to limited observations).

measure used. There is bi-directional causality between growth and BDC, while there is uni-directional causality from PSC to economic growth, and uni-directional causality from economic growth to BLL (Acaravci *et al.,* 2009:24).

Individual county empirical studies have also examined the finance-growth relationship, such as Ghali (1999), Aziakpono (2005b), and Agu and Chukwu (2008). Ghali (1999) empirically analysed linkages between finance and economic growth from 1963 to 1993 in Tunisia employing Engle-Granger (1987) cointegration, Johansen (1988) cointegration and Granger causality tests. Ghali (1999) found a stable long-run relationship between financial development and *per capita* real output, with Granger causality running from finance to economic growth in Tunisia. While Aziakpono (2005b) examined the effects of financial intermediation on economic growth in Lesotho using quarterly data from 1980:Q1 to 2001:Q4. Johansen and Juselius (1992) cointegration findings reveal a lack of long-run impact of financial intermediation on economic growth (irrespective of the financial intermediation measure[16] used), while the results of the weak exogeneity tests, impulse response and variance decomposition analysis reveal a lack of mutual causality between financial intermediation and growth. Aziakpono (2005b:24) cautions that these results do not suggest that there is no role for financial intermediation in promoting Lesotho's economic growth, rather that finance has a weak impact on economic growth.

Agu and Chukwu (2008) investigated a similar hypothesis in Nigeria from 1970 to 2005, using the Johansen and Juselius (1990) cointegration approach as well as Toda-Yamamoto causality tests. A stable long-run relationship is found between growth and financial development. Uni-directional causality from growth to finance is found when PSC and BLL are used as development proxies, while uni-directional causality from financial development to growth prevails when the ratio of bank deposit liabilities to GDP and the loan deposit ratio are used as financial development measures.

2.4.2 MARKET-BASED EMPIRICAL LITERATURE

As earlier noted, there exists substantially less empirical research which employs stock market development indicators when examining the finance-growth relationship. This is primarily due to data limitations since fewer established stock markets exist globally relative to banking systems. One

[16] Three financial intermediation measures used: (i) BLL, (ii) PSC, and (iii) ratio of PSC to LL [PSC-BLL].

of the early studies which examined the role of stock market development in the economic growth process was by Atje and Jovanovic (1993). The researchers analysed forty countries from 1980 to 1988 employing OLS regressions on a cross-sectional model. Using the ratio of annual value of all stock market trades to GDP (VALT) as the stock market development measure, Atje and Jovanovic (1993:636) found large growth enhancing effects of stock markets on economic development. Levine and Zervos (1996), building on Atje and Jovanovic's (1993) work, use instrumental variable procedures on pooled cross-country, time series regressions for forty-one countries from 1976 to 1993. Levine and Zervos (1996:335) find that stock market development (measured by an overall stock market development index[17]) is strongly, positively correlated with economic growth, even after controlling for other growth influencing factors.

These studies have however been criticised by other researchers due to flaws in their methodologies. Harris (1997:140) suggests that Atje and Jovanovic's (1993) findings may be misleading since they used lagged investment as opposed to current investment. According to Harris (1997), this inadequately deals with endogeneity and gives rise to omitted variables bias, thus the coefficient of stock market development is biased upwards. So Harris (1997:140) includes current investment instead of lagged investment into the model and estimates it using Two Stage Least Squares (2SLS) estimation. Harris (1997:145) finds that the effects of stock market development do not offer much explanation for economic growth. Harris' (1997) findings together with the summary in Table A.1 in the Appendix importantly highlight that the use of differing financial development measures produces mixed or conflicting results, since finance-growth linkages are sensitive to the financial development measure employed. In terms of the early market-based work, Levine and Zervos (1996:336) themselves caution that their results should be taken as suggestive partial correlations as there are limitations associated with cross-country growth regressions. Levine and Zervos (1996:325) suggest that cross-country growth regressions suffer from measurement, statistical and conceptual problems. According to Levine and Zervos (1996:325), measurement issues stem from inconsistencies in the way variables are defined, collected, and measured across countries; statistical problems exist since regression analysis assumes that the observations are drawn from the same population however vastly different countries often appear in cross-country regressions; and conceptual issues exist since cross-country regressions do not resolve issues of causality and coefficients are not interpreted with the required caution since cross-country regressions often

[17] Overall stock market development index is calculated by averaging the means-removed values of the market capitalisation ratio, the total value traded ratio, the turnover ratio, and the asset pricing theory (APT) mispricing indicator of stock market integration.

involve averaging over long periods. Mohtadi and Agarwal (2004) also caution against these three methodological issues in Levine and Zervos (1996, 1998).

Amongst studies employing more advanced panel and time series methodologies (such as the panel instrumental variables approach and Johansen-Juselius (1990) cointegration) to investigate the impact of stock market development on real activity includes Filer *et al.* (1999), Mohtadi and Agarwal (2004), Van Nieuwerburgh *et al.* (2006), Padhan (2007), and Shabhaz *et al.* (2008). Using the ratio of stock market capitalisation to GDP (MCP), turnover velocity[18] and the change in the number of domestic listed shares as stock market development measures, Filer *et al.* (1999) applied Granger causality tests to an unbalanced panel of sixty-four countries over varying time periods between 1985 and 1997. Filer *et al.* (1999:14) found a strong relationship between stock market development and future growth in low and lower middle income countries but not in higher income countries. Mohtadi and Agarwal (2004) similarly find a positive relationship between financial development and economic growth in twenty-one developing countries from 1977 to 1997. The dynamic panel model is estimated using the instrumental variables approach and reveals that stock market development positively influences growth both directly (when the turnover ratio [TURN] is used, i.e. the ratio of total shares traded value to market capitalisation) and indirectly (when MCP is used).

Van Nieuwerburgh *et al.* (2006) analysed the finance-growth nexus in Belgium, from 1832 to 2002 and also during various sub-periods[19] between 1832 and 2002, employing Johansen-Juselius (1990) cointegration and Granger causality tests. The researchers used five stock market development measures[20] and conclude that financial development substantially affected Belgium's economic growth. Specifically, Van Nieuwerburgh *et al.* (2006) found that stock market development played a smaller role in economic performance prior to 1873 in comparison to the post 1873 period, while the stock market influenced Belgium's economic growth most significantly between 1873 and 1935, and there was a smaller influence of the stock market on economic performance after 1935. Therefore, the researchers found that the relationship between stock market development and economic performance was time-varying in nature, changing with the institutional changes in

[18] Turnover velocity was computed as the ratio of turnover to market capitalisation (Filer *et al.*, 1999:4).

[19] Sub-periods Include: 1832–1914; 1914–2002; 1832–1873; 1873–1935; 1935–2002.

[20] Five stock market development measures: (i) stock market capitalisation, (ii) total number of listed shares, (iii) annual number of initial public offerings [IPOs], (iv) ratio of the total number listed firms to number of Belgium firms [operating mainly in Belgium], (v) share the 3 largest Belgium firms [operating in Belgium] have of total market capitalisation of Belgium firms [operating in Belgium].

Belgium (i.e. liberalisation of the stock market in 1867, laws passed pertaining to limited liability companies in 1873 and reforms of the stock market and the financial system in 1935).

Padhan (2007) assessed the Indian finance-growth relationship by applying Johansen-Juselius (1990) cointegration tests and Toda-Yamamota, Dolado and Lutkephol (TYDL model) Granger non-causality tests to monthly data from 1991:04 to 2005:03. Padhan's (2007:748) results show a long-run relationship between finance and growth, with bi-directional Granger causality between stock market development[21] and economic activity. While Shabhaz *et al.* (2008:191) found that in Pakistan, from 1971 to 2006, there was a long-run relationship with bi-directional causality between stock market development (measured by MCP) and economic growth, though short-run causality was uni-directional from finance to growth.

a) Purely African Market-based Empirical Literature

Focus on African countries by researchers is extremely rare, even when studies have analysed impacts of stock market development on growth in developing economies. This is largely because African markets are relatively recent in origin, small by world standards and have inadequate regulatory frameworks. However, recently researchers have given some attention to empirically examining the role stock markets perform in African economies.

Adjasi and Biekpe (2006) study the effects of stock market development (measured by MCP, VALT, and TURN) on economic growth in a dynamic panel of fourteen African countries[22] over varying periods from 1975 to 2001. Employing the GMM dynamic instrumental variable modelling approach, Adjasi and Biekpe (2006:149) found that on the whole stock market development (only when using VALT) is important for growth. When countries were divided into income groups then stock markets had significant positive influences on growth only in upper middle income countries (Botswana, Mauritius and South Africa), while classifying countries as to market capitalisation groups showed that stock markets were more important in countries with moderately capitalised markets (Mauritius and South Africa). Nowbutsing and Odit (2009:77) provide support to Adjasi

[21] Stock market development measure is: Stock price taken from the Bombay Stock Exchange (BSE) Sensex index.

[22] The fourteen countries included: Botswana, Egypt, Ghana, Ivory Coast, Kenya, Mauritius, Morocco, Namibia, Nigeria, South Africa, Swaziland, Tunisia, Zambia, and Zimbabwe.

and Biekpe's (2006) findings for Mauritius as they also find that stock market development (i.e. MCP and VALT as measures) positively affects growth in the short-run and long-run from 1989 to 2006.

Enisan and Olufisayo (2009) examined the effects of stock market development, measured by MCP and VALT, on economic growth in seven African countries[23] from 1980 to 2004. The autoregressive distributed lag (ARDL) bounds test and VECM based Granger causality tests were used. Enisan and Olufisayo (2009:167) only find a long-run relationship between stock market development (irrespective of the indicator) and growth in Egypt and South Africa, with uni-directional Granger causality from finance to growth. VAR based causality tests show bi-directional causality between stock market development (irrespective of the indicator) and growth prevails in the Ivory Coast, Kenya, Morocco and Zimbabwe. While in Nigeria there is weak evidence of growth led finance when MCP is used as the development measure.

N'zue (2006), studying the Ivory Coast from 1976 to 2002, provides differing findings to that of Enisan and Olufisayo (2009) for the Ivory Coast. Bivariate Johansen cointegration tests performed by N'zue (2006:137) revealed no cointegration between stock market development and growth, similar to Enisan and Olufisayo's (2009) findings. However, when multivariate Johansen-Juselius (1990) cointegration tests were used and several control variables[24] were included then N'zue (2006:137) found that a long-run relationship between stock market development[25] and economic growth existed, along with uni-directional causality which ran from financial development to growth.

Ezeoha *et al.* (2009) also reached differing conclusions to Enisan and Olufisayo (2009) when examining the impact of stock market development (measured by MCP) on domestic and foreign private investment flows in Nigeria using Johansen (1988) cointegration. Ezeoha *et al.* (2009:31) find a positive, significant relationship between stock market development and domestic private investment growth, which in turn positively influences economic growth in Nigeria. The summary in Table A.1 in the Appendix also shows that mixed or conflicting results exist when studies examine similar countries however employ differing econometric methods, as just highlighted.

Odhiambo (2010) empirically studied the relationship between three stock market development measures (i.e. MCP, VALT, TURN) and economic growth in South Africa from 1971 to 2007.

[23] The seven African countries: Egypt, Ivory Coast, Kenya, Morocco, Nigeria, South Africa, and Zimbabwe. Selected based on stock market establishment date and data availability.

[24] Four control variables: (i) public investment, (ii) foreign direct investment, (iii) public expenditure, and (iv) public development aid.

[25] Stock market development indicators: (i) MCP-GDP, (ii) VALT-GDP, and (iii) the stock market's 4-firm concentration ratio.

ARDL bounds test results indicate that there is a long-run relationship between financial development and growth irrespective of the indicator used, while causality findings are sensitive to the financial development measure used. When VALT and TURN are used then stock market development seems to Granger-cause economic growth, whereas when MCP is used then economic growth Granger causes stock market development (Odhiambo, 2010:9). Therefore, Odhiambo (2010:10) concludes that overall there is a predominant causal flow from stock market development to economic growth in South Africa, similar to Enisan and Olufisayo's (2009) findings.

2.4.3 HYBRID – BANK & MARKET – BASED EMPIRICAL LITERATURE

Hybrid empirical research in this area emerged mostly from the mid 1990s when there was greater available financial system data to use in calculating both bank development and market development indicators for specific countries. Levine and Zervos (1998) empirically investigate whether six measures of stock market development[26] and a single banking development measure (i.e. PSC) are robustly association with current and future rates of economic growth in forty-nine countries from 1976 to 1993. Employing OLS cross country regressions, instrumental variables approach and sensitivity checks, Levine and Zervos (1998:29) find a positive link between financial development and economic growth suggestive of an integral role in the growth process for financial factors. Specifically, it was found that two stock market development measures (i.e. TURN and VALT) and the banking system development measure were positively and significantly correlated with current and future rates of economic growth, capital accumulation and productivity growth.

Levine and Zervos' (1998) work was criticised by Beck and Levine (2004). According to Beck and Levine (2004:425), the OLS regression approach used fails to (i) account for potential simultaneity bias, (ii) control for fixed country effects and (iii) control for the routine use of lagged dependent variables in the growth regressions. Beck and Levine (2004) however acknowledge an important methodological improvement made by Rousseau and Wachtel (2000). Rousseau and Wachtel (2000:1955) applied the panel GMM technique – which removes any bias from unobserved country-specific effects and eliminates effects from simultaneity bias – to data on forty-seven countries from

[26] Stock market development indicators: (i) MCP, (ii) TURN, (iii) VALT, (iv) Market Volatility [12-month rolling standard deviation estimate based on market returns], (v) CAPM calculated integration measure, and (vi) APM calculated integration measure.

1980 to 1995 and found leading effects for both stock market development (measured by MCP and VALT) and banking development (measured by BLL) on *per capita* output.

Therefore, Beck and Levine (2004) also employ the GMM technique to examine the impact of stock markets and banks on economic growth in forty countries over the period from 1976 to 1998. Beck and Levine (2004) improve on earlier studies (e.g. Rousseau and Wachtel, 2000) by (i) averaging the data over five-years (to avoid business-cycle effects), (ii) controlling for other growth determinants and reverse causation, (iii) more carefully deflating the data for financial development indicators, and (iv) performing robustness checks of the results. Beck and Levine (2004:440) find, on the balance, that bank and stock market development is important and has positive effects on economic growth.

The effect of financial development on economic growth in Greece was assessed by Hondroyiannis *et al.* (2005). Johansen-Juselius (1990) cointegration and Granger causality tests were applied to monthly data from 1986:01 to 1999:12. Hondroyiannis *et al.* (2005:186) find a long-run relationship between banking development (measured by PSC and the ratio of bank credit extended to industries as to GDP), stock market development (measured by MCP and the ratio of market capitalisation of industrial shares as to GDP) and economic growth, with bi-directional causality between economic growth and financial development measures. Overall, finance has a weak effect on growth in Greece, with banking development considerably more important for growth than stock market development.

Other hybrid studies assessing the finance-growth nexus, by employing panel techniques, include Law (2004), and Naceur and Ghazouani (2007). Law (2004) uses traditional panel data estimation and dynamic panel data estimations (namely: the mean group and pooled mean group estimation) when analysing the finance-growth nexus in fourteen developing countries[27]. Over a twenty-four year period, from 1978 to 2001, Law's (2004:20) estimations indicate that both banks and stock markets are important in promoting economic growth, with the impact of banking sector development more influential compared to stock market development. While Naceur and Ghazouani (2007), using GMM estimates, fail to find a significant relationship between banking development[28], stock market development[29] and growth for eleven countries[30] of the Middle-East North-Africa (MENA) region for the period from 1979 to 2003. After controlling for stock market

[27] Fourteen developing countries: Brazil, Chile, Colombia, Egypt, Jamaica, Jordan, Korea, Mexico, Malaysia, Philippines, Thailand, Uruguay, Venezuela, and South Africa.

[28] Bank development measures: (i) BLL, (ii) PSC, and (iii) Bank Aggregate Index [average of BLL and PSC]

[29] Stock market measures: (i) MCP, (ii) VALT, (iii) TURN, and (iv) Stock Market Aggregate Index [average of MCP, VALT, TURN].

[30] Eleven countries include: Bahrain, Egypt, Iran, Jordan, Kuwait, Lebanon, Morocco, Oman, Saudi Arabia, Tunisia, and Turkey.

development, the impact of banking development on growth became negative, which Naceur and Ghazouani (2007:313) explain could have been due to the underdeveloped nature of MENA financial systems hampering economic growth or caused by unstable MENA growth rates.

a) Purely African Hybrid – Bank & Market – based Empirical Literature

There exists scanty empirical research investigating the effects of finance on growth in Africa by employing both bank development and stock market development measures. This is chiefly due to the limited available banking system and stock market data for African countries. Thus there is a relative abundance of studies which use a single class of financial development measure. Below three purely African studies which employ both classes of financial development measures will be reviewed.

The effect of Egypt's financial development on TFP and economic growth was investigated by Bolbol *et al.* (2005) for the period from 1974 to 2002. The authors studied the interactions of bank-based[31] and market-based[32] financial development indicators with two enabling factors (*per capita* income and private net resource flows). Banking development measures were found to have a negative impact on TFP growth, only becoming positive impact when after a certain threshold level[33] of *per capita* income (Bolbol *et al.*, 2005:186). Hence, the banking system's positive impact on Egypt's economic growth is highly dependent on improvements to per-capita income. Stock market development had more prominent effects on TFP growth, particularly when related with private net resource flows (Bolbol *et al.*, 2005:190). Hence, indicating that the Egyptian stock market's influence on growth depends somewhat on foreign capital inflows. Bolbol *et al.* (2005:193) conclude that over the sample period the widening of financial development, to include the stock market, has positively impacted on TFP and growth in Egypt.

Frank (2007), using an aggregate stock market development indicator[34] and PSC as a banking development indicator, examined the effects of financial deepening on economic growth in South Africa from 1989 to 2001. OLS regression results reveal a positive relationship between banking

[31] Banking development measures: (i) PSC, and (ii) Ratio of commercial banks assets to commercial bank & central bank assets.

[32] Stock market development measures: (i) MCP, and (ii) TURN.

[33] Minimum threshold level equals US $1265 of change in *per capita* income.

[34] Aggregate stock market development index was comprised of, equally weighted: (i) Size, MCP; (ii) Liquidity, VALT; and (iii) Market integration with world capital markets [ratio of foreign portfolio investments to nominal GDP].

development and growth, and also a negative relationship between stock market development and growth. Frank's (2007:32) Johansen cointegration and Granger causality results indicate a positive relationship between banking development and growth with a high probability that growth causes banking development, while there was no significant causal relationship between stock market development and economic growth. Frank (2007:33) explains that market liquidity was by far the most influential component of the aggregate stock market index, while market size had no importance and international market integration had very little importance. This led Frank (2007:33) to conclude that "[g]iven the rather thin trading of the JSE Securities Exchange then, this may be the reason that a significant causal relationship between stock market development and growth could not be found."

In contrast, Gondo (2009:20) finds that stock market development (measured by VALT) and banking system development (measured by PSC) have a complimentary and progressive impact on economic growth in South Africa. This is interesting given that Frank (2007) similarly used PSC as a banking development indicator and VALT comprised the largest proportion of the stock market development measure used by Frank (2007) which he argued could have been largely responsible for the inconclusive causal findings. However, the data and methodology differences might largely explain the inconclusive findings. Frank (2007) analysed quarterly data from 1989:01 to 2001:04 and included stock market volatility as the only control variable. While Gondo (2009) examines annual data from 1970 to 1999, employs the instrumental variables approach and includes a wider set of control variables (e.g. inflation, trade openness, government share of real GDP, investment share of real GDP, and periods of monetary authorities intervention and regulation). These findings, as well as the summary provided in Table A.1 in the Appendix, illustrate that employing differing econometric methods can often result in mixed or conflicting results.

2.5 CONCLUSIONS

This chapter set out to explore the key issues in the relationship between financial development and economic growth. The initial task was to highlight the crucial role that the financial system performs in the economy and how this role affects changes in growth processes. In this regard, great theoretical debate surrounds the growth altering influence of overall financial development as well as the effects of financial structural differences on economic growth.

The empirical literature was separately reviewed in three broad groups based on the type of financial development measures used, namely: (i) bank-based studies, (ii) market-based studies, and (iii) hybrid – bank-market – based studies. Of the existing empirical literature, there are by far a greater number of studies which explore the finance-growth relationship by using banking system development measures in comparison to studies that use stock market development measures or a combination of banking system and stock market development measures. Purely African focused studies make up only a small part of the existing body of empirical literature on the linkage between financial development and growth. In terms of the Africa specific empirical research there is a relative abundance of bank-based studies, with substantially less market-based African studies, and very little available hybrid based studies (with only three purely African hybrid studies reviewed).

Generally, the empirical literature finds that a relationship exists between the development of a country's financial system and economic growth in that country. However, the strength of this relationship and the causal direction which holds is sensitive to the financial development measures used, control variables included, estimation techniques employed, study period covered and countries examined. In this regard, empirical literature commonly suggests that to avoid drawing incorrect conclusions about the overall impact of financial development on economic growth more than a single measure of financial development should be considered and the highly flawed approach of cross-sectional analysis should be avoided.

Given that: (i) in general, African specific studies only constitute a small proportion of the large existing body of finance-growth empirical literature; (ii) there are very few purely African hybrid (bank and market) based studies currently known of; (iii) only a few purely African analyses have employed the more advanced technique of panel cointegration; and (iv) early purely African studies do not include a comprehensive set of control variables. Therefore, this study aims to address these aforementioned concerns by applying the panel cointegration technique to variables which capture banking system development, stock market development, overall financial development and various control factors within a purely African focused hybrid (bank and market) based study.

The next chapter compares the financial systems of the countries under investigation with a view of uncovering the relative performance of the banking systems and stock markets, and to establish if there are any possible linkages between financial development and economic performance. This chapter together with the next chapter lays the foundations for the empirical analysis.

CHAPTER 3:
OVERVIEW AND COMPARISON OF FINANCIAL SYSTEMS

3.1 INTRODUCTION

This chapter aims to provide a brief overview of the financial systems of Egypt, the Ivory Coast, Kenya, Morocco, Nigeria, South Africa and Tunisia in order to achieve the first sub-objective of this study set out in Chapter 1. More specifically, this chapter intends to review the background events and the key performance indicators of each country's financial system during the study period. This chapter is therefore divided into five main sections. Section 3.2 considers the circumstances faced by African economies which may have influenced the operations and performance of the respective financial systems during the sample period. Section 3.3 closely assesses the performance of the banking systems in the sample countries and compares them based on banking development measures such the liquid liabilities ratio, the private sector credit ratio and the ratio of bank liquid reserves to bank assets. Section 3.4 analyses and compares the performance of the stock markets in the study countries based on measures of stock market development which include the market capitalisation ratio, the number of domestically listed companies, total stock value traded ratio and the turnover ratio. Section 3.5 examines the selected indicators of banking system and stock market development in relation to each country's economic performance so to identify any possible linkages between financial development and economic growth. Finally, Section 3.6 concludes this chapter.

3.2 BACKGROUND OF AFRICAN FINANCIAL SYSTEMS

African countries are amongst the poorest and most weakly institutionalised economies in the world. There is consensus amongst researchers (such as Easterly and Levine, 1997; Abraham, 2003; Oliver and Aldcroft, 2007; Knutsen, 2009) that African countries suffer from a 'growth tragedy' or 'development disaster' where economic growth has been largely negative from the 1970s to 1990s. According to Oliver and Aldcroft (2007:317), this is primarily due to declines in physical capital accumulation (which was negative between 1984 and 1994) and sharp deteriorations in total factor productivity (which was negative between 1960 and 1994). Researchers commonly scrutinise the degree of success that financial sector reforms, encouraged by the International Monetary Fund

(IMF) and the World Bank, have had in Africa. During the 1980s many African countries adopted financial sector reforms which were based upon the financial liberalisation theories of McKinnon and Shaw, whereby reforms were aimed at removing repression and advancing economic growth and development (Ncube, 2007:26). Financial sector reforms commonly include liberalising interest rates, eliminating administrative credit allocations, restructuring banking systems, improving financial regulations, developing financial markets, and moving towards indirect monetary policy (Ncube, 2007:26). Reforms have however not had the desired effects.

According to CIA World Fact Book (2009:1) data for GDP *per capita* (PPP) country comparisons, nine of the ten poorest countries in the world are African nations, with the Democratic Republic of Congo as the poorest country with a recorded GDP *per capita* of US$300. The World Bank uses Gross National Income (GNI) *per capita*, calculated based on the Atlas Method, as the main criterion for classifying economies. The World Bank similarly shows that the ten poorest countries globally, based on the World Development Indicators (2009), are African nations (see Table 3.1). Furthermore, other measures evidenced in Figure 3.1 show that African nations (from North Africa and sub-Saharan Africa) have the lowest levels of gross domestic savings and gross capital formation worldwide, while Figure 3.2 indicates that sub-Saharan Africa in specific has the largest interest rate spread worldwide. This evidence gives a brief indication of the level of underdevelopment and stagnation African economies are faced with.

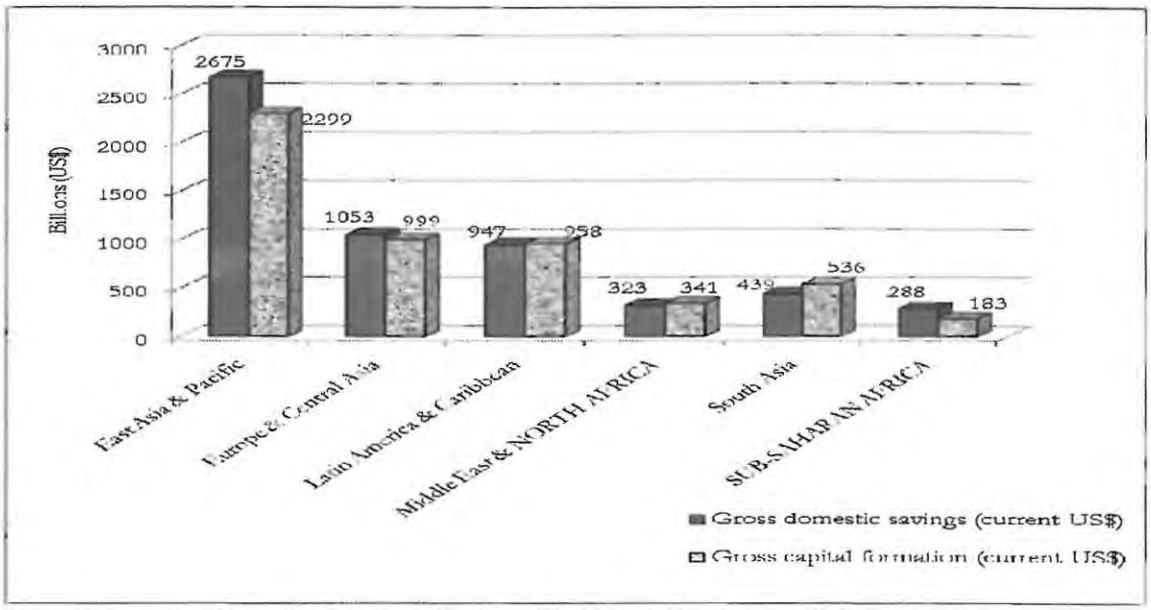
Table 3.1: Poorest Countries based on GNI *per capita* (Current US$) & GNI *per capita* (PPP, Current International $) in 2008

2008 - GNI *per capita*, Atlas method (current US$)		
10	Guinea	350
9	Niger	330
8	Sierra Leone	320
7	Eritrea	300
6	Ethiopia	280
6	Malawi	280
4	Guinea-Bissau	250
3	Liberia	170
2	Democratic Republic of Congo	150
1	Burundi	140

2008 - GNI *per capita* (PPP, current international $)		
10	Malawi	810
9	Sierra Leone	770
9	Mozambique	770
7	Central African Republic	730
6	Niger	680
5	Eritrea	640
4	Guinea-Bissau	520
3	Burundi	380
2	Liberia	310
1	Democratic Republic of Congo	280

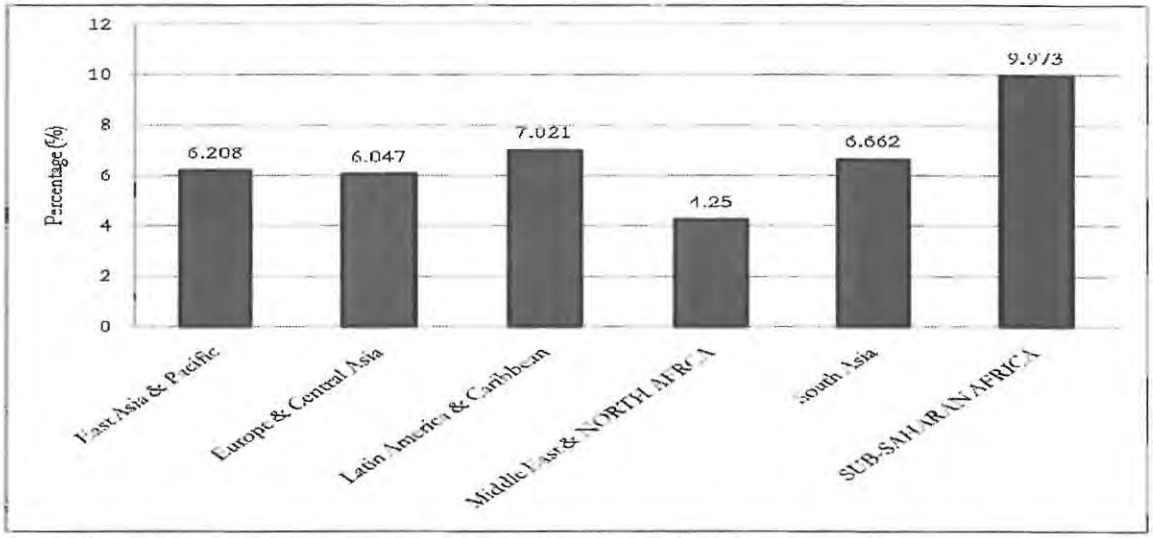
Source: Table compiled by author based on data from World Bank Development Indicators (2009)

Figure 3.1: Regional Gross Domestic Savings and Gross Capital Formation in 2008 (Billions US$)



Source: Figure plotted by author based on data from World Bank Development Indicators (2009)

Figure 3.2: Interest Rate Spreads[35] in 2007



Source: Figure plotted by author using based on data from World Bank Development Indicators (2009)

The financial systems of African countries are dominated by their banking sectors and thus the largest source of external finance for African firms emanates from banks. The unsuccessful nature

[35] Interest rate spread is the difference between the interest rate banks pay for deposits received and the interest rate banks charge on loans to prime borrowers; this is a measure of banking efficiency.

of financial reforms has meant that African financial systems remain highly underdeveloped with low levels of technological progress, expertise, financial infrastructure and only a few stock markets being established prior to 1988 (Mlambo and Biekpe, 2001:61). The financial systems of Egypt, the Ivory Coast, Kenya, Morocco, Nigeria, South Africa, and Tunisia are relatively well developed compared to other African countries, hence, these seven countries are analysed in what follows.

3.3 BANKING-SYSTEMS

According to an array of researchers (see for example: Demirgüç-Kunt and Levine, 1999; Law, 2004; Chakraborty and Ray, 2006; Ncube, 2007; Aggarwal and Goodell, 2009; amongst others) less developed countries, and Africa specifically, are predominantly dependent on their banking systems (relative to stock markets) as a source of financing for growth and expansion purposes. Although African banking systems have been noted to be more influential in promoting growth, the manner in which the banking systems have gone about this has changed over time. Prior to the adoption of financial sector reforms (during the 1980s and 1990s) African banking systems were commonly characterised by little/no foreign participation in the domestic banking sector; a narrow range of financial institutions (largely state owned banks) which were often obliged to lend to priority sectors irrespective of the profitability of the borrowing firms (giving little concern to small-scale entrepreneurs and the rural operators); capital flows were tightly regulated; and the financial asset portfolios of banks were highly concentrated in only a few commodities and industrial sectors, and were plagued by a large proportion of non-performing loans (Jbili *et al.*, 1997:29; UNECA, 1997:1).

Since the implementation of financial sector reforms there has been a drastic increase in the total number of banks, the number of foreign banks, the value of bank assets, and the degree to which banks finance the private sector of the economy. This is seen in the number of banks increasing from 40 banks prior to 1986 in Nigeria to 89 banks in 1998, similarly the total number of banks in Egypt rose from 27 banks in 1975 to 62 banks in 2001, while total bank assets as a percentage of GDP also increased from 93 percent to 135 percent during this same period in Egypt (Central Bank of Nigeria, 2010; Bolbol *et al.*, 2005:180). According to the World Economic Forum (2010), South Africa's banking system is ranked sixth globally in terms of soundness (i.e. balance sheet health) and is the most sound in Africa, while it is easiest to obtain a bank loan in Kenya with only a good

business plan and no collateral in comparison to the other sample countries, and the interest rate spread (a measure of banking efficiency) is lowest in Morocco, as reported in Table 3.2. Hence, we see that African banking systems have progressed by world standards since financial liberalisation. However, the most problematic factor for doing business in the African countries is largely the lack of access to financing, indicating there is still a large degree of domestic financial system weakness.

Table 3.2: Global Rankings of African Banking Systems

	World Ranking					
	Availability of financial services	Ease of Access to Loans	Affordability of financial services	Interest Rate Spread	Soundness of Banks	Most Problematic Factor for doing Business
Egypt	60	49	69	69	61	Corruption
Ivory Coast	105	138	101	92	98	Access to financing
Kenya	53	21	67	107	74	Corruption & Access to finance
Morocco	61	44	56	21	69	Access to financing
Nigeria	90	126	84	74	122	Access to financing
South Africa	7	41	43	34	6	Inefficient Gov Bureaucracy
Tunisia	42	30	31	30	59	Access to financing

Note: Ranking is relative to the 133 countries considered in the World Economic Forum, Global Competitiveness Report, 2010-2011.

Source: Table compiled by author based on information from World Economic Forum, Global Competitiveness Report 2010-2011

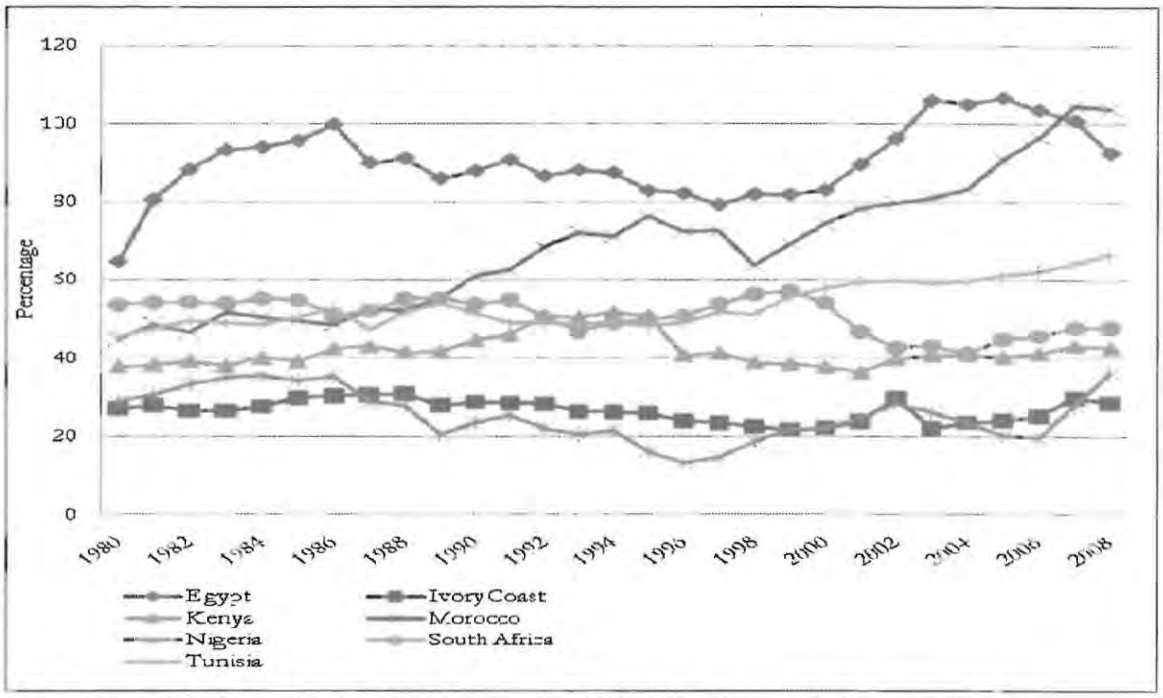
Next, we analyse various indicators of banking system size and liquidity in the seven sample countries from a historical perspective in order to understand the significance of banking systems to these countries and to decipher which of the sample countries have the leading banking systems.

3.3.1 BANKING SYSTEMS: SIZE

The liquid liabilities ratio is utilised as an indicator of the size of the banking system, taken as the size of financial intermediaries relative to the size of the economy. The liquid liabilities ratio is calculated as the ratio of bank liquid liabilities (measured by the money stock - M3) to GDP. Higher liquid liabilities ratios indicate larger banking systems and the size of a banking system is positively related to the provision of financial services (World Bank, 2004:273). Figure 3.3 below indicates that

Egypt and Morocco have by far the largest banking systems in the sample with liquid liabilities ratios of 97.35 percent and 96.57 percent respectively in 2006. Tunisia and South Africa have the third and fourth largest banking systems over the sample period with average liquid liabilities of 53.5 percent of GDP and 51 percent of GDP respectively. Kenya's banking system is seen as the fifth largest with an average liquid liabilities ratio of 42 percent from 1980 to 2008, while the Ivorian banking system is ranked sixth. The Nigerian banking system is seen to have the least depth even though Nigeria had a total of 89 registered banks in 1998. However, reforms implemented since 2004 have seen the minimum financial reserves held by banks increase from 2 Billion Naira to 25 Billion Naira, prompting numerous mergers and takeovers, consequently only 24 banks remained (PWC, 2010a:1).

Figure 3.3: Liquid Liabilities Ratios

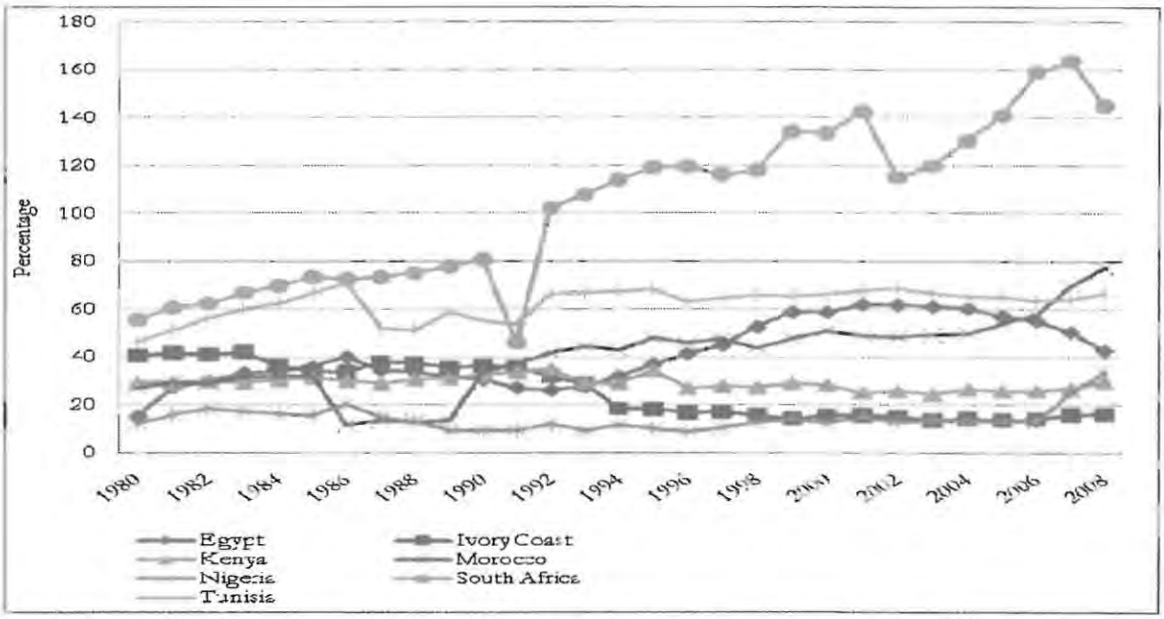


Source: Figure plotted by author based on data from World Bank Development Indicators (2009)

A second banking sector size indicator is the private sector credit ratio which is calculated as the amount of domestic credit allocated to the private sector (by the banking sector) divided by GDP. The private sector credit ratio indicates the extent to which banks finance the economy, and more specifically the extent to which banks finance private investment and private sector development (World Bank, 2009:273). Therefore, this ratio not only indicates banking system size but also the

importance of the banking system to the private sector of an economy. The banking system refers to monetary authorities, deposit money banks, savings institutions, loan institutions, and building associations (World Bank, 2009:289). Domestic credit provided to the private sector includes financial resources which establish a claim for repayment such as loans, purchases of non-equity securities, trade credits and other accounts receivables (World Bank, 2009:273). Hence, this domestic credit excludes credit extended to governments and public enterprises (Beck and Levine, 2004:428).

Figure 3.4: Domestic Credit provided to the Private Sector as a Percentage of GDP



Source: Figure plotted by author based on data from World Bank Development Indicators (2009)

Figure 3.4 above graphically plots the evolution of the ratio of domestic private sector credit provided by banking sector to GDP from 1980 to 2008 for the seven sample countries. South Africa consistently has the highest private sector credit ratio except for a dramatic fall off in 1991 which coincides with a political shift in South Africa. Thus, according to private sector credit ratios the banking system of South Africa is the largest in Africa and the most important source of private credit, while the Tunisian banking system is consistently viewed as the second largest banking system. Interestingly South Africa and Tunisia, which were seen as the fourth and third largest banking systems according to liquid liabilities ratios, can now be seen as the largest and second largest banking systems respectively. Egypt, the Ivory Coast, Kenya and Morocco appear to have

similarly sized and important banking systems over the period 1980 to 1991. This also contrasts with the liquid liabilities ratio findings. However, from 1992 to 2008 the two North African countries (Egypt and Morocco) outperform the Ivorian and Kenyan banking systems which coincide with the liquid liabilities ratio findings. Kenya is viewed as the fifth largest banking system having maintained a steady average private sector credit ratio, while the Ivorian banking system experienced a dramatic fall in private sector credit extension from an average of 37.8 percent of GDP (from 1980 to 1991) to an average of 17.4 percent of GDP (from 1992 to 2008). Thus the Ivory Coast has the sixth largest banking system and Nigeria has the weakest banking system over the period 1980 to 2006.

3.3.2 BANKING SYSTEMS: LIQUIDITY

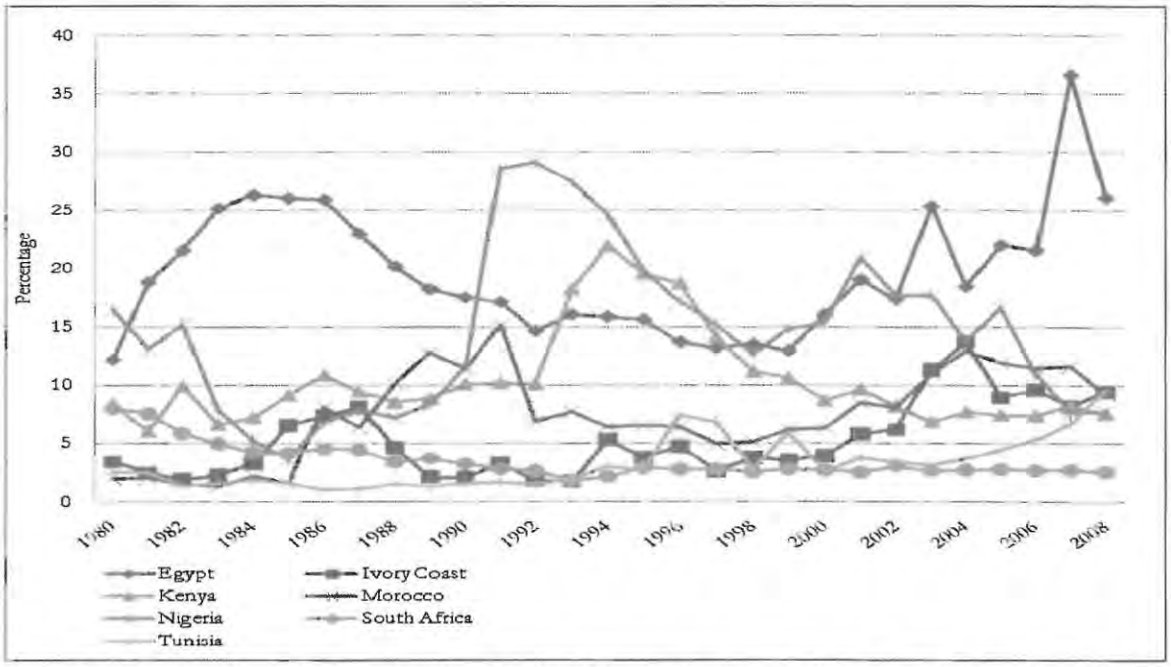
Banking system liquidity is commonly indicated by the ratio of bank liquid reserves to bank assets. This ratio is calculated as the monetary authorities' holdings of domestic currency and deposits divided by claims on other governments, nonfinancial public enterprises, the private sector, and other banking institutions (World Bank, 2004:273). A higher liquid reserve to assets ratio indicates greater banking system liquidity and thus less likelihood that a banking system is to suffer crises when there are adverse macroeconomic conditions (World Bank, 2004:273). Figure 3.5 below indicates that Egypt has the most liquid banking system of the seven countries. However, the most notable observation from Figure 3.5 is that South Africa and Tunisia have amongst the most illiquid banking systems along with the Ivory Coast. While Nigeria and Kenya, which were consistently amongst the smallest sized and least important sources of private sector credit, appear to be the second and third most liquid banking systems in the sample.

It must be noted that although this measure is widely used as an indication of banking system liquidity, it is however influenced by the monetary policy stance of the country, such that the required reserve ratio (i.e. a monetary policy tool used to influencing interest rates, borrowing and economic activity) has an effect on the amount of bank liquid reserves. Hence, a higher required reserve ratio (i.e. greater restrictions placed on the commercial banks ability to expand bank credit) will result in a greater amount of bank liquid reserves held in relation to bank assets. This influence is greater in an African context. Gulde *et al.* (2006:11) note that sub-Saharan African countries tend to have higher reserve requirements than the US and Euro areas. The impact of the required reserve ratios is further exacerbated, in the case of Africa, by the lack of viable investments and credible

borrowers within African countries. Hence, the lack of viable investment opportunities often results in African banking systems holding significant amounts of unremunerated excess reserves (Gulde *et al.*, 2006:12). Consequently, in addition to a higher ratio of bank liquid liabilities to bank assets indicating greater banking system liquidity, it might also indicate a more restrictive monetary policy stance or a banking system which finances fewer investment projects.

Therefore, these factors might explain the lower liquidity recorded in South Africa where a required reserve ratio of 2.5 percent is the lowest of the sample countries and where there might be greater viable investments financed by the banking system.

Figure 3.5: Bank liquid reserves to Bank assets Ratio



Source: Figure plotted by author based on data from World Bank Development Indicators (2009)

(a) Summary

The Egyptian banking system is viewed as the largest and most liquid banking system of the sample countries, followed closely by the Moroccan and Tunisian banking systems. Although South Africa recorded higher private sector credit ratios than these three North African countries, the South African banking system is inferior in terms of liquid liabilities and liquid reserves to assets ratios.

Hence, South Africa is considered the fourth best banking system, while the Kenyan banking system is ranked fifth. Consistently, the Ivorian and Nigerian banking systems are the most underdeveloped banking systems.

3.4 STOCK MARKETS

African stock markets are in their infancy stage of development as they are relatively recent in origin with only eight stock markets established prior to 1980, while about two thirds of African stock markets emerged in the late 1980s and early 1990s (Mlambo and Biekpe, 2007:6). Seven of the eight stock markets established prior to 1980 are examined in this study, with the country excluded being Zimbabwe (due to data availability constraints). Of the seven African stock markets, the two earliest established markets are the Egyptian Stock Exchange (previously called the Cairo and Alexandria Stock Exchange) established in 1883 and the Johannesburg Stock Exchange (in South Africa) established in 1887, as reported in Table 3.3 below. According to Mlambo and Biekpe (2001:61), the emergence of African stock markets was mostly driven by a desire to privatise state-owned enterprises as privatisation raised the prospects of fully integrating Africa into the global economy.

Over the years, these seven African stock markets have undergone several strategic and structural changes (in terms of trading methods, trading days, trading hours, clearing and settlement methods, settlement cycles, and demutualisation of scrip, etc.) in order to facilitate their continued development. As reported in Table 3.3, all seven stock markets have moved from the open outcry trading method to an electronic trading system (ETS), they all trade five days a week – however at different times of the day – and they all have foreign participation to differing degrees. The various structural and strategic decisions are intended to influence the stock market size, liquidity, efficiency and stability.

The Egyptian, Ivorian, Kenyan, Moroccan, Nigerian, South African and Tunisian Stock Exchanges are analysed as to their size and liquidity in the sub-sections below. Data availability constraints limit the stock market analysis below to the period from 1988 to 2008 with the exception of the turnover ratio analysis which is furthered constrained to the period from 1996 to 2008.

Table 3.3: Stock Market Characteristics

	Name of Exchange	Date Est.	Principal Index	Trading Method	Settlement Cycle	Trading Days	Trading Hours
Egypt	Egyptian Exchange	1883	EGX 30 Index	ETS	T+2	Sun-Thur	10:30-14:30
Ivory Coast[36]	Abijan Stock Exchange (until 1997) and BRVM (from 1998)	1974	BRVM 10 Index	ETS	T+3	Mon-Fri	08:30-13:00
Kenya	Nairobi Stock Exchange	1954	NSE ALSI	ETS	T+5	Mon-Fri	09:30-15:00
Morocco	Casablanca Stock Exchange	1929	Moroccan ALSI	ETS	T+3	Mon-Fri	10:00-15:30
Nigeria	Nigerian Stock Exchange	1960	NSE ALSI	ETS	T+3	Mon-Fri	09:30-12:30
South Africa	Johannesburg Stock Exchange	1887	FTSE JSE ALSI	ETS	T+5	Mon-Fri	09:00-17:00
Tunisia	Bourse de Tunis	1969	TUNINDEX	ETS	T+5	Mon-Fri	10:00-14:10

Note: Est. - Established; ALSI - All Share Index; ETS - Electronic Trading System; Mon - Monday; Thur - Thursday; Fri - Friday; Sun - Sunday; T+2, T+3 or T+5 - transaction date plus two days, plus three days or plus five days.

Source: Table compiled by author based on data from the countries' official stock exchange websites

3.4.1 STOCK MARKETS: SIZE

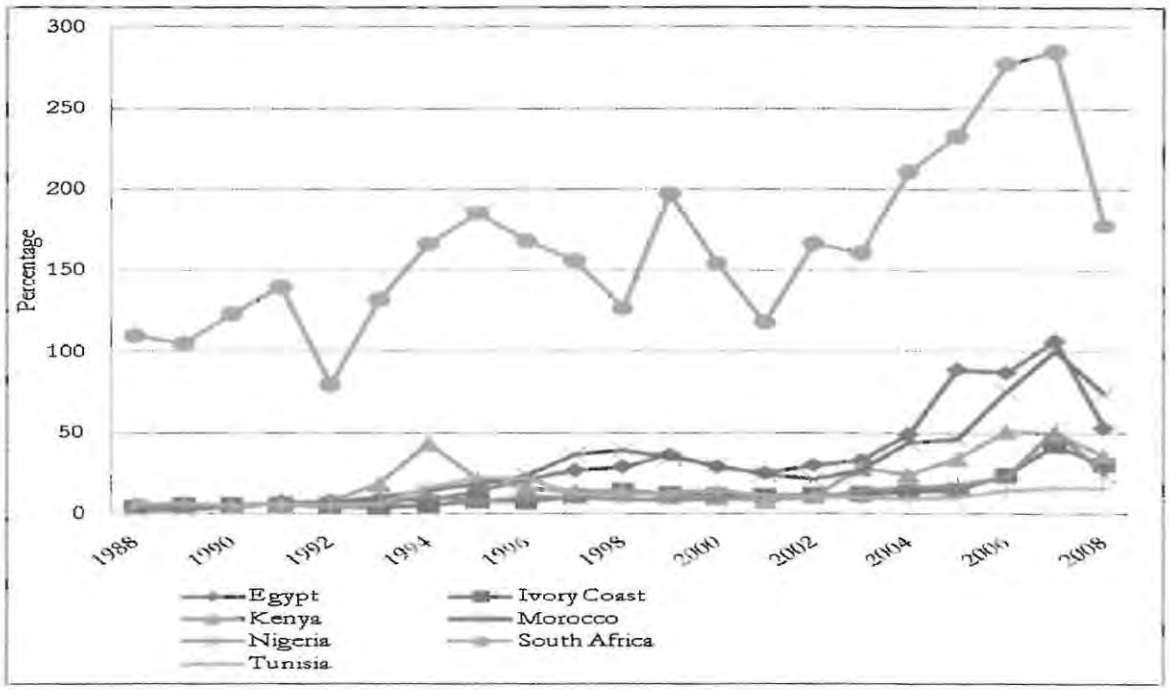
The stock market size is analysed below by using the stock market capitalisation ratio and the total number of listed companies. Stock market size is related to a stock market's ability to diversify risk and mobilise capital (World Bank, 2009:285). Stock market capitalisation gives an overall size indication and is computed by multiplying the share price by the total number of shares outstanding (World Bank, 2009:285). Market capitalisation therefore gives the market value of the stock market at a point in time, where a higher market capitalisation signifies a larger stock market. The market capitalisation ratio is calculated as the stock market capitalisation divided by GDP and this gives an indication of stock market performance relative to a country's economic outlook, revealing the significance of a stock market to a country. The second size measure is the number of listed companies and this refers to domestically incorporated companies that are listed on the stock market

[36] The Abijan Stock Exchange closed in December 1997 and was replaced by the Bourse Régionale des Valeurs Mobilières (BRVM) in 1998, which is a regional stock exchange serving 8 West African countries (which includes Benin, Burkina Faso, Guinea Bissau, Ivory Coast, Mali, Niger, Senegal and Togo). The BRVM is located in Abijan (Ivory Coast) which is the commercial hub of this zone and 90% of the listed companies on the BRVM are from the Ivory Coast (i.e. 34 of the 38 listed companies are Ivorian). For various reasons, the BRVM continues to be classified as the Ivory Coast stock market by the World Bank, World Development Indicators (2009) and is used by various researchers (such as Adjasi and Biekpe, 2006; Nzue, 2006; Enisan and Olufisayo, 2009, amongst others) when studying the Ivory Coast. This study therefore takes the approach followed by the above mentioned researchers as well as the classification system of the World Bank and so uses the BRVM as representation of the Ivory Coast stock market.

at year end. The listed companies measure excludes investment companies, mutual funds, and other collective investment vehicles (World Bank, 2009:285).

Based on the market capitalisation ratio standings provided in Figure 3.6 South Africa has by far the largest stock market in Africa achieving over 290 percent in 2007. This is of little surprise as the South African stock exchange is ranked nineteenth in the world based on year ended 31 December 2009 market capitalisation data from the World Federation of Exchanges (2010).

Figure 3.6: Ratio of Market Capitalisation to GDP



Source: Figure plotted by author based on data from World Bank Development Indicators (2009)

The Egyptian and Moroccan stock markets perform similarly well over the sample period and are the second and third largest respectively. Kenya has also performed promisingly, outperforming Egypt and Morocco from 1993 to 1995 when the International Finance Corporation rated the Kenyan stock market as the "best performing market in the world" as it recorded a 179 percent rate of return in US dollar terms (PWC, 2010b:1). The Ivory Coast, Nigerian and Tunisian stock markets have performed disappointingly in this regard being the three smallest stock markets in the sample.

The total number of companies listed on each stock market, for selected periods, is illustrated in Table 3.4 below and indicates a contrasting outlook of stock market size. Based on the number of listed companies the Egyptian stock market can be regarded as the largest African stock market from 1993 to 2007, while the South African stock market is the second largest market. Furthermore, it indicates that the Nigerian stock market is larger than both the Moroccan and Kenyan stock markets. Thus the total number of listed companies as a measure of the size of stock markets has produced a noticeably divergent outlook as compared to the market capitalisation ratio. The total number of listed companies is however largely a secondary indicator of stock market size as the widely used market capitalisation ratio measure is often unanimously preferred. This is chiefly because in Africa companies are largely undercapitalised and the large majority of listed African companies are very rarely traded. This is confirmed by the Chairman of the Egyptian Stock Exchange – Mr Maged Shawky – who revealed that only 30 to 40 of the 1148 listed companies existing before 2002 were actually traded, but after new listing rules (implemented in 2002) 100 percent of the 219 listed companies in March 2010 were traded (World Federation of Exchanges, 2010:1). Further evidence of that number of listed companies is a weaker size measure can be seen by examining Figure 3.6 above. During the period of significant company delisting in Egypt (i.e. 2002 to 2008) the Egyptian stock market capitalisation ratio has shown a rapidly increasing trend.

Table 3.4: Total Number of Listed Companies for selected periods[37]

	Egypt	Ivory Coast	Kenya	Morocco	Nigeria	South Africa	Tunisia
1990	57	23	54	71	131	732	13
2000	1076	41	57	53	195	616	44
2008	373	38	53	77	213	425	49

Source: Table compiled by author based on data from World Bank Development Indicators (2009)

3.4.2 STOCK MARKETS: LIQUIDITY

Liquidity refers to ability of stock market participants to easily purchase and sell securities on a stock market. This is an important attribute of stock markets as a more liquid market improves capital

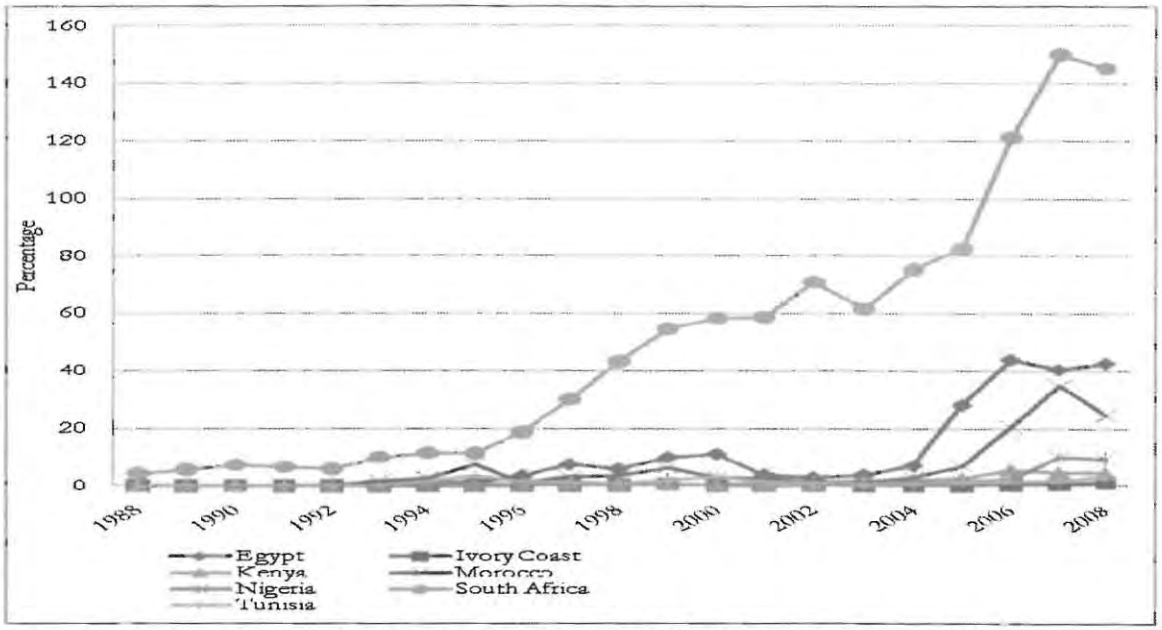
[37] A complete list of all listed companies in each country for the entire period (1988 – 2008) is provided in Table A.2 in the Appendix.

allocation which, in turn, can enhance economic growth (World Bank, 2009:285). Two measures of market liquidity are examined below, namely, the total value traded ratio and the turnover ratio. Total value traded ratio is the total value of stocks that are traded during the period divided by GDP (World Bank, 2009:285). The total value traded ratio provides a measure of stock market liquidity that complements the measure of stock market size (market capitalisation) as it indicates whether market trading is able to match market size. A higher value traded ratio indicates greater market liquidity. The second measure of market liquidity is the turnover ratio, which also measures transaction costs. Hence, a higher turnover ratio indicates greater market liquidity and lower transaction costs. Turnover ratio is computed as the total value of shares traded during the period divided by the average market capitalisation for the period (World Bank, 2009:285). The turnover ratio indicates stock market trading volume relative to stock market size, thus complementing both the total value traded ratio and market capitalisation ratio (Beck and Levine, 2004:428). Therefore, a smaller sized, liquid market might have a lower value traded ratio but a higher turnover ratio.

According to the total value traded ratios for the period from 1988 to 2008 reported below in Figure 3.7, South Africa consistently has the highest value traded ratios. It can be seen that South Africa is by far the most liquid African nation, while results also indicate that Egypt and Morocco – which have considerably lower ratios – are the second and third most liquid markets respectively. Kenya, Nigeria, Tunisia and the Ivory Coast all have extremely low value traded ratios and can be regarded as very illiquid stock markets. However, based on value traded ratio averages of just above 1 percent for Kenya and well below 1 percent for the Ivory Coast these two stock markets can be classified as the most illiquid markets.

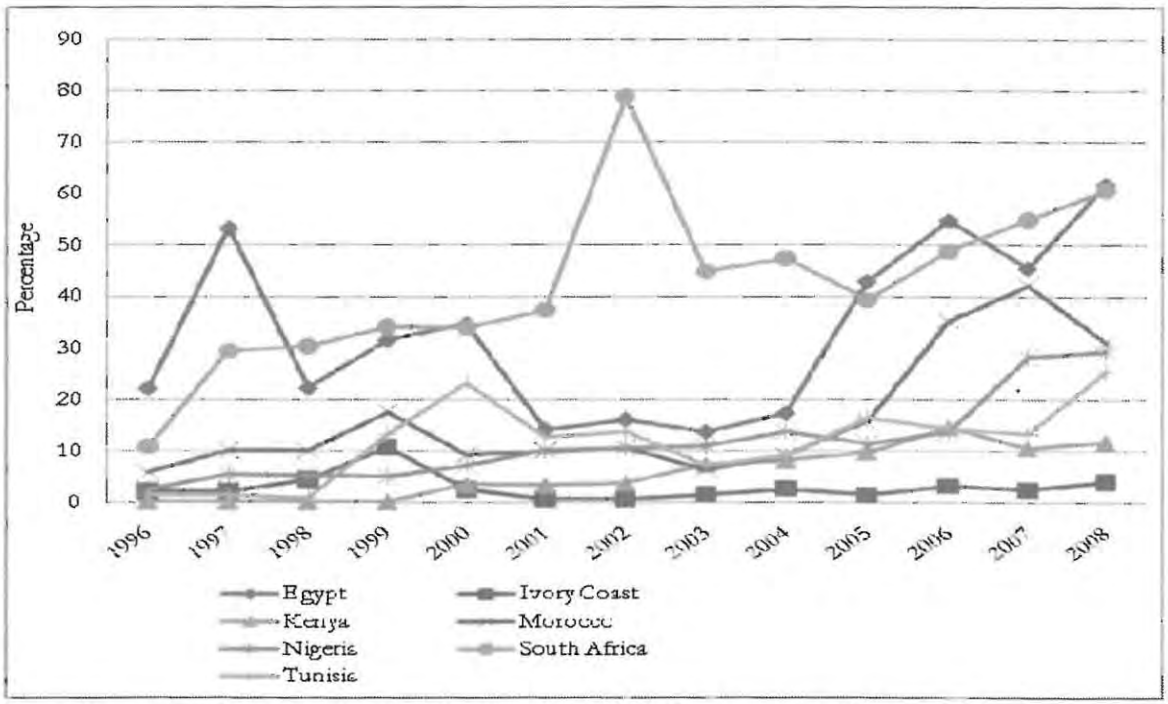
The turnover ratio findings in Figure 3.8 below present a closer grouping of liquidity standings. Kenya, Nigeria, Tunisia and the Ivory Coast can still be viewed as the most illiquid markets in the sample, with the Ivorian stock market once again as the most illiquid market, and South Africa and Egypt again the two most liquid markets. Although the turnover ratio findings are similar to that of the value traded ratios there are also points of contrast. South Africa does not outperform the other African countries as largely in terms of liquidity when the size of the stock market is taken into consideration. Figure 3.8 also indicates that the Tunisian stock market is not as illiquid as it appears from the total value traded ratios (as it outperforms the Ivorian, Kenyan, Moroccan and Nigerian stock markets from 1999 to just after 2002), while the Moroccan stock market is grouped with the more illiquid stock markets of Nigeria and Tunisia.

Figure 3.7: Total Value Traded Ratios (1988 – 2008)



Source: Figure plotted by author based on data from World Bank Development Indicators (2009)

Figure 3.8: Turnover Ratio (1996 – 2008)



Source: Figure plotted by author based on data from World Bank Development Indicators (2009)

(a) Summary

Unanimously the South African stock market is the largest and most liquid stock market in Africa, while other African stock markets are lagging far behind. Egypt and Morocco have the second and third best stock markets in the sample, while Nigeria can be ranked fourth best as it outperforms Kenya in terms of both liquidity measures and is superior to Tunisia for all measures. Distinguishing between the Kenyan and Tunisian stock markets proves difficult since Kenya has a larger sized market while Tunisia has a more liquid market. However, the Ivory Coast is clearly the poorest performing stock market in the sample as it is the most illiquid and one of the smallest markets.

3.5 LINKS BETWEEN FINANCIAL SYSTEM AND ECONOMIC PERFORMANCE

The analysis of each country's financial system in terms of their banking sectors and stock markets was intended to highlight the relative importance of the development of these two components of the financial system. Now, there is a need to examine each country's economic performance relative to their financial development over corresponding time periods with the aim of identifying any potential linkages between finance and growth. Simple pair wise correlation analysis and country specific plots of the movement of economic growth alongside banking system development and stock market development is used to meet this objective.

3.5.1 BANKING SYSTEM DEVELOPMENT AND ECONOMIC GROWTH

The correlation results for linkages between banking system development and economic growth, provided in Table A.3 in the Appendix, reveals that there is lower correlation between banking sector development and growth in Kenya, Nigeria and South Africa. However, in Egypt, the Ivory Coast, Morocco and Tunisia there appear to be higher correlation between banking development and economic performance. Specifically, private sector credit alone is closely related to economic growth in Egypt and the Ivory Coast, with correlation coefficients of 0.788 and 0.825 respectively. In Morocco there is close correlation between liquid liabilities and private sector credit with economic growth, recording correlation coefficients of 0.935 and 0.802 respectively. While in

Tunisia, economic growth is strongly correlated with liquid liabilities with a correlation coefficient of 0.919 and also correlated with bank liquid reserves to assets with a correlation coefficient of 0.740.

These variables are further examined using side by side plots of their movement over time reported in Figure A.1 in the Appendix. Figure A.1 illustrates that there is little similarity in the movements of all banking sector development measures and economic growth in Kenya, Nigeria and South Africa. These plots thus confirm the correlation findings for Kenya, Nigeria and South Africa, where lower correlation was found between banking development and growth.

Figure A.1 shows that for Egypt there are closer co-movements between economic growth and measures of banking system development. Specifically, private sector credit and economic growth in Egypt are seen to move more closely, with a general upward slopping trend over time. However, the steep drop off in private sector credit from 1986 to 1992 has no notable influence on economic performance as there is only a small decline in GDP from 1990 to 1991. Figure A.1 also shows that economic growth and private sector credit similarly have downward sloping trends in the Ivory Coast. However, there is little growth enhancing significance of the spike in private sector credit from 1986 to 1987, while it is also seen that the increasing economic growth experienced between 1994 and 1998 is not related to any increases in private sector credit. Therefore, for both Egypt and the Ivory Coast, although there appears to be some correlation between private sector credit and economic performance these linkages do not appear strong.

Morocco's banking development can be seen to move closely with economic performance. Figure A.1 in the Appendix shows that liquid liabilities move closer with economic growth than private sector credit, which is consistent with the correlation findings. Looking closely at this illustration indicates that movements in liquid liabilities are somewhat in response to movements in economic performance, interestingly showing a potential leading effect of growth on finance.

Lastly, Figure A.1 shows that Tunisia's liquid liabilities move more closely with its economic growth than bank liquid reserves to assets, and this agrees with the correlation findings. From the plots it can be seen that liquid liabilities move in response to economic growth movements, similar to the case in Morocco. Specifically, the fall in economic growth from 1987 to 1989 is seen to affect liquid liabilities from 1989 to 1991, while a spike in economic growth from 1995 to 2002 corresponds with a spike in liquid liabilities from 1998 to 2002. These movements could potentially show a leading effect of growth on finance in Tunisia.

3.5.2 STOCK MARKET DEVELOPMENT AND ECONOMIC GROWTH

Looking at correlation results between stock market development and economic growth, provided in Table A.3 in the Appendix, it can be seen that there is little correlation between stock market development and growth in the Ivory Coast and Tunisia. In Egypt, Kenya, Morocco, Nigeria and South Africa there is stronger correlation which may symbolise potential relationships between stock market development and economic performance. Specifically, both market capitalisation and total value traded ratios are closely related to economic growth in Egypt, Kenya and South Africa. In Egypt correlation coefficients of 0.727 and 0.844 were recorded for market capitalisation and total value traded ratios respectively, in Kenya correlation coefficients of 0.808 and 0.876 were recorded respectively, while in South Africa correlation coefficients of 0.729 and 0.944 were obtained respectively. Close correlation was found between all three measures of stock market development (i.e. market capitalisation, total value traded and turnover ratios) and economic performance in Morocco and Nigeria. All three measures were similarly correlated with economic growth in Morocco, where the market capitalisation correlation coefficient was 0.796, the total value traded correlation coefficient was 0.785, and the turnover ratio correlation coefficient was 0.770. In Nigeria the liquidity measures of stock market development are more highly correlated with growth, with correlation coefficients of 0.844 for total value trade and 0.892 for turnover ratio, while the market capitalisation correlation coefficient was 0.784.

As performed above, side by side plots of these variables are provided in Figure A.2 in the Appendix in order to offer a closer look at potential linkages. Figure A.2 shows that there is very little co-movement between stock market development measures and economic growth in the Ivory Coast and Tunisia over time, which is in agreement with the lower correlation coefficients found for these countries. In the case of Egypt, Figure A.2 shows that the market capitalisation and value traded ratios move similarly with growth. From Egypt's plots it appears that market capitalisation, rather than total value traded, more similarly moves with economic growth.

When examining Kenya's comparative performance in Figure A.2, it can be seen that economic growth appears to move in response to the stock market development indicators. Most notably a steep market capitalisation spike in 1993 is followed by a significant growth spike in 1994, while sharp increases in market capitalisation and total value traded ratios in 2002 are followed by equally large increases in Kenya's economic growth starting in 2003.

Furthermore, Figure A.2 shows that in Morocco all three stock market indicators trend similarly with each other over the period. When these indicators are related to Morocco's growth there appears to be some co-movement but no strong influence of stock market development on the economic growth movements is seen (particularly when considering the consistent decline in all three stock market indicators from 1998 to 2003). While Nigeria's performance indicates that all three stock market development measures move closely with growth. The plots for Nigeria reveal that growth leads stock market development as market capitalisation, in particular, tends to follow the economic growth path.

Lastly, it can be seen from Figure A.2 that there are close co-movements between South Africa's market capitalisation and value traded ratios with economic growth, however South Africa's value traded ratio moves more closely with growth for almost the entire period.

(a) Summary

The investigation has revealed that all countries have some linkages between financial development and economic growth, with five of the countries revealing possible finance-growth links within a single class of financial development measure (banking or stock market), while two countries have potential finance-growth linkages within two classes of financial development measures. Specifically, there is a possible relationship between banking development and growth in the Ivory Coast and Tunisia. However, in the Ivory Coast private sector credit does not have strong correlation with growth, while growth is seen to lead banking development in Tunisia. Close co-movements between stock market development measures and economic growth in Kenya, Nigeria and South Africa could suggest a finance-growth relationship. Furthermore, there are indications of stock market led growth in Kenya. Finally, results for Egypt and Morocco reveal possible linkages between both banking and stock market development with growth. In Egypt the stock market appears to have a stronger impact on growth since the banking effects do not robustly influence economic growth, while in Morocco there are stronger bank-growth links with a potential leading role for growth in finance. Overall, trend analysis suggests potential linkages exist between finance and growth in the selected countries, with a leading role for growth in finance on the balance.

3.6 CONCLUSIONS

This chapter has assessed and contrasted the financial systems of Egypt, the Ivory Coast, Kenya, Morocco, Nigeria, South Africa and Tunisia in terms of size and liquidity aspects of their banking systems and stock markets. Section 3.2 provided general background information and statistics of African nations in order to illustrate the poor and underdeveloped state of African economies. Section 3.3 examined the banking systems of the seven countries. The graphs and tables produced in this section indicate that the three North African banking systems (i.e. Egypt, Morocco and Tunisia) are the most developed in the sample, while Nigeria and the Ivory Coast have the most underdeveloped banking systems. Section 3.4 studied the stock markets of the respective countries and findings commonly revealed that South Africa has the most developed African stock market by a long way. In the sample Egypt, Morocco and Nigeria have the second, third and fourth best stock markets respectively, while the Ivory Coast is clearly the most underdeveloped stock market.

Finally, Section 3.5 examined measures of banking sector and stock market development in relation to economic performance for each country. Findings indicate that banking sector development is possibly related to growth in Tunisia and the Ivory Coast, while there are potential linkages between stock market development and growth in Kenya, Nigeria and South Africa. In Egypt and Morocco both banking sector and stock market development could be related to economic performance. Furthermore, there is potentially growth led financial development in Morocco (in the banking sector), Tunisia (in the banking sector), and Nigeria (in the stock market), while finance (from the stock market) plays a potentially leading role in Kenya's growth. Thus, on the balance, trend analysis suggests that there are potential linkages between finance and growth.

Based on the foundation provided in Chapter 2 and Chapter 3, the next chapter will describe the analytical methodology to be followed in order to empirically analyse the potential finance-growth relationships highlighted in Chapter 3.

CHAPTER 4:
METHODOLOGY AND ANALYTICAL FRAMEWORK

4.1 INTRODUCTION

This chapter builds on the preceding review of literature concerning the finance-growth relationship, and on the background information about African financial systems with the purpose of detailing the analytical techniques which will be employed in this study. Hence, this chapter is divided into four main sections so as to describe the methodological and analytical structure which will be followed. Accordingly, Section 4.2 specifies and discusses the model employed to estimate the relationship between financial system development and economic growth. Descriptions of the variables included in the model, the *a priori* expectations of the variables and the data sources follow in Section 4.3. While Section 4.4 reviews the estimation techniques used in the study, more specifically Principal Component Analysis, panel unit root tests, panel cointegration analysis, and the panel Granger causality test. Lastly, Section 4.5 concludes the chapter.

4.2 MODEL SPECIFICATION

The review of theoretical and empirical issues in Chapters 2 and 3 revealed that a variety of control variables should be considered in models which assess finance-growth linkages and that no single financial development measure is able to fully capture all the dimensions of the impact of banking system and stock market development on economic growth. Consequently a variety of financial development measures are currently employed in empirical studies, with the most widely utilised measures being liquid liabilities of the banking system as a percentage of GDP, private sector credit as a percentage of GDP, and the stock market capitalisation as a percentage of GDP. Furthermore, the control variables commonly included are used to capture the effects of macroeconomic stability, convergence, the degree of trade openness, and the level of human capital accumulation. Based on theoretical and empirical considerations as well as on data availability, the model to be estimated in this study is similar to that of Christopoulos and Tsionas (2004), Apergis *et al.* (2007), Aslan (2008), Acaravci *et al.* (2009), and Kiran *et al.* (2009). The model is specified as:

$$Y_{it} = \beta_{0i} + \beta_{1i} FD_{it} + \beta_{2i} X_{it} + \mu_{it}, \quad \text{..... (4.1)},$$

where Y_{it} is GDP *per capita*; FD_{it} is a measure of financial system development; X_{it} is a set of control variables, and μ_{it} is the error term.

According to Apergis *et al.* (2007:183), there is "an interesting and controversial view of the finance-growth nexus that the magnitude of financial development's impact on growth varies depending on the type of the financial indicator employed and the level of the country's development". It is also evident from the summary in Table A.1 in the Appendix that different studies have employed a wide range of indicators of financial development. Therefore, in order to overcome the concerns which consequently might arise, we examine the impacts of three different groups of financial development measures. The three groups of financial development measures include: overall financial system development (OD) measures, banking system development (BD) measures, and stock market development (SD) measures.

The OD measures are to be used as indicators of the overall level of development of the entire financial system, capturing the influence of the elements of both banking system development and stock market development on growth in each country. Two OD measures will be used. LOFD is the overall financial development index computed using the Findex formula (i.e. a formula for calculating an aggregate financial development index similar to that used by Demirgüç-Kunt and Levine (1996)) and OFD2 is a second overall financial development measure that will be generated using principal component analysis (PCA). Two different BD measures shall be utilised to indicate the degree of banking system development in a country based on two size aspects of the banks. These BD measures include the liquid liabilities ratio (BLL) and the private sector credit ratio (PSC). This study also utilises two SD measures in order to account for the level of stock market development based on size and liquidity aspects of the markets. The market capitalisation ratio (MCP) and the total value traded ratio (VLT) shall be employed as the two SD measures.

The set of control variables (X_{it}) employed in this study (where data is available), in addition to the three groups of financial development measures, includes inflation, government expenditure, trade volume, and population growth. These four control variables are similar to those used in Beck *et al.* (2000), Levine *et al.* (2000), Apergis *et al.* (2007), Aslan (2008) and Kiran *et al.* (2009) to account for the level of macroeconomic stability, the degree of openness of an economy and the level of human capital within sample countries.

4.3 VARIABLE DESCRIPTION AND DATA SOURCE

Prior to specifying the econometric techniques to be employed on the data, there is a need to be clear and complete about the details of the data. Hence, this section presents descriptions of each variable included in the specified model and explains the theoretically expected relationship between economic growth and each of these variables, while also providing the sources from where the data used in this study has been obtained.

4.3.1 DESCRIPTIONS OF THE VARIABLES

There exists no unique set of variables, across studies, for analysing the influence of financial development on growth. Also, there are a variety of approaches that can be used to measure economic performance, financial development and controlling for other factors that may influence growth. Hence, the specific variables included in empirical models are often a controversial topic. Since much of the controversy which surrounds the set of variables used in empirical research is largely due to their computation variations, there is a need to clearly describe how the variables used in this study are computed.

Economic growth – GDP *per capita* (Y) is used as the proxy for economic growth and this is similar to the approach used in other recent panel data empirical research such as Beck and Levine (2004), Loayza and Ranciere (2006), Apergis *et al.* (2007), Odhiambo (2007), Acaravci *et al.* (2009), Kiran *et al.* (2009), and Seetanah *et al.* (2009), among others. Specifically, Y refers to GDP *per capita*, PPP (constant 2005 International $).

Financial Development Measures – Since all of the BD and SD measures that are used in this study were comprehensively reviewed in Chapter 3, Table 4.1 below provides a summary of the descriptions of each of these BD and SD indicators. Two OD aggregate indexes will be computed and will serve to isolate the most important influences of several financial development measures on growth. The first OD measure used is the LOFD index and it is computed in terms of the Findex formula, which is a formula adapted from the algorithm developed by Demirgüç-Kunt and Levine (1996), and used by Allen and Ndikumana (2000:148), Ndikumana (2000:385), Bakwena *et al.* (2008:21), Mohamed and Sidiropoulos (2010:193).

The Findex formula can be specified as follows:

$$FINDEX_{it} = \frac{1}{m}\sum_{j=1}^{m}\left[100 * \left(\frac{F_{j,it}}{\overline{F}_j}\right)\right] \qquad \text{..... (4.2),}$$

where $F_{j,it}$ is an indicator of financial development, i is a specific country, t is a specific year, m is the number of financial development indicators included in the index, and $\overline{F}_j$ is the sample mean of the individual financial development indicator. The second OD measure used is the OFD2 index that is derived by means of PCA, as alluded to above. The detail of the PCA procedure is discussed further in Section 4.4.1.

Control Variables – The Inflation rate (INF) and Government expenditure (GOV) are used as indicators of macroeconomic stability. INF is measured as the percentage change in the consumer price index, while GOV is computed as the general government final consumption expenditure as a percentage of GDP. The measure chosen as an indicator for the degree of openness of an economy is trade as a percentage of GDP (TRA). TRA can be measured as the ratio of exports to GDP or the ratio of imports to GDP, however for the purpose of this study TRA is computed as the sum of exports plus imports over GDP, following the approach used in Apergis *et al.* (2007) and Kiran *et al.* (2009). Lastly, Population growth rate (POP) is used as the indicator of human capital and has been chosen solely based on restrictions regarding the availability of African human capital data. POP is measured as the annual percentage change in population size.

Table 4.1: Description of the BD and SD measures used in the study

BD Measure:	**Evaluates:**	**Computed as:**
Liquid Liabilities ratio (BLL)	Size	M3 money supply (currency plus demand and interest bearing liabilities of bank and non-bank financial intermediaries) divided by GDP.
Private Sector Credit ratio (PSC)	Size	Domestic credit provided to the private sectors (by way of loans, trade credit, purchases of non-equity securities) divided by GDP.
SD Measure:	**Evaluates:**	**Computed as:**
Market Capitalisation ratio (MCP)	Size	Stock market capitalisation (share price multiplied by total number of shares outstanding) divided by GDP.
Total Value Traded ratio (VLT)	Liquidity	Total value of shares traded during the period divided by GDP.

a) a priori expectations

Theoretical literature provides insight concerning the impacts that diverse variables (such as inflation, financial development, government spending, and human capital, among many) are expected to have on economic growth. Of these variables, theory suggests that overall financial development has a positive influence on economic growth since well functioning financial systems (composed of financial market and intermediary elements) perform the vital financial functions (alluded to in Section 2.3.2.b) which minimise information, transaction, and enforcement costs, and thus stimulates economic growth (Levine, 2004:34).

Similarly, banking system development and stock market development are expected to be positively related to economic growth. In terms of the BD measures, a positive relationship is expected between BLL and growth. Higher BLL implies a larger banking sector, where the size of the banking sector is positively related to the provision of financial services and thus to growth (World Bank, 2004:273). A positive relationship is also expected to hold between PSC and growth. PSC is critical for poverty reduction and for financing consumption, production and capital formation, which helps to stimulate aggregate demand and, in turn, advance economic activity (World Bank, 2008:271). While most studies confirm the existence of positive effects of banking development on economic growth, some economists (such as Khan and Senhadji, 2000; and Levine, 2002) assert that banking development (both BLL and PSC) may actually hinder growth. Shen and Lee (2006: 1908) suggest that "by enhancing resource allocation, and hence the returns on savings, banking development may lower savings rates. If there are sufficiently large externalities associated with savings and investments, then banking development slows long-run growth". Empirical studies which find evidence of a negative influence of banking development on growth includes Ram (1999), Zang (2003), and Shen and Lee (2006), amongst others.

In terms of the SD measures, MCP is expected to be positively related to growth. A larger sized stock market with a higher market value will have a greater MCP, and a larger MCP is related to the provision of better-quality, growth enhancing stock market processes (e.g. capital mobilisation and diversification opportunities) (World Bank, 2008:283). A positive relationship is also expected between VLT and growth. Levine (1996:7) and Osinubi (2004:6) explain that a greater total value of shares listed signifies greater market liquidity and lower investment risk, which helps better capital allocation in the market and thus can enhance economic growth. Similar to the case with BD

measures, it is noted that SD measures can also negatively influence economic growth. This is due to conflicts in capital allocation and deficiencies in regulatory structures. Economists such as Devereux and Smith (1994), Mauro (1995), Levine (1997), and Arestis *et al.* (2001) note that stock markets can inhibit economic growth by reducing the savings rate. This occurs since the existence of more developed stock markets - which allow greater stock trading - could introduce "noise" into the market with detrimental effects for efficient resource allocation (De Long *et al.,* 1989). In this case, more capital is allocated to risk sharing on liquid stock markets while a trade-off arises in the form of reduced precautionary savings. Azarmi *et al.* (2005:68) explain that the negative relationship found between growth and stock market development in India could be due to weaknesses in stock market transaction transparency and inefficient market regulations, which Singh (1997:772) similarly argues is the case in many other developing countries.

Of the control variables, the influence of INF on economic growth is theoretically unclear. Early economists, such as Mundell (1965) and Tobin (1965), predict that inflation would induce greater savings which, in turn, would increase investment and capital accumulation rates, thereby improving economic growth. While Stockman (1981) and De Gregorio (1996) suggest that inflation is harmful to growth since it increases the effective cost of capital (thus reduces investment rates) and distorts the optimal choice between consumption and leisure (thereby reducing the labour supply). However, empirical literature (see for example: Fernandez Valdovinos, 2003; Gokal and Hanif, 2004; Ahmed and Mortaza, 2005; Erbaykal and Okuyan, 2008) strongly support a negative influence of INF on growth. The theoretical relationship between GOV and economic growth is similarly unclear as it is dependent on the nature of the expenditure (Apergis *et al.,* 2007:184). Expenditure on productive capital such as infrastructure and education encourages economic growth, while unproductive expenditure obstructs private investment and causes inflationary pressure which hampers growth. Hence, GOV's effect on growth is ambiguous since unproductive expenditure has a crowding out effect on the growth enhancing impacts of productive investment (Apergis *et al.,* 2007:184).

The third control variable is TRA and it is expected to have a positive impact on economic growth. Aziakpono (2008:176) notes that although trade literature does suggest a positive relationship there can be a negative impact on growth. Aziakpono (2008:176) explains that in smaller countries where "trade constitutes mainly imports of finished consumer goods with little or no valued added in the domestic economy, trade openness may inhibit growth". Lastly, theory suggests that POP can have both positive and negative effects on economic growth. According to Kremer (1993:714), as a

population grows there are a larger number of potential innovators or pioneers in society, with non-rivalry of innovation, stimulating technological change and thus improving economic growth. In contrast, higher population growth can negatively impact economic growth by lowering total factor productivity (Mankiw *et al.*, 1992:433; Klasen and Lawson, 2007:4). This occurs since a higher population growth rate often means that savings are channelled toward capital widening[38] rather than capital deepening[39]. Capital widening (i.e. greater investment in capital and employment) in a faster growing population leads to capital stock increasing at the same rate as the labour force, hence capital per worker remains constant. If the population were not growing as fast, capital deepening (i.e. greater investment in technology/innovation) would lead to a given capital stock being more productive, in this way increasing productivity of capital per worker. Hence, a higher population growth rate diverts investment from technology/innovation to inputs (e.g. labour and materials), thus lowering productivity of capital (A in Equation (2.5)), hence lowering economic growth

4.3.2 DATA SOURCES

Lastly, it is imperative that the data used in this study be obtained from reputable sources. Inflation and government expenditure data has been sourced from the IMF International Financial Statistics (IFS), while data on six other variables (namely: liquid liabilities ratio, private sector credit ratio, market capitalisation ratio, value traded ratio, trade volume and population growth rate) used in this study were obtained from the World Bank, World Development Indicators (2009). Furthermore, money supply and GDP data used in the calculation of the outstanding liquid liabilities ratios were sourced from Thomson Data stream. All the data used in this study is of an annual frequency. The sample includes seven countries (Egypt, Ivory Coast, Kenya, Morocco, Nigeria, South Africa, and Tunisia) for the period from 1988 to 2008, making up a balanced panel with a total of 147 observations.

[38] Capital widening is the investment in greater amounts of inputs like labour, fuel, and materials in order to increase output rather than in investment in technology/techniques to influence output.

[39] Capital deepening is the investment in technology/techniques while inputs (like labour, fuels and materials) are constant in order to increase output.

4.4 ESTIMATION TECHNIQUES

In order to examine the relationship between financial system development and economic growth several econometric techniques will be employed. These techniques aim to, firstly determine whether the variables included in the model are stationary or not, secondly to examine whether any long-run relationships exist between various financial development measures and growth, thirdly if relationships are detected then proceed to estimate these long-run relationship, and lastly to determine the direction of causality between the variables. Consequently, we sequentially derive the OD measures, assess the stationarity, test for cointegration, estimate the long-run relationships and explore the causal linkages.

4.4.1 PRINCIPAL COMPONENT ANALYSIS (PCA)

The PCA technique is commonly used in finance-growth literature to derive various aggregate measures, such as aggregate banking development indicators, stock market development indicators, overall financial development measures, financial integration measures, financial openness measures, and measures of industry performance, amongst others (see for example: Huang, 2006; Singh *et al.*, 2007; Aziakpono, 2008; Chinn and Ito, 2008; Gondo, 2009; Enowbi Batuo and Kupukile, 2010). This study therefore follows a similar approach and derives the principal components of a set of variables which are used to generate a new series (i.e. the OD measure).

According to Johnson and Wichtern (2007:430), PCA is "concerned with explaining the variance-covariance structure of a set of variables through a few linear combinations of these variables". Therefore, PCA decomposes the variance structure into factors which are common to all the variables and proportions that are specific to each variable (Brooks, 2008:120). In this way, PCA takes P observed variables and produces new indices (the principal components) that are mutually uncorrelated (i.e. orthogonal) (Huang, 2006:6). In order to obtain these principal components the eigenvalue (λ) decomposition of the observed variance matrix is to be estimated.

Johnson and Wichtern (2007:431) show algebraically that principal components are particular linear combinations of the p random variables $X_1, X_2, \ldots, X_p$ and depend solely on the covariance matrix $\sum$ (or correlation matrix ρ) of $X_1, X_2, \ldots, X_p$. They let the random vector $\mathbf{X'} = [X_1, X_2, \ldots, X_p]$ have the covariance matrix $\sum$ with eigenvalues $\lambda_1 \geq \lambda_2 \geq \ldots \geq \lambda_p \geq 0$.

Johnson and Wichtern (2007:431) consider the linear combinations:

$$\begin{aligned} Y_1 &= a_1'X = a_{11}X_1 + a_{12}X_2 + ... + a_{1p}X_p \\ Y_2 &= a_2'X = a_{21}X_1 + a_{22}X_2 + ... + a_{2p}X_p \\ &\vdots \qquad\qquad\qquad \vdots \\ Y_p &= a_p'X = a_{p1}X_1 + a_{p2}X_2 + ... + a_{pp}X_p \end{aligned} \qquad \text{..... (4.3),}$$

Then using the linear combinations:

$$Z = CX$$
$$\mu_z = E(Z) = E(CX) = C\mu_z$$
$$\sum_z = Cov(Z) = Cov(CX) = C\sum_x C'$$

where μ_X and $\sum_X$ are the mean vector and variance-covariance matrix of X, respectively.

They obtain: $Var(Y_i) = a_i' \sum a_i \qquad i = 1,2,...., p$ ..... (4.4),

$Cov(Y_i, Y_k) = a_i' \sum a_k \qquad i,k = 1,2,...., p$ ..... (4.5),

Hence, the principal components are those uncorrelated linear combinations $Y_1, Y_2, ..., Y_p$ whose variances in Equation (4.4) are as large as possible.

Furthermore, Johnson and Wichtern (2007:431) explain that the first principal component is the linear combination with the maximum variance, so it maximises $Var(Y_1) = a_1' \sum a_1$. The principal components can be defined as follows:

First principal component = linear combination $a_1'X$ that maximises
$Var(a_1'X)$ subject to $a_1'a_1 = 1$

Second principal component = linear combination $a_2'X$ that maximises
$Var(a_2'X)$ subject to $a_2'a_2 = 1$ and
$Cov(a_1'X, a_2'X) = 0$

$\vdots \qquad\qquad \vdots$

ith principal component = linear combination $a_i'X$ that maximises
$Var(a_i'X)$ subject to $a_i'a_i = 1$ and
$Cov(a_i'X, a_k'X) = 0 \quad for \quad k < i$

Although p principal components are required to reproduce the total system variability, often much of the variability can be accounted for by a small number k of the principal components, where the k components contain as much information as the original p variables. There are a number of decision rules that can be followed in order to determine how many principal components should be retained so as to account for the most variation. Hence, the rules are used to determine the k principal components that will replace the initial p variables. These rules include: (i) the cumulative percentage of total variation rule[40], (ii) the scree graph rule[41], and (iii) the Kaiser (1960) rule. Kaiser's rule will be used in this study and it states that any principal component with a variance of less than 1 is not retained (Jolliffe, 2002:114). So, the components retained are those principal components whose variance exceeds 1. Studies (such as Graff, 2003; Huang, 2006) which similarly examine the finance-growth nexus often use the first principal component as it is found to explain the largest amount of variation in the set of variables. An aggregate financial development proxy index for the set of variables is generated from this principal component and a similar approach will be taken in this study.

4.4.2 TESTING FOR STATIONARITY/UNIT ROOTS

It is imperative that all the variables included in the model are to be assessed as to whether they are stationary or non-stationary prior to identifying any possible long-run relationships and parameter estimation. This is because the stationarity properties can strongly influence the behaviour[42] of a series and most economic variables are non-stationary in nature.

The stationarity of a series can be assessed by employing stationarity tests and/or unit root tests. The most common methods used in empirical research include the Kwiatkowski, Phillips, Schmidt and Shin (KPSS) stationarity test, Phillips-Perron (PP) unit root test, Dickey-Fuller (DF) unit root

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[40] The cumulative percentage of total variation rule: When a cumulative percentage of total variation (e.g. 80% or 90%) is selected which one desires that the principal components contribute, then the required number of principal components is the smallest value of principal components for which this chosen percentage (i.e. 80% or 90%) is exceeded (Jolliffe, 2002:112).

[41] The scree graph rule: Analysing the plot of the variances of principal components against the number of principal components, at the point of the slope of the line (joining the plotted points) where it is "steep" to the left and "not steep" to the right (i.e. the elbow in the line), then the number of principal components at this elbow is the principal components to be retained (Jolliffe, 2002:)116.

[42] Employing regression techniques on non-stationary series may lead to spurious (or meaningless) regression results. Thus, where results should indicate a lack of a relationship between two non-stationary series, regression results may appear 'good' when assessed by standard measures (i.e. significant t-ratios and high R^2 values). These results are in fact meaningless (Brooks, 2008:319).

test, and the Augmented Dickey-Fuller (ADF) unit root test. However, a large body of literature[43] argues that for panel data, specifically panel unit root tests are more accurate than the time series alternative when assessing stationarity. Panel unit root tests have increased power as they are able to exploit the additional information provided by pooled cross-sectional time series (Aslan, 2008:6). Pierse and Snell (1995:344) failed to uncover a cointegrating relationship in their study and subsequently attributed this to traditional unit root tests lacking power when applied to data of a short time span. Accordingly, this study employs panel based methods to assess stationarity of which a variety of methods exist in literature.

Panel based methods are frequently classified in terms of their assumptions about the individual series within the panel. Barbieri (2006:3) groups them into 'first generation' approaches and 'second generation' approaches. 'First generation' approaches are based on the assumption that individual time series are cross-sectionally independently distributed and these include panel unit root approaches by Levin, Lin and Chu (2002); Im, Pesaran and Shin (2003); Maddala and Wu (1999); Choi (2001) and panel stationarity approaches [by Hadri (2000)]. While 'second generation' approaches are tests which reject the assumption of cross-sectional independence and these include tests by O'Connell (1998), Choi (2002), Pesaran (2003), Bai and Ng (2002, 2004), Chang (2002, 2004), and Moon and Perron (2004).

It is widely acknowledged[44] that African countries, in general, are characterised by lower levels of regional financial integration or interdependence. Financial integration is largely found to be concentrated in the regional economic communities such as ECOWAS, ECCAS, COMESA, SADC, EAC, IGAD, UMA, and CENSAD[45] (Irving, 2005; Yartey and Adjasi, 2007; Russo and Ugolini, 2008; African Union, 2009; WWB, 2009; AFDB, 2010). Although interdependence of African financial systems occur by means of regional economic communities, the sample countries are largely drawn from separate regional associations[46], while studies (such as Maghyereh, 2006; and Alagidede, 2010) have found the markets to be largely segmented in the sample countries. Hence,

[43] See: Levin and Lin (1992); Maddala and Kim (1998); Maddala and Wu (1999); Baltagi (2001); Levin, Lin and Chu (2002); Choi (2006); Aslan (2008); and Acaravci *et al.* (2009).

[44] E.g.: Irving (2005); Russo and Ugolini (2008); UNECA (2008); African Union (2009); Amadeus Institute (2009); AFDB (2010).

[45] ECOWAS-Economic Community of West African States; COMESA-Common Market for Eastern and Southern Africa; ECCAS-Economic Community of Central African States; SADC-Southern African Development Community; ECA-East African Community; UMA-Arab Maghreb Union; IGAD-Inter Governmental Authority on Development; CENSAD-Community of Sahel-Saharan States.

[46] COMESA: Egypt and Kenya. ECOWAS: Ivory Coast and Nigeria. SADC: South Africa. UMA: Morocco and Tunisia. IGAD: Kenya. EAC: Kenya. CENSAD: Egypt, Ivory Coast, Kenya, Morocco, Nigeria and Tunisia. However, CENSAD was largely established to ease the development of the agricultural sector and to ease exchange of agricultural products, while the members' principal trading partner is the European Union. Thus, there are very low levels of financial integration between CENSAD members.

the assumption of cross-sectional interdependence does not hold for the sample countries and thus the 'first generation' approaches can be deemed more appropriate for the stationarity assessment in this study.

Furthermore, of the 'first generation' approaches, the techniques proposed by Hadri (2000) and Levin, Lin and Chu (2002) assume that a common unit root process exists in the panel. This assumption, that the unit root processes are identical across cross-sections, is too restrictive since the evidence provided in Chapter 3 showed that the financial systems of the sample countries are heterogeneous in nature and this heterogeneity was similarly acknowledged by Acaravci *et al.* (2009:20). For this reason, this study will employ panel unit root tests which allow individual unit root processes to vary across cross-sections. Hence, the heterogeneous panel unit root tests to be discussed in the following sub-sections include the Im, Pesaran and Shin (2003) approach - which is based on averaging the individual ADF unit root test statistics - as well as the Maddala and Wu (1999), and the Choi (2001) Fisher-ADF based approaches - which are based on combining the *p*-values of unit root tests for each cross-section *i*.

a) Im, Pesaran and Shin (2003) Panel Unit Root Test

The panel unit root test proposed by Im, Peseran and Shin (2003), hereafter denoted IPS (2003), is one of the most widely applied panel unit root tests in empirical research as it is "less restrictive and more powerful" compared to other panel unit root tests (Apergis *et al.,* 2007:185).

For this test the stochastic process, y_{it}, is generated by the first-order autoregressive process:

$$y_{it} = (1-\phi_i)\mu_i + \phi_i y_{i,t-1} + \varepsilon_{it} \qquad \text{..... (4.6),}$$

$$i = 1,..., N;\ t = 1,..., T, \quad \textit{where initial values } (y_{i0}) \textit{ are given}$$

where y_{it} is each of the variables under consideration in the model, ϕ_i is the autoregressive root, N is the number of cross-sections (countries), and T is the number of time periods (Apergis *et al.,* 2007:186).

The IPS (2003:55) approach is concerned with testing the null hypothesis that unit roots ($\phi_i = 1$) exist for all i, therefore Equation (4.6) is re-expressed as:

$$\Delta y_{it} = \alpha_i + \beta_i y_{i,t-1} + \varepsilon_{i,t} \quad \text{..... (4.7),}$$

where $\alpha_i = (1-\phi_i)\mu_i$, $\beta_i = -(1-\phi_{i,})$, and $\Delta y_{it} = y_{it} - y_{i,t-1}$.

Thus the null hypothesis, that each series in the panel contains a unit root (i.e. each series is unit root non-stationary), becomes:

$$H_0: \beta_i = 0 \text{ for all } i \quad \text{..... (4.8),}$$

while the alternative hypothesis, which allows unit roots to differ across groups and allows for some of the individual series to have unit roots (i.e. some of the series are non-stationary while other series are stationary), becomes:

$$H_1 : \beta_i < 0, \quad i = 1, 2, ..., N_1; \quad \beta_i = 0, \quad i = N_1 + 1, N_1 + 2, ..., N \quad \text{.....(4.9),}$$

The test statistic proposed by IPS (2003:59) is the modified standardised t-bar statistic. The t_{IPS} statistic is given as follows:

$$t_{IPS} = \frac{\sqrt{N}(\bar{t} - \frac{1}{N}\sum_{i=1}^{N} E[t_{Ti}|\beta_i = 0])}{\sqrt{\frac{1}{N}\sum_{i=1}^{N} Var[t_{Ti}|\beta_i = 0]}} \quad \text{..... (4.10),}$$

where $Var[t_{Ti}|\beta_i = 0]$ and $E[t_{Ti}|\beta_i = 0]$ refer to the momemts of variance and mean obtained from Monte Carlo simulations respectively (Kiran *et al.*, 2009:89). While $\bar{t}$ is the average of individual ADF statistics, $\bar{t} = \frac{1}{N}\sum_{i=1}^{N}(t_{ki})$ where t_{ki} is the individual t-statistic and k_i is the number of lags.

The t_{IPS} statistic is distributed as N (0, 1) when $T \to \infty$ followed by $N \to \infty$ sequentially, and the t_{IPS} statistic is found to provide an excellent approximation of the exact test, even for relatively small values of N (IPS, 2003:62).

b) Maddala and Wu (1999) Fisher-ADF based Panel Unit Root Test

Maddala and Wu (1999:636) proposed a Fisher (1932) type test which is similar to the IPS test in that it combines information based on individual unit root tests. The Fisher-based tests however

differ from the IPS test as they combine the observed significance levels (p-values) of several independent unit root tests rather than averaging the numerous unit root test statistics, and thus are commonly referred to as combining p-value tests (Maddala and Wu, 1999:637; Baltagi, 2001:240). The Maddala and Wu (1999) approach similarly tests the stationarity/non-stationarity hypotheses specified in Equations (4.8) and (4.9) above.

In such a Fisher-based test, let G_{iT_i} denote a unit root test statistic for the i-th group and assume that as the time series observations for the i-th group tends to infinity (i.e. $T_i \rightarrow \infty$) then G_{iT_i} weakly converges to G_i (i.e. $G_{iT_i} \Rightarrow G_i$) where G_i is a non-degenerate random variable (Baltagi, 2001:240). Thus, the asymptotic p-value (p_i) of a unit root test for cross-section i is defined as:

$$p_i = F(G_{iT_i}) \qquad \text{..... (4.11),}$$

where $F(.)$ denotes the distribution function of the random variable, G_i.

Maddala and Wu's (1999) approach proposed using the inverse chi-square test (Fisher's test), which is based on the additive property of the χ^2 variables (Choi, 2006:518), with a test statistic defined as:

$$P = -2\sum_{i=1}^{N} \ln(p_i) \qquad \text{..... (4.12),}$$

where $-2\ln(p_i)$ has a χ^2 distribution with two degrees of freedom, so P is distributed as χ^2 with $2N$ degrees of freedom as $T_i \rightarrow \infty$ for finite N (number of separate samples).

Hence, this test combines the p-values from unit root tests for each cross-section i to test for unit roots in panel data. According to Maddala and Wu (1999:636) this test has advantages since it does not require a balanced panel, it can be carried out for any unit root test derived, and one can use different lag lengths in the individual ADF regressions. Maddala and Wu (1999:636) also indicate that the disadvantage of this test is that the p-values need to be derived by Monte Carlo simulations, while the IPS test is easy to use since tables are available for $E(t_{i,T})$ and $V(t_{i,T})$.

c) Choi (2001) Fisher-ADF based Panel Unit Root Test

Choi (2001:251) proposes panel unit root tests under differing general assumptions based on the Fisher-test principles of combining the *p*-values from independent unit root tests for each group. Amongst some of the assumptions, Choi (2001:250) assumes that each group has different types of non-stochastic and stochastic components, as well as the groups all having different time series spans, and assumes cases where N can be finite and infinite. The combining *p*-value test statistics proposed by Choi (2001), in order to examine the stationarity/non-stationarity hypotheses specified above in Equations (4.8) and (4.9), include:

i) Test statistics based on the assumptions that the number of groups N is finite and the number of time series T_i is infinite. Hence, these test statistics are based on the asymptotic *p*-values given in Equation (4.11) and these statistics include:

– Fisher's inverse chi-square test statistic, P, which was also proposed by Maddala and Wu (1999) distributed as $P \Rightarrow \chi^2_{2N}$ and given in Equation (4.12) as:

$$P = -2\sum_{i=1}^{N} \ln(p_i)$$

– The Inverse Normal test statistic, Z, defined as:

$$Z = \frac{1}{\sqrt{N}} \sum_{i=1}^{N} \Phi^{-1}(p_i) \qquad \text{..... (4.13),}$$

where $\Phi(\cdot)$ is the standard normal cumulative distribution function. Since $0 \leq p_i \leq 1$, $\Phi^{-1}(p_i)$ is a standard normal random variable and as $T_i \rightarrow \infty$ for all i, $Z \Rightarrow N(0,1)$.

– The Logit test statistic, L, defined as:

$$L = \sum_{i=1}^{N} \ln\left(\frac{p_i}{1-p_i}\right) \qquad \text{..... (4.14),}$$

where $\ln(p_i/1-p_i)$ has the logistic distribution with mean 0 and variance $\pi^2/3$. As $T_i \rightarrow \infty$ for all i, $L^*(=\sqrt{k}\,L) \Rightarrow t_{5N+4}$, where $k = 3(5N+4)/\pi^2 N(5N+2)$. The distribution L^* is an approximation to the exact asymptotic distribtution.

(ii) Test statistics based on the assumptions that both the number of groups N and the number of time series T_i are infinite. Now $P \rightarrow_p \infty$ thus the P test statistic does not have a non-degenerate distribution in the limit and it must be modified so that it has a non-degenerate limiting distribution.

– Since the P test has $E(-2\ln p_i)=2$ and $\text{Var}(-2\ln p)=4$, the modified P test is derived as:

$$P_m = \frac{1}{2\sqrt{N}} \sum_{i=1}^{N} \left(-2\ln(p_i) - 2\right) \quad \text{..... (4.15),}$$

applying the Lindeberg-Lévy central limit theorem to Equation (4.15) gives $P_m \Rightarrow N(0,1)$ as $T_i \rightarrow \infty$ followed by $N \rightarrow \infty$.

– While, the Z test and L^* test can be used without modification for infinite N. This is due to the distribution of the Z-statistic being invariant to infinite N [i.e. $Z \Rightarrow N(0,1)$ as $T_i \rightarrow \infty$ followed by $N \rightarrow \infty$] since it is scaled by the square root of N. While $L^* \Rightarrow N(0,1)$ as $T_i \rightarrow \infty$ and then $N \rightarrow \infty$ by the central Lindeberg- Lévy central limit theory because $\ln(p_i/1-p_i)$ has the logistic distribution with mean 0 and variance $\pi^2/3$.

Choi's (2001:259) Monte Carlo simulation results for N = 5, 10, 25, 50 and 100, and T = 50 and 100 reveal that when N is small then the empirical size of all the test statistics is reasonably close to the 0.05 nominal size, while at N=100 the P and P_m statistics show mild size distortions. Results also indicate that the Z-test and IPS (1999) *t-bar* test show the most stable size, while all tests become more powerful as N increases (Choi, 2001:268). Both the combining p-value tests [Maddala and Wu (1999) and Choi (2001)] show superior size adjusted power to the IPS (1999) *t-bar* test, with the Z-test notably three times more powerful than the IPS (1999) *t-bar* test in some cases. Overall, the Z-test seems to outperform the other tests and it can be used for both finite and infinte N, thus it is recommended by Choi (2001:268).

4.4.3 TESTING FOR COINTEGRATION

According to Maddala and Kim (1998:26), a linear combination of I(1) variables can be I(0) when the I(1) variables are cointegrated (i.e. there exists a long-run equilibrium relationship between the variables). So I(1) variables y_t and x_t are said to be cointegrated if there exists a β such that $y_t - \beta x_t$ is I(0), in this case y_t and x_t do not drift too far apart from each other over time. In contrast, when y_t

and x_t are not cointegrated then $y_t - \beta x_t = u_t$ is also I(1), thus y_t and x_t would drift apart from each other over time (Maddala and Kim, 1998:26). Consequently, once the variables in the study have been identified as unit root stationary, I(1), there is a need to test for the presence of cointegration (long-run relationships) amongst the variables.

The concept of cointegration was first introduced by Granger (1981) and there currently exists several ways of testing for its presence. Amongst the most commonly applied cointegration techniques in empirical research includes the Engle and Granger (1987) two-step method, the Phillips-Ouliaris (1990) test, as well as the Johansen (1988, 1992) and Johansen-Juselius (1990) procedures. Researchers however note that these conventional time series cointegration tests frequently suffer from inappropriately low power when used to test series of short time spans (Pedroni, 1999:655). According to Christopoulos and Tsionas (2004:62), the Johansen (1988, 1992) and Johansen-Juselius (1990) cointegration procedures suffer from distortedly low power when applied in multivariate systems on small sample sizes. Therefore, researchers have highlighted the need to pool the data of individual panel members in order to take advantage of the information contained in both time series and cross-sectional aspects of the data regarding the hypothesis. In this regard, panel cointegration tests have been noted to resolve the small sample issues pertaining to time series methods. Although panel cointegration techniques have the noted advantages they are less frequently applied in empirical research. The four most widely known panel cointegration techniques include the Fisher-type test using Johansen's test methodology, the Kao (1999) test, the Pedroni (1999, 2004) test, and the LR-bar test proposed by Larsson *et al.* (2001). However, in empirical research the Fisher-Johansen combined test proposed by Maddala and Wu (1999) is very scarcely applied while the LR-bar test is found to be outperformed by the Kao (1999) and Pedroni (1999, 2004) tests in both small and large panels (Gutierrez, 2003:109). Consequently, the two residual based panel cointegration tests proposed by Pedroni (1999, 2004) and Kao (1999), which are more widely utilised in empirical research, will be employed in this study.

a) Pedroni (1999, 2004) Panel Cointegration Test

The Pedroni (1999, 2004) cointegration test extends the Engle and Granger (1987) two-step method to panels and relies on the PP and ADF principles. Pedroni's early research, in 1995 and 1997, exposed a method of testing for cointegration within heterogeneous panels but this initial work was

limited to simple bivariate cases largely because critical values required for more complex multivariate regressions were not available. Pedroni (1999) filled this gap by describing a method of providing appropriate critical values to allow cointegration testing in cases with multiple regressors. The Pedroni (1999, 2004) cointegration approach allows investigators to pool selective information concerning the common long-run associations within the panel, while importantly also permitting the related fixed effects and short-run dynamics to be heterogeneous (diverse) across the different panel members. For each member of the panel, a null hypothesis of no cointegration is tested against an alternative of a single cointegrating vector existing. Under the alternative hypothesis the cointegrating vector is allowed to differ across panel members because, as Pedroni (1999:655) states, "in practice the cointegrating vectors are often likely not to be strictly homogeneous in such panels". When cointegrating vectors are erroneously deemed homogeneous it may result in failure to reject the null of no cointegration even when the variables are truly cointegrated.

In order to test the null hypothesis of no cointegration, Pedroni (1997) derived the asymptotic distributions and explored the small sample properties of seven test statistics for cointegration in a panel context. When the calculated test statistics values exceed the tabulated critical value, the null hypothesis of no cointegration is rejected and the variables are cointegrated. These test statistics are constructed by firstly estimating the hypothesised cointegrating relationship separately for each panel member and then pooling the resulting residuals. The residuals required to construct these test statistics are based on a general case multivariate cointegrating regression of the form:

$$y_{i,t} = \alpha_i + \delta_i t + \beta_{1i} x_{1i,t} + \beta_{2i} x_{2i,t} + ... + \beta_{Mi} x_{Mi,t} + e_{i,t} \quad \text{..... (4.16),}$$

for t=1,...,T; i=1,...,N; m=1,...,M

where T is the number of observations; N is the number of members in the panel; M is the number of regression variables; $\beta_{1i}, \beta_{2i}, ..., \beta_{Mi}$ are the slope coefficients that are allowed to differ across panel members; $\delta_i t$ is the deterministic time trend (specific to panel members); and α_i is the member-specific intercept (or fixed-effects parameter) that is also permitted to vary across panel members (Pedroni, 1999:656).

The estimated residuals ($\hat{e}_{it}$) obtained from estimating these cointegrating regressions need to be pooled, however the manner in which the estimated residuals may be pooled differs. Consequently, different pooling basis results in test statistics which differ accordingly. The first four test statistics

are known as 'panel' or 'within-dimension' statistics as they are based on pooling the residuals of the regression along what is generally referred to as the 'within-dimension' of the panel. The 'panel' statistics include the:

(i) Panel v-statistic, a non-parametric variance ratio statistic, which can be specified as:

$$Z_{\tilde{v}_{N,T}} \equiv \left(\sum_{i=1}^{N} \sum_{t=1}^{T} \hat{L}_{11i}^{-2} \hat{e}_{i,t-1}^{2} \right)^{-1} \quad \text{..... (4.17),}$$

(ii) Panel ρ-statistic, a panel version of a non-parametric statistic analogous to the PP rho-statistic, which can be specified as:

$$Z_{\hat{p}_{N,T-1}} \equiv \left(\sum_{i=1}^{N} \sum_{t=1}^{T} \hat{L}_{11i}^{-2} \hat{e}_{i,t-1}^{2} \right)^{-1} \sum_{i=1}^{N} \sum_{t=1}^{T} \hat{L}_{11i}^{-2} (\hat{e}_{i,t-1}^{2} \Delta \hat{e}_{i,t} - \hat{\lambda}_i) \quad \text{..... (4.18),}$$

(iii) Panel non-parametric (PP) t-statistic, a panel version of a non-parametric statistic that is analogous to the PP t-statistic, which can be specified as:

$$Z_{t_{N,T}} \equiv \left(\tilde{\sigma}_{N,T}^{2} \sum_{i=1}^{N} \sum_{t=1}^{T} \hat{L}_{11i}^{-2} \hat{e}_{i,t-1}^{2} \right)^{-\frac{1}{2}} \sum_{i=1}^{N} \sum_{t=1}^{T} \hat{L}_{11i}^{-2} (\hat{e}_{i,t-1}^{2} \Delta \hat{e}_{i,t} - \hat{\lambda}_i) \text{..... (4.19),}$$

(iv) Panel parametric (ADF) t-statistic, a parametric statistic that is analogous to the ADF t-statistic, which can be specified as:

$$Z_{t_{N,T}}^{*} \equiv \left(\tilde{s}_{N,T}^{*2} \sum_{i=1}^{N} \sum_{t=1}^{T} \hat{L}_{11i}^{-2} \hat{e}_{i,t-1}^{*2} \right)^{-\frac{1}{2}} \sum_{i=1}^{N} \sum_{t=1}^{T} \hat{L}_{11i}^{-2} \hat{e}_{i,t-1}^{*} \Delta \hat{e}_{i,t}^{*} \quad \text{..... (4.20),}$$

where:

- $\hat{L}_{11i}^{-2}$ is the nuisance parameter estimator related to the member specific long-run conditional variance for the residuals,
- $\hat{e}_{i,t}$ are the residuals from the original cointegrating relationship,
- Δ is a difference operator,
- $\hat{\lambda}_i$ is a nuisance parameter estimator such that $\hat{\lambda}_i = \frac{1}{2}(\hat{\sigma}_i^2 - \hat{s}_i^2)$,
- $\hat{\sigma}_i^2$ is the long-run variance of the residuals $\hat{u}_{i,t}$ of the autoregression $\hat{u}_{i,t} = \hat{e}_{i,t} - \hat{\gamma}_i \hat{e}_{i,t-1}$,

- $\hat{s}_i^2$ is the individual contemporaneous variance of the residuals $\hat{u}_{i,t}$,
- $\tilde{\sigma}_{N,T}^2$ is a nuisance parameter estimator such that $\tilde{\sigma}_{N,T}^2 \equiv \frac{1}{N}\sum_{i=1}^{N} \hat{L}_{11i}^{-2}\hat{\sigma}_i^2$,
- $\hat{e}_{it}^*$ are the parametric estimated residuals,
- $\tilde{s}_{N,T}^{*2}$ is the contemporaneous panel variance estimator such that $\tilde{s}_{N,T}^{*2} \equiv \frac{1}{N}\sum_{i=1}^{N} \hat{s}_i^{*2}$, and
- $\hat{s}_i^*$ is the standard contemporaneous variance of the residuals from the ADF regressions.

These 'panel' statistics are constructed by summing the numerator and denominator terms separately for the analogous conventional time series statistics, thus 'panel' statistics are based on estimators which pool the autoregressive coefficient across the differing panel members (Pedroni, 2004:604). It is therefore assumed that there is a common value for the autoregressive coefficient (γ_i) of the estimated residuals for 'panel' statistics (Pedroni, 1999:657). Since the manner in which the residuals are pooled influences the assumptions about the autoregressive coefficient (γ_i), therefore the alternative hypothesis will also be impacted. Hence, for the 'panel' statistics, the null hypothesis of no cointegration, H_0: $\gamma_i=1$ for all i, is tested against the alternative hypothesis of H_1: $\gamma_i=\gamma<1$ for all i, where the alternative hypothesis reveals the assumption of a common value for $\gamma_i=\gamma$.

The three remaining test statistics are referred to as the 'group' or 'between-dimension' statistics as they are based on pooling the residuals from the regression along what is known as the 'between-dimension' of the panel. The 'group' statistics include the:

(v) Group ρ-statistic, a group non-parametric statistic analogous to the PP rho-statistic, which can be specified as:

$$\tilde{Z}_{\hat{\rho}_{N,T}-1} \equiv \sum_{i=1}^{N}\left(\sum_{t=1}^{T}\hat{e}_{i,t-1}^2\right)^{-1}\sum_{t=1}^{T}(\hat{e}_{i,t-1}\Delta\hat{e}_{i,t}-\hat{\lambda}_i) \quad \text{..... (4.21),}$$

(vi) Group non-parametric (PP) t-statistic, a group non-parametric statistic that is analogous to the PP t-statistic, which can be specified as:

$$\tilde{Z}_{t_{N,T}} \equiv \sum_{i=1}^{N}\left(\hat{\sigma}_i^2\sum_{t=1}^{T}\hat{e}_{i,t-1}^2\right)^{-\frac{1}{2}}\sum_{t=1}^{T}(\hat{e}_{i,t-1}\Delta\hat{e}_{i,t}-\hat{\lambda}_i) \quad \text{..... (4.22),}$$

(vii) Group parametric (ADF) *t*-statistic, a group parametric statistic that is analogous to the ADF *t*-statistic, which can be specified as:

$$\tilde{Z}^{*}_{t_{N,T}} \equiv \sum_{i=1}^{N}\left(\sum_{t=1}^{T}\hat{s}_i^{*2}\hat{e}_{i,t-1}^{*2}\right)^{-\frac{1}{2}}\sum_{t=1}^{T}\hat{e}^{*}_{i,t-1}\Delta\hat{e}^{*}_{i,t} \qquad \text{..... (4.23),}$$

where:

- $\hat{e}_{i,t}$ are the residuals from the original cointegrating relationship,
- Δ is a difference operator,
- $\hat{\lambda}_i$ is a nuisance parameter estimator such that $\hat{\lambda}_i = \frac{1}{2}(\hat{\sigma}_i^2 - \hat{s}_i^2)$,
- $\hat{\sigma}_i^2$ is the long-run variance of the residuals $\hat{u}_{i,t}$ of the autoregression $\hat{u}_{i,t} = \hat{e}_{i,t} - \hat{\gamma}_i\hat{e}_{i,t-1}$,
- $\hat{s}_i^2$ is the individual contemporaneous variance of the residuals $\hat{u}_{i,t}$,
- $\hat{e}_{it}^{*}$ are the parametric estimated residuals, and
- $\hat{s}_i^{*}$ is the standard contemporaneous variance of the residuals from the ADF regressions.

These 'group' statistics are constructed by first computing the ratio corresponding to the conventional time series statistic and then computing the standardised sum of the entire ratio over the N dimension of the panel (Pedroni, 2004:604). Thus the 'group' statistics are based on estimators which average the individually estimated coefficients for each member. It is therefore assumed that the autoregressive coefficient (γ_i) of the estimated residuals differs across members (Pedroni, 1999:657). For the 'group' statistics the null hypothesis of no cointegration, H_0: $\gamma_i = 1$ for all i, is tested against the alternative hypothesis of H_1: $\gamma_i < 1$ for all i. This alternative hypothesis reveals the assumption that there is no common value for $\gamma_i = \gamma$, in this way it allows for heterogeneous autocorrelation parameters and permits modelling of an additional source of potential heterogeneity across individual panel members (Pedroni, 1999:658).

Pedroni (1997) used Monte Carlo simulations to investigate the small sample properties of these seven statistics. In terms of power, Pedroni (1997) showed that for samples with T larger than 100 then all seven statistics do fairly well and are stable. However, in small samples (shorter time periods, $T \leq 20$) then the group-ADF statistic generally performs best, followed by the panel-ADF statistic. Pedroni (2004) further examined the small sample properties of the five non-parametric statistics

(i.e. panel-v, panel-PP, panel-rho, group-PP, and group-rho statistics), excluding the parametric group-ADF and panel-ADF statistics (which were found to have the best small sample power). Pedroni (2004:614) shows that in very small samples, of the five non-parametric statistics, when the group-rho statistic rejects the null hypothesis then one can be relatively confident of the conclusion, while the panel-v statistic is most useful in large samples but has the lowest small sample power.

b) Kao (1999) Panel Cointegration Test

The Kao (1999) approach is also a residual based test originating from the Engle and Granger (1987) two-step method, and is thus similar to the Pedroni (1999, 2004) approach in this manner. However, the Kao (1999) test is a homogenous panel cointegration test which specifies cross-section specific intercepts and homogeneous coefficients on the first-stage regressors. Kao (1999:3) considered the following system of cointegrated regressions:

$$y_{it} = \alpha_i + x_{it}\beta + e_{it} \qquad (i = 1,...,N,\ t = 1,...,T) \qquad \text{..... (4.24),}$$

$$x_{it} = x_{it-1} + \varepsilon_{it} \qquad \text{..... (4.25),}$$

where α_i are individual constant terms, β is the slope parameter, e_{it} are stationary disturbance terms, and by construction y_{it} and x_{it} are integrated processes of the first order, I(1), for all i.

The zero mean innovation vector $w_{it}=(e_{it}, \varepsilon_{it})'$ satisfies:

$$\frac{1}{\sqrt{T}}\sum_{t=1}^{Tr} w_{it} \Rightarrow B_i(\Omega) \quad \textit{for all } i \textit{ as } T \to \infty$$

where $B_i(\Omega)$ is a vector Brownian motion with asymptotic covariance Ω.

Therefore, under the assumptions that (i.) the process w_{it} is independent across i (i.e. $E[w_{it} w_{js}'] = 0$ for all $i \neq j$ and for all t and s), (ii.) x_{it} are not cointegrated (i.e. Ω_{22} is non-singular), and (iii.) using Phillips and Moon's sequential limit theory in which $T \to \infty$ first followed by $N \to \infty$, Kao (1999:6) derives two types of cointegration tests in panel data, the DF and ADF type tests. Both tests are calculated from:

$$\hat{e}_{it} = \rho \hat{e}_{it-1} + v_{it} \quad \text{..... (4.26),}$$

where the residuals $\hat{e}_{it}$ are obtained from Equation (4.24).

In order to test the null hypothesis of no cointegration against the alternative that Y and X are cointegrated, the following specification of null and alternative hypotheses is used:

$$H_0: \rho = 1, \quad H_A: \rho < 1 \quad \text{..... (4.27),}$$

Kao (1999:7-9) proposed the following four DF type test statistics:

$$DF_\rho = \frac{\sqrt{N}T(\hat{\rho}-1)+3\sqrt{N}}{\sqrt{10.2}} \quad \text{..... (4.28),}$$

$$DF_t = \sqrt{1.25}t_\rho + \sqrt{1.875N} \quad \text{..... (4.29),}$$

$$DF_\rho^* = \frac{\sqrt{N}T(\hat{\rho}-1)+\frac{3\sqrt{N}\hat{\sigma}_v^2}{\hat{\sigma}_{0v}^2}}{\sqrt{3+\frac{36\hat{\sigma}_v^4}{5\hat{\sigma}_{0v}^4}}} \quad \text{..... (4.30),}$$

$$DF_t^* = \frac{t_\rho + \frac{\sqrt{6N}\hat{\sigma}_v}{2\hat{\sigma}_{0v}}}{\sqrt{\frac{\hat{\sigma}_{0v}^2}{2\hat{\sigma}_v^2}+\frac{3\hat{\sigma}_v^2}{10\hat{\sigma}_{0v}^2}}} \quad \text{..... (4.31),}$$

where N and T are the time series and cross-sectional elements of the data respectively, $\hat{\sigma}_v^2$ and $\hat{\sigma}_v$ are the variances and standard deviations of v respectively, $\hat{\rho}$ is the estimate for ρ derived from Equation (4.26), and $t_\rho = \left[(\hat{\rho}-1)\sqrt{\sum_{i=1}^{N}\sum_{t=2}^{T}\hat{e}_{i,t-1}^2}\right]/s_e$ where $s_e^2 = (1/NT)\sum_{i=1}^{N}\sum_{t=2}^{T}(\hat{e}_{it} - \hat{\rho}\hat{e}_{i,t-1})^2$.

The first two DF statistics (DF_ρ and DF_t) are based on the strict exogeneity of the regressors with respect to errors in the equation, while the remaining two DF statistics (DF^*_ρ and DF^*_t) are for the cointegration with endogenous relationships between regressors and errors (Gutierrez, 2003:107).

In addition, Kao (1999) proposes an ADF-type test statistic which originates from the regression:

$$\hat{e}_{it} = \rho \hat{e}_{i,t-1} + \sum_{j=1}^{p} \vartheta_j \Delta \hat{e}_{i,t-j} + v_{itp} \quad \text{..... (4.32),}$$

Consequently the ADF-type Kao (1999) test statistic is constructed as:

$$ADF = \frac{t_{ADF} + \frac{\sqrt{6N}\hat{\sigma}_v}{2\hat{\sigma}_{0v}}}{\sqrt{\frac{\hat{\sigma}_{0v}^2}{2\hat{\sigma}_v^2} + \frac{3\hat{\sigma}_v^2}{10\hat{\sigma}_{0v}^2}}} \quad \text{..... (4.33),}$$

where t_{ADF} is the t-statistic of ρ in Equation (4.32).

The ADF statistic and the two DF statistics which allow for endogeneity involve deriving some nuisance parameters from the long-run conditional variances Ω (Gutierrez, 2003:107). The asymptotic distributions of all the test statistics converge to a standard normal distribution N (0, 1) by sequential limit theory (i.e. as $T \rightarrow \infty$ and $N \rightarrow \infty$).

Gutierrez (2003) conducted Monte Carlo comparisons of various panel cointegration methods. Gutierrez (2003:109) finds that, for a homogeneous panel, the Kao (1999) test outperforms the Pedroni (1999) test when the time-dimension (T) of the panel is small ($T = 10$); while the Pedroni (1999) test has higher power than the Kao (1999) test when the time-dimension (T) of the panel increases ($T > 10$). Thus when the sample grows large, the power of Pedroni's tests outperforms Kao tests. Gutierrez (2003:109) further notes that in applied work, for large-T panels (small-T panels), there is a risk of modelling the whole panel erroneously as cointegrated (non-cointegrated), given the higher power (low power) of the tests, even when only a fraction (a larger number) of relationships are cointegrated in the panel. Thus, caution must be taken when researchers impose cointegration or non-cointegration properties to a panel.

4.4.4 TESTING THE DIRECTION OF CAUSALITY

Once the variables are found to be cointegrated, this implies a long-run relationship exists and therefore there is causality in at least one direction, but cointegration does not indicate causal direction (Chontanawat, 2008:2). Furthermore, if no cointegration (i.e. no long-run relationship) is found there still may be short-run linkages between the economic variables under consideration and thus causality tests should be employed to investigate the presence of such linkages. Hence, the final step of the statistical analysis is the exploration of the direction of the causal linkages among the variables using Granger causality tests.

It is common that when dealing with panel data, the Granger causality tests which have been extended for panel data be used. According to Holtz-Eakin *et al.* (1989:1), the standard Granger (1969) causality test cannot be applied directly to panel data due to the relatively small time periods observed, since there must be enough observations on x and y in order to obtain consistent estimates of the parameters of the causality regressions. According to Hurlin (2007:3), causality can be tested with more efficiency in a panel context with NT observations. While, Hsiao (2003:7) suggests that more accurate predictions about the individuals can be generated when using panel data since "an individual's behaviour can be learned by observing the behaviour of others, in addition to the information on that individual's behaviour". Furthermore, the standard Granger causality estimates do not deal appropriately with heterogeneity among the cross-sectional units. Consequently, we employ the Holtz-Eakin *et al.* (1989) (or Holtz-Eakin, Newey and Rosen, 1989) Granger causality approach, which allows for heterogeneous country-effects.

The Holtz-Eakin *et al.* (1989) panel Granger causality test can be undertaken using the model:

$$y_{it} = \alpha + \sum_{j=1}^{p} \delta_j y_{it-j} + \sum_{j=1}^{p} \beta_j x_{it-1} + f_i + \varepsilon_{it} \qquad \text{..... (4.34),}$$

where α is a constant, δ_j and β_j are coefficients of the lagged explanatory variables, f_i is the individual (country-specific) effects term, p denotes the lag length, ε_{it} is the error term, $i = 1,\ldots,N$; $t = p+1,\ldots T$.

The error term ε_{it} satisfies the orthogonality conditions:

$$E(y_{is}\varepsilon_{it}) = E(x_{is}\varepsilon_{it}) = E(f_i\varepsilon_{it}) = 0, \quad for\, s < t \qquad \text{..... (4.35),}$$

The model specified in Equation (4.34) allows the relationship between x and y to vary across each country and over time. This occurs by: (i) adding the individual effects term (f_i) since the ith unobservable individual effect (which translates into a unit specific intercept in Equation (4.34)) cannot be neglected; and (ii) relaxing the assumption that the lag coefficients δ_j and β_j are constant for each t. The lag order may be arbitrarily selected however it may not be large (especially in small panels) since there might not be sufficient observations to estimate all of the δ_j and β_j coefficients.

Equation (4.34) can be re-written as two auto-regressive equations:

$$GDP_{it} = \alpha + \sum_{j=1}^{p} \delta_j GDP_{it-j} + \sum_{j=1}^{p} \beta_j FD_{it-j} + \mu_i + \varepsilon_{it} \quad \text{..... (4.36),}$$

$$FD_{it} = \gamma + \sum_{j=1}^{p} \lambda_j GDP_{it-j} + \sum_{j=1}^{p} \pi_j FD_{it-j} + \eta_i + v_{it} \quad \text{..... (4.37),}$$

where ε_{it} and v_{it} are error terms, and μ_i and η_i are individual specific effects.

The inclusion of the individual effects and the lagged dependent variables in panel models (such as Equations (4.36) and (4.37)) leads to the problem that the lagged dependent variables are correlated with the error terms, and thus estimation is biased (Choe, 2003:46). In order to address this issue, Holtz-Eakin *et al.* (1989:5) suggests using the first difference operator to remove the unobserved individual effects (μ_i and η_i). Δ indicates the first difference operator, the resulting models become:

$$\Delta GDP_{it} = \sum_{j=1}^{p} \delta_j \Delta GDP_{it-j} + \sum_{j=1}^{p} \beta_j \Delta FD_{it-j} + \Delta \varepsilon_{it} \quad \text{..... (4.38),}$$

$$\Delta FD_{it} = \sum_{j=1}^{p} \lambda_j \Delta GDP_{it-j} + \sum_{j=1}^{p} \pi_j \Delta FD_{it-j} + \Delta v_{it} \quad \text{..... (4.39),}$$

This specification (i.e. first-order differencing) introduces a problem of simultaneity, since the error terms ($\Delta \varepsilon_{it}; \Delta v_{it}$) are correlated with the regressors ($\Delta GDP_{it-j}; \Delta FD_{it-j}$). The solution is to employ instrumental variables in order to obtain a consistent estimation of the parameters, as suggested by Holtz-Eakin *et al.* (1989). A necessary condition for identification is that there are at least as many instrumental variables as right-hand-side variables of Equations (4.38) and (4.39). GMM estimation is said to yield consistent and asymptotically efficient instrumental variables. The GMM estimator does not require information on the exact distribution of the error terms and so is able to deal with unknown forms of heteroskedasticity and serial correlation, consequently it is preferred to the generalised least squares (GLS) method as it is a more robust estimator (Chen, 2008:115). The panel GMM estimator uses the lagged regressors as instruments in the regressions.

Consequently, testing for causality between x and y, using the Holtz-Eakin *et al.* (1989) approach, is equivalent to testing zero constraints on the coefficients in Equations (4.38) and (4.39). The test as

to whether FD has a causal effect on GDP, then corresponds to testing whether all the β_j in Equation (4.38) are simultaneously equal to zero (i.e. $\beta_j = 0$). Hypotheses are tested using the Wald coefficient restriction tests and the test statistic is the chi-square statistic. If the chi-square statistic is shown to be significant, the null hypothesis that FD does not Granger cause GDP is rejected, this implies that FD Granger causes GDP (i.e. there is supply-leading finance). While testing the causal effect of GDP on FD is a test of the hypothesis that $\lambda_j = 0$ in Equation (4.39), thus GDP does not Granger cause FD. Similarly, a significant chi-square statistic results in the null hypothesis being rejected and the conclusion is that GDP Granger causes FD (i.e. there is demand-following finance).

4.5 CONCLUSION

This chapter details the analytical framework which is applied in this study in order to analyse the impacts of financial system development on economic growth in selected African countries. The empirical model relating economic growth to various explanatory variables, based on theoretical and empirical foundations, was specified in Section 4.2. The explanatory variables included a set of control variables (containing measures of inflation, volume of trade, government spending and population growth) and three categories of financial development indicators. The three categories include indicators of overall financial development (using two newly computed indexes), banking system development (using liquid liabilities ratio and private sector credit ratio) and stock market development (using stock market capitalisation ratio and total value traded ratio). Section 4.3 provided a description of the variables used, reviewed the *a priori* expectations with respect to the variables in the model and also described the sources of the data used in the study. Section 4.4 then explained the various estimation techniques that are to be used in this study. More specifically, the principal component analysis method was discussed which will be used to generate one of the new indexes of overall financial development that captures both banking system and stock market development aspects. Next, we discussed the panel unit root tests proposed by Im, Pesaran and Shin (2003), Maddala and Wu (1999) and Choi (2001) that will be performed to determine whether the variables are integrated of order one, I(1), a necessary condition prior to testing for cointegration. We then discussed the Pedroni (2004) and Kao (1999) panel cointegration procedures that will be used to test for any long-run relationships between the variables. Lastly, the Holtz-Eakin *et al.* (1989)

panel Granger causality test which will be applied in order to determine the direction of causal linkages among the variables was explained.

In the next chapter the analytical framework presented in this chapter will be applied to the relevant dataset in order to test the possible finance-growth linkages identified in Chapter 3 and to achieve the objectives set out in Chapter 1.

CHAPTER 5:
EMPIRICAL RESULTS

5.1 INTRODUCTION

The previous chapter detailed the model to be estimated and the analytical framework which is applied in this study in order to analyse the impacts of financial development on economic growth. This chapter applies the framework and proposed techniques on annual African data covering the period 1988 to 2008. The results from this chapter are used to address sub-objectives two, three and four, set out in Chapter 1. Specifically, to determine the overall effect of the financial system on economic growth, to analyse the relationships between banking system development and growth, and between stock market development and growth in the seven countries, and lastly to determine the direction of causality which prevails between various financial development measures and economic growth. This chapter is divided into four main sections. In Section 5.2 the derived overall financial development measures are discussed, while the empirical findings relating to the long-run finance-growth relationship are discussed in Section 5.3. More specifically, Section 5.3 applies panel unit root tests (by IPS (2003), Maddala and Wu (1999), and Choi (2001)) to evaluate the stationarity of the variables considered in the model and also applies panel cointegration approaches (by Pedroni (2004) and Kao (1999)) to assess the long-run relationship between financial development and economic growth. Section 5.4 uses the Holtz-Eakin *et al.* (1989) panel Granger causality test to analyse the direction of causality which holds between financial development and growth. Finally, Section 5.5 provides the conclusions to the chapter.

5.2 OVERALL FINANCIAL DEVELOPMENT MEASURES

Two overall financial development measures have been derived by applying the Findex formula (discussed in Section 4.3.1) and employing PCA to the banking system and stock market development measures. Table A.4 in the Appendix reports the series derived by applying the Findex formula and this derived series (when applying the Findex formula) is also reported in a natural logarithm form (LOFD) in Table A.5 in the Appendix. The LOFD series is used in this study for testing the finance-growth nexus. Furthermore, in order to obtain the second OD series, we analyse

the PCA estimates reported in Table A.6 in the Appendix. Apply Kaiser's rule (i.e. the components retained are those principal components whose variance exceeds 1) to these results, we find that it is appropriate to retain only one principal component. Based on the selected principal component the second index, OFD2, is derived and is reported in Table A.7 in the Appendix.

A brief look at the estimates for LOFD and OFD2, reported in Tables A.5 and A.7 respectively, shows that the differing computational methodologies have had an influence on the values of these indexes. The LOFD series have values ranging from 3.28 to 5.86, whilst the OFD2 series ranges from -2.03 to 2.25, where the larger the value of index the greater the level of overall financial development. Figure A.3 in the Appendix provides a simple plot of the two series. This plot shows that the two overall financial development measures trend similarly over the sample period, spiking and falling similarly over time; however this plot also highlights scaling differences between the two measures which are an outcome of the inherent differences in calculation methods.

The use of these two aggregate measures will serve two main purposes, namely, (i) to provide broader coverage of overall financial development occurring in the countries, just as two measures of banking development and two measures of stock market development are employed to more fully cover banking and stock market areas respectively, and (ii) the use of two measures allows for the exploration into the impacts of computational differences of OD measures on empirical results.

5.3 LONG-RUN FINANCE-GROWTH RELATIONSHIP

In order to answer the crucial questions of this study, this section firstly presents the findings of the unit root tests conducted on the variables which are to be incorporated into the models used for investigating the dynamics of the finance-growth nexus. Next, this section presents the results of the cointegration analysis, which investigates long-term finance-growth linkages, applied to different specifications of the underlying model (specified earlier in Equation (4.1)).

5.3.1 TESTS FOR STATIONARITY

In order to determine whether the variables are stationary or non-stationary – the first step in the panel cointegration methodology – three formal unit root tests by IPS (2003), Maddala and Wu (or

MW) (1999), and Choi (2001) are employed, as discussed in Chapter 4. These tests are applied to the data under different deterministic trend assumptions, namely, the assumption of an intercept alone (i.e. no trend) and the assumption of an intercept and a trend.

It would be recalled that each of the three unit root techniques employed in the study tests the null hypothesis of a unit root (i.e. non-stationarity) at levels and at first differences. Therefore, the rejection of the null hypothesis under either of these tests indicates that the series does not have a unit root and is interpreted as evidence of stationarity.

The unit root test results for both the case of an intercept alone and the case of an intercept and trend, are reported in Table 5.1 below. The lag order chosen is by means of the Schwarz Automatic lag length selection. Results reveal that the IPS, MW, and Choi tests fail to reject the null hypothesis in levels (i.e. are non-stationary) for the GDP *per capita* (LGDP), liquid liabilities ratio (LLL), total value traded ratio (LVLT), government expenditure (LGOV), and ratio of trade to GDP (LTRA) variables, however these variables become stationary after the variables are differenced once (i.e. I(1)), irrespective of the deterministic trend assumption. The IPS, MW, and Choi tests also commonly find that the inflation (INF) and population growth rate (POP) variables reject the null hypothesis of a unit root at levels (i.e. are stationary at levels), irrespective of the deterministic trend assumption.

The remaining three variables (that is, overall financial development (LOFD), private sector credit ratio (LPSC), market capitalisation ratio (LMCP)) display mixed stationarity results. In the case of LOFD, it is seen that eleven of the twelve unit root estimates across both assumptions find LOFD to be non-stationary in levels, with only the MW chi-square statistic (under the assumption of an intercept and trend) finds LOFD to be weakly stationary in levels (at the 10% level of significance). It would be recalled that the Choi Z-test is more powerful than the IPS and MW tests. Therefore, in the case of mixed results such as is noted here, the Z-test results should be followed. Overall, when taking into account the Z-test findings as well as the fact that LOFD is found to be weakly stationary in levels in only one case of twelve estimates (when using the MW chi-square test and assuming an intercept and trend), it is concluded that LOFD is non-stationary in levels and is integrated of order one (i.e. I(1)).

The mixed stationarity results recorded for the LPSC and LMCP variables occur when the differing deterministic trend assumptions are used (i.e. intercept alone, and intercept and trend). In the case of

LPSC, across all three panel unit root tests the null hypothesis is rejected in levels at the 10% level of significance, when the intercept alone assumption is used. However, when the intercept and trend assumption is used, these unit root tests all find LPSC to be non-stationary in levels and stationary only after differencing the series once. These contrasting results could be due to the adequate consideration of a possible deterministic trend in the LPSC series and it should be kept in mind that LPSC is found to be only weakly significant in levels when the intercept alone assumption is used.

Furthermore, across all unit root tests LMCP fails to reject the null hypothesis in levels and is found to be an I(1) variable when the intercept alone assumption is used. However, using the intercept and trend assumption, LMCP is found to be stationary in levels. As above, these mixed results could be due to the adequate consideration of a possible deterministic trend in the LMCP series.

Table 5.1: Unit Root Test Results [Intercept Alone, and Intercept and Trend]

Variable	Trend Assumption	IPS		MW_Chi-square Test		Choi_Z-Test	
		LEVELS	1ST DIFF	LEVELS	1ST DIFF	LEVELS	1ST DIFF
LGDP	Intercept Alone	4.132	-3.554[a]	7.459	38.440[a]	3.844	-3.292[a]
	Intercept and Trend	1.883	-4.907[a]	11.138	47.520[a]	2.126	-4.529[a]
LLL	Intercept Alone	-0.041	-6.272[a]	14.702	62.238[a]	-0.079	-5.761[a]
	Intercept and Trend	0.320	-5.095[a]	9.167	48.694[a]	0.332	-4.548[a]
LPSC	Intercept Alone	-1.393[c]	-8.421[a]	21.801[c]	87.329[a]	-1.454[c]	-6.843[a]
	Intercept and Trend	0.276	-6.006[a]	16.202	59.543[a]	0.380	-4.989[a]
LMCP	Intercept Alone	-0.465	-6.361[a]	14.256	63.511[a]	-0.427	-5.769[a]
	Intercept and Trend	-2.354[a]	-4.700[a]	26.788[b]	45.792[a]	-2.305[b]	-4.363[a]
LVLT	Intercept Alone	1.822	-7.503[a]	4.390	75.192[a]	1.921	-6.652[a]
	Intercept and Trend	-0.689	-6.756[a]	15.387	62.548[a]	-0.709	-5.823[a]
LOFD	Intercept Alone	3.843	-7.536[a]	3.389	74.805[a]	3.869	-6.732[a]
	Intercept and Trend	-1.132	-5.469[a]	22.254[c]	51.494[a]	-0.796	-5.050[a]
LGOV	Intercept Alone	-1.181	-8.841[a]	18.303	88.451[a]	-1.268	-7.406[a]
	Intercept and Trend	0.054	-6.197[a]	16.603	64.934[a]	0.256	-4.988[a]
INF	Intercept Alone	-1.854[b]	-8.996[a]	21.905[c]	95.317[a]	-1.912[b]	-7.383[a]
	Intercept and Trend	-1.391[c]	-7.336[a]	21.758[c]	68.540[a]	-1.444[c]	-6.353[a]
LTRA	Intercept Alone	1.698	-7.996[a]	14.601	79.837[a]	1.708	-6.881[a]
	Intercept and Trend	0.089	-7.439[a]	16.942	68.979[a]	0.243	-6.107[a]
POP	Intercept Alone	-3.397[a]	-6.637[a]	37.477[a]	90.108[a]	-3.102[a]	-5.029[a]
	Intercept and Trend	-1.319[c]	-4.893[a]	33.553[a]	52.778[a]	-0.944	-2.575[a]

Note 1: a, b, and c denote significance at the 1%, 5%, and 10% levels respectively.

Note 2: LGDP - Log of *per capita* GDP; LLL - Log of liquid liabilities ratio; LPSC - Log of privates sector credit ratio; LMCP - Log of market capitalisation ratio; LVLT - Log of value traded ratio; LOFD - Log of overall financial development measure (findex formula); LGOV - Log of government expenditure; INF - Inflation; LTRA - Log of ratio of trade to GDP; POP - Population growth rate.

Source: Estimates by the author

We conclude therefore that of the ten variables tested, two (i.e. INF and POP) are level stationary (I(0)) and will not be included in the cointegration testing, while five of the variables (i.e. LGDP, LLL, LVLT, LGOV and LTRA) are non-stationary (integrated of order one, I(1)) and thus will be included in the cointegration analysis since a linear combination of I(1) variables could be I(0) , thus suggesting cointegration among the variables. In addition, the LOFD variable is largely found to be non-stationary (I(1)) and thus will also be included in the cointegration analysis. Furthermore, the LPSC and LMCP variables display conflicting results when differing deterministic trend assumptions are applied, alternating between status as I(0) and I(1) variables. These two series are however also carried forward to cointegration tests since I(0) and I(1) variables could also be cointegrated.

5.3.2 TESTS FOR COINTEGRATION

The next step is to combine the I(1) variables identified above into 12 different models in order to test for cointegration and provide insight into the sub-objectives under investigation in this study. The specifications of the models analysed in this study are reported in Table 5.2 below. Models 1 and 2 serve to provide insight into the relationship between overall financial development and economic growth; Models 3, 4 and 7 are used to explore the relationship between banking system development and economic growth; Models 5, 6 and 8 are used to explore the relationship between stock market development and growth; while Models 9 to 12 are used to investigate the relationship between elements of both banking system and stock market development with economic growth.

Table 5.2: Specifications of Models Estimated

	LGDP	LOFD	OFD2	LLL	LPSC	LMCP	LVLT	LGOV	LTRA
Model 1	X	X						X	X
Model 2	X		X					X	X
Model 3	X			X				X	X
Model 4	X				X			X	X
Model 5	X					X		X	X
Model 6	X						X	X	X
Model 7	X			X	X			X	X
Model 8	X					X	X	X	X
Model 9	X			X		X		X	X
Model 10	X			X			X	X	X
Model 11	X				X	X		X	X
Model 12	X				X		X	X	X

Source: Table compiled by the author

Table 5.3 below reports the panel cointegration results for Models 1 to 12. The lag order chosen is by means of the Schwarz Automatic lag length selection. As explained in Chapter 4, both the Pedroni and Kao panel cointegration approaches test the null hypothesis of no cointegration, thus the rejection of the null hypothesis for any model when using either of these tests can be interpreted as evidence of cointegration.

The results of the Pedroni cointegration test applied to Models 1 to 12 are reported in Table 5.3. All Pedroni tests of Models 1 to 12 are based on two deterministic trend assumptions, namely, the assumption of an intercept alone (i.e. no trend) and the assumption of an intercept and a trend. It would be recalled that of the seven Pedroni test statistics, the group-ADF and panel-ADF statistics are the most powerful statistics within small samples ($T \leq 20$), such as in this study ($T = 21$). Thus in the presence of conflicting evidence provided by the seven statistics, the group-ADF and panel-ADF statistics generally perform best (Pedroni, 1997; Camarero and Tamarit, 2002; Kelly and Mavrotas, 2003; Asteriou and Price, 2005; Higón, 2007; Barnichon and Peiris, 2008). It was also noted that the panel-v statistic has the lowest explanatory power within small samples. Hence, significant group-ADF and panel-ADF statistics lead to the rejection of the null hypothesis.

From the Pedroni results shown in Table 5.3, it can be seen that the group-ADF statistics are significant in Models 1 and 5 at the 10% and 5% levels respectively, when we use the assumption of an intercept and an individual specific deterministic trend. Furthermore, it can be seen that the panel-ADF statistics in Models 2, 4 and 6 are significant at the 5% level, when the assumption of an intercept alone is used. Model 4 additionally has a weakly significant panel-PP statistic at the 10% level. These significant statistics therefore lead to the rejection of the null hypothesis and may indicate the presence of cointegration. The significant panel-v statistics, found for all 12 models under the assumption of an intercept and trend, alone cannot lead to the rejection of the null hypothesis in small samples (due to their lower power). However, when a model contains a significant panel-v statistic and also an additional significant test statistic (such as the case of Models 1 and 5 under the assumption of an intercept and trend), the null hypothesis can be rejected.

Therefore, the Pedroni panel cointegration results reveal that financial development and economic growth are cointegrated. Specifically, Models 1 and 2 show that there is a long-run relationship between overall financial development and growth. In the case of Model 1, LOFD is cointegrated with economic growth, while OFD2 and growth are related in the long-run in Model 2. Model 4

reveals that a long-run relationship exists between banking system development and growth, specifically when LPSC is used as the banking development measure. While Models 5 and 6 show that stock market development and economic growth are related in the long-run, with both LMCP and LVLT found to have long-run linkages with growth. Of these results, it is noted that LLL is not cointegrated with growth while LPSC is cointegrated, even though LLL was seen to move more closely with growth in Chapter 3. The financial sector reforms implemented during the 1980s and 90s could explain this result. Reforms led to an increase in the number of banks, it allowed greater autonomy of African banks and subsequently augmented private sector credit availability. Although this stimulated both LLL and LPSC, private domestic investment in Africa has largely been encouraged by improved private sector credit availability; while the increase in the number of banks (influencing the LLL) may not have had as strong an influence on growth since many African banks are poorly run and several have been liquidated since the 1990s (as in the case of Nigeria).

Next, we analyse the results of the Kao cointegration test applied to Models 1 to 12, also reported in Table 5.3 below, which serve to provide comparisons to the cointegration results obtained using the Pedroni technique. The Kao test results reveal that in all the 12 Models the null hypothesis of no cointegration cannot be rejected. These findings differ sharply to the Pedroni findings. These differing results may largely be explained by the fact that the Pedroni test is a heterogeneous panel cointegration approach, while the Kao test is a homogeneous panel cointegration approach. Thus using the Kao test, the individual specific deterministic trends were not permitted. Therefore, the superiority of the Kao test over the Pedroni test in small samples (which was noted in Section 4.4.3b) is only applicable in a homogeneous panel setting. It should also be kept in mind, as revealed earlier, that Gutierrez (2003:109) cautions that in small samples, researchers should be careful not to conclude no cointegration as there might in fact be cointegration. Taking the aforementioned issues in account and given that our panel is heterogeneous in nature, the Pedroni cointegration results (which allows for varying intercepts and slopes) are deemed appropriate for further analysis.

Therefore, on balance, findings are largely supportive of cointegration between financial development and economic growth. More specifically, these results suggest that overall financial system development, banking system development (specifically the LPSC measure) and stock market development are related to economic growth in the long-run. These results are in line with the findings of Ghali (1999), Ghirmay (2004), Adjasi and Biekpe (2006), and Odhiambo (2007), who similarly find long-run relationships between financial development and economic growth in Africa.

Table 5.3: Panel Cointegration Test Results [Models 1 – 12]

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12
I.) PEDRONI TEST												
Intercept Alone												
>Panel v-Statistic	-0.252	-0.319	-1.319	-0.247	-0.076	-0.319	-0.791	-0.768	-0.474	-0.747	-0.345	-0.776
>Panel rho-Statistic	0.122	0.299	1.718	-0.186	0.246	0.299	1.091	1.469	1.305	1.590	0.762	0.865
>Panel PP-Statistic	-0.948	-0.830	1.827	-1.376[c]	-0.450	-0.830	-0.108	0.634	0.305	0.741	-0.452	-0.540
>Panel ADF-Statistic	0.078	-1.728[b]	2.047	-1.961[b]	-0.487	-1.728[b]	-0.289	-1.004	-1.039	0.088	0.496	-0.705
>Group rho-Statistic	1.615	1.767	2.306	1.130	1.518	1.767	2.036	2.679	2.492	2.683	1.811	2.255
>Group PP-Statistic	0.324	0.734	1.317	-0.200	0.598	0.734	0.203	1.641	1.160	1.670	0.058	0.966
>Group ADF-Statistic	-0.627	-0.722	0.371	-1.001	-0.844	-0.722	-0.307	-0.451	-0.900	0.443	0.481	0.085
Intercept & Trend												
>Panel v-Statistic	5.325[a]	3.097[a]	2.376[a]	3.719[a]	5.105[a]	3.097[a]	1.829[b]	3.596[a]	3.360[a]	1.339[c]	4.142[a]	2.885[a]
>Panel rho-Statistic	1.246	2.544	2.493	1.615	1.574	2.544	2.408	2.068	2.049	3.077	1.522	2.322
>Panel PP-Statistic	-0.030	2.320	2.211	0.306	0.870	2.320	0.889	1.220	0.910	2.776	-0.556	0.816
>Panel ADF-Statistic	-0.951	1.556	1.580	0.415	-0.268	1.556	0.776	1.072	0.218	2.386	-0.878	0.765
>Group rho-Statistic	2.384	3.006	3.026	2.221	2.358	3.006	2.787	2.884	2.682	3.531	2.578	2.772
>Group PP-Statistic	0.611	2.153	2.407	0.417	0.205	2.153	0.505	0.484	0.255	1.972	-0.872	0.370
>Group ADF-Statistic	-1.495[c]	0.148	0.716	0.204	-1.899[b]	0.148	-0.063	0.540	-0.238	1.018	-0.937	0.330
II.) KAO TEST												
Kao ADF Statistic	-0.023	0.217	-0.955	-0.367	0.066	0.111	-0.948	0.495	-0.772	-0.616	-0.002	-0.207

Note: a, b, and c denote significance at the 1%, 5%, and 10% levels respectively.

Source: Estimates by the author

Next, the long-run cointegrating relationships identified in Models 1, 2, 4, 5 and 6 are estimated using Panel OLS[47]. The estimated long-run relationships are reported below in Table 5.4. It can be seen that all the estimated coefficients for the measures of financial development have the expected positive sign, while LOFD is the only financial development measure that does not display a significant coefficient. The other four financial development measures (i.e. OFD2, LPSC, LMCP and LVLT) appear to have strong, significant (at the 1% level) relationships with economic growth. More specifically, the LPSC finding suggests that financial deepening – by way of increasing credit availability to the private sector – has a positive influence on real activity. Ndikumana (2000), Ghirmay (2004), and Padachi *et al.* (2007) similarly show that a positive, significant long-run relationship exists between banking development (particularly LPSC) and growth in Africa. While findings also suggest that enhancing the size and liquidity of stock markets has a significantly positive impact on economic growth. Similar positive, significant long-run linkages between stock market development (measured by LMCP and LVLT) and growth in Africa have been found by Adjasi and Biekpe (2006), Enisan and Olufisayo (2009), Ezeoha *et al.* (2009), and Notbutsing and Odit (2009). Finally, the OFD2 finding suggests that the balanced expansion of the financial system, with regard to the banking sector and stock market, is associated with growth improvements.

Table 5.4: Panel OLS Estimates of Models 1, 2, 4, 5, and 6

	Specific FD Measure	C	FD	LGOV	LTRA
MODEL 1	LOFD	5.244[a] (5.791)	0.191 (1.315)	0.764[a] (6.635)	0.034 (0.174)
MODEL 2	OFD2	5.755[a] (8.011)	0.362[a] (8.994)	0.444[a] (4.506)	0.256[c] (1.730)
MODEL 4	LPSC	5.187[a] (11.867)	1.026[a] (21.463)	-0.612[a] (-7.148)	0.152[c] (1.692)
MODEL 5	LMCP	4.406[a] (5.638)	0.263[a] (7.233)	0.551[a] (5.370)	0.328[b] (2.043)
MODEL 6	LVLT	5.714[a] (7.957)	0.171[a] (8.994)	0.453[a] (4.197)	0.293[c] (1.777)

Note: a, b, and c denote significance at the 1%, 5%, and 10% levels respectively. Values in parentheses represent the t-statistics.
Source: Estimates by the author

[47] Several researchers use the panel Fully Modified OLS (FMOLS) method propounded by Pedroni (2000) in order to estimate the panel cointegration regressions. The Pedroni panel FMOLS estimation is more powerful estimator in small samples than Panel OLS. This estimation technique has been reviewed an included in the Appendix for the interest of the reader. However, the software required to perform the panel FMOLS estimation is not currently available to the author (in Eviews 7) and thus due to limitations this estimation technique cannot be applied to estimate the long-run relationships. Consequently, the author proceeds to estimate the cointegration regressions using the Panel OLS method to explore the long-run finance-growth linkages.

In terms of the control variables, it is seen that in all cases LTRA is found to be positively related to real activity, which indicates that increased trade openness and activity has a growth enhancing role in the economy. This result is in line with the findings of Kandiero and Chitiga (2003), and Nabine (2009), where trade openness was found to have a positive, long-run impact on economic growth in Africa. Looking more closely at our results, it can be seen that LTRA is largely found to only be weakly significantly related to economic growth, and when it is included in a model with LOFD it is found to not have significant linkages with growth.

Regarding LGOV, this variable is seen to have a strongly significant relationship with economic growth (at the 1% level in all cases) similar to the findings of Kweka and Morrissey (2000), Yasin (2003), and Sola (2008). On the other hand, when LGOV is combined in a model with LPSC there appears to be a negative impact of LGOV on growth. This impact is however not surprising since, as explained in Chapter 4, unproductive government expenditure can obstruct private investment and causes inflationary pressure which hampers growth. This obstruction might be increased when credit to the private sector is taken into account, since LGOV's crowding out effect of private investment might have greater negative implications for economic growth when there are greater amounts of credit made available by the banking system to the private sector for investment. Similarly, Mitchell (2005) asserts that government spending – by displacing private sector investment – undermines economic growth. Thus, where LGOV should improve growth it actually impedes growth by obstructing the larger amounts of investable funds flowing to productive projects/usage. The negative linkages between LGOV and growth found in this study are in line with the findings of Mariotti (2002) and Romm (2003).

5.4 DIRECTION OF CAUSALITY

The panel cointegration analysis performed in the previous section examined the existence of long-run relationships between financial development measures and economic growth, revealing positive or negative linkages. In this section we focus specifically on the short-run finance-growth linkages and investigate the causal direction which exists between financial development and economic growth. It would be recalled that the null hypothesis tested in each case is 'FD does not Granger cause GDP' and 'GDP does not Granger cause FD', where FD refers to the specific financial

development measure under consideration in each case. Hence, a statistically significant chi-square statistic leads to the rejection of the null hypothesis and conclusion of a causal linkage.

These short-run linkages are analysed by employing the Holtz-Eakin *et al.* (1989) Granger causality approach which is estimated by using a GMM estimator, as similarly performed in Choe (2003), Al-Iriani (2006), Chen (2008), Acaravci *et al.* (2009), Pradhan (2009), amongst others. Following Nair-Reichert and Weinhold (2001), Kelly and Mavrotas (2003), and Bakwena *et al.* (2008), in this study the lag length selected was 2 lags to avoid loss of degrees of freedom due to limited observations. When using the GMM estimator it is necessary to determine whether there is serial correlation in the causal regressions by employing the Arellano-Bond (AB) test. The AB test is used to check for serial correlation based on the residuals of the estimation and determine whether the lag length selected is appropriate for estimation. The null hypothesis of the AB test is that there is no serial correlation. As reported in Table 5.5 below, we fail to reject the null hypothesis in all our estimated regressions and thus conclude that there is no serial correlation in the estimated equations. Furthermore, when using GMM estimation it is necessary to determine whether the instrumental variables included are consistent and efficient instruments, since some of the right hand side variables could be correlated with the residuals. Therefore, the Sargan test is used to test for over-identifying restrictions imposed by the instruments used in the estimations and thus to determine the validity of these instruments. The Sargan test examines the null hypothesis that the instruments are uncorrelated with the residuals and thus are acceptable, healthy instruments which may be used in the estimations. The instruments used in this study are the lagged regressors for two periods. The results of the Sargan test (p-values) reported in Table 5.5 show that in all cases the null hypothesis is not rejected, thus indicating that the instruments included in all our estimations are valid and acceptable instruments.

We now study the direction in which causality runs between the estimated variables, and this is done by examining the chi-square statistics of the Wald tests which are reported in Table 5.5. Results show that five of the six measures of financial development analysed in this study are found to have causal linkages with economic growth. The only variable which does not display causality in either direction is LMCP. This implies that the development of African stock markets in terms of size does not result in growth linkages in the short-run. The absence of short-run linkages could be explained by the fact that prospective investors in African stock markets are less concerned with the size of the stock market when deciding upon whether to invest and the magnitude of investment in the short-run. Prospective investors in African stock markets rather have preference for greater stock market

liquidity over size as a determinant of market activity in the short-run. Hence, in the short-run, the ability of an African stock market to provide rapid and inexpensive sale of stocks (i.e. superior exit mechanisms or liquidity) is more likely to result in linkages between stock markets and growth in the short-run, compared to when the size of African stock markets is considered. This finding is in agreement with Levine (1996:8) who suggests that stock market size is not to a good predictor of growth since other market characteristic are regarded as more essential for investment activity in the short-run, such as stock market liquidity.

Table 5.5: Panel Granger Causality Test Results

Hypothesis	Chi-square statistic	Sargan p-value	Arellano-Bond Test	Results
LOFD does not Cause LGDP	8.536[a] (0.014)	1.000	-0.085 (0.324)	LOFD → LGDP
LGDP does not Cause LOFD	6.162[a] (0.046)	1.000	0.027 (0.768)	LOFD ← LGDP
OFD2 does not Cause LGDP	12.896[a] (0.002)	0.999	-0.078 (0.371)	OFD2 → LGDP
LGDP does not Cause OFD2	4.851[c] (0.088)	1.000	0.067 (0.444)	OFD2 ← LGDP
LLL does not Cause LGDP	3.426 (0.180)	1.000	-0.093 (0.284)	LLL ← LGDP
LGDP does not Cause LLL	4.925[c] (0.085)	1.000	0.085 (0.341)	
LPSC does not Cause LGDP	1.898 (0.387)	1.000	-0.084 (0.337)	LPSC ← LGDP
LGDP does not Cause LPSC	11.705[a] (0.003)	1.000	0.011 (0.898)	
LMCP does not Cause LGDP	2.216 (0.330)	1.000	-0.112 (0.199)	NONE
LGDP does not Cause LMCP	1.961 (0.375)	1.000	-0.014 (0.878)	
LVLT does not Cause LGDP	12.863[a] (0.003)	1.000	-0.065 (0.441)	LVLT → LGDP
LGDP does not Cause LVLT	4.976[c] (0.078)	0.999	0.076 (0.370)	LVLT ← LGDP

Note: a, b, and c denote significance at the 1%, 5%, and 10% levels respectively. Numbers in parentheses are the p-values.
Source: Estimates by the author

Of the five variables which are shown to have causal links with growth, both of the banking development measures (i.e. LLL and LPSC) show a distinctive uni-directional causal flow from economic growth to banking development. Therefore, growth and expansion of the real sector in an economy plays a leading causal role in the development of the banking sector, with respect to bank liquid liabilities and credit availability to the private sector. This demand-following finance is shown to be stronger (at the 1% level) when LPSC is used as the measure, while there is only weak Granger

causality from growth to finance (at the 10% level) when LLL is used to measure banking development. This demand-following causality for banking development is surprising given that the larger proportion of financial development that has occurred in Africa has occurred within the banking systems. However, this demand-following result is in line with the findings of Agbetsiafa (2003), Odhiambo (2007), Agu and Chukwu (2008), and Acaravci *et al.* (2009) who examine the causal effect of various banking development measures on growth in African countries. Therefore, the growth in real activity creates demand for the services of the banking sectors which, in turn, leads to the expansion of the banking systems in Africa (Agu and Chukwu, 2008:190)

In the case where causal linkages were found between stock market development and economic growth, it is seen that there exists bi-directional causality, with economic growth and LVLT both have a causal effect on each other. This finding provides support for the results of Enisan and Olufisayo (2009:169) that two-way Granger causality exists between growth and LVLT in the Ivory Coast and Morocco. Although bi-directional causality is acknowledged, results show that LVLT has a stronger Granger causal effect on economic growth (at the 1% level), while the Granger causal effect of growth on LVLT is weaker but still significant (at the 10% level). Studies which similarly find stronger causality from LVLT to growth included N'zue (2006) and Odhiambo (2010). The weaker, significant Granger causality from growth to LVLT should however not be neglected since this implies that the economic development of the African countries impacts on the levels of stock market development. Hence, the improvement of African economies has a causal effect on the development of stock markets, such that it may improve the relatively underdeveloped African stock markets, and this stock market expansion has a causal impact on real activity.

Lastly, both measures of overall financial development (i.e. LOFD and OFD2) show bi-directional causality with economic growth. However, bi-directional causality appears to be stronger between LOFD and growth, than between OFD2 and growth (since it is seen that growth has only a weak Granger causal effect on OFD2, at the 10% level). In general, a mutually causal relationship between overall financial development and economic growth may not be surprising. There have been notable advances in economic development occurring across Africa largely with respect to Africa's progress in terms of infrastructure development and an increasing world dependence on African natural resources. These improvements to economic activity are chiefly facilitated by the advancing financial systems within African countries which makes Africa an attractive investment prospect to external economies. Hence, the balanced development of the financial system has a Granger causal effect on

economic growth by facilitating greater transactions for an economy. At the same time, an advancing economy stimulates development in the banking sectors and stock markets given an environment wherein there is greater demand for financial services, flourishing real activity, greater exposure to advanced operational procedures and technological progress of trading partners, as well as the often stricter regulatory and legal frameworks which are implemented. In this way, economic development Granger causes overall financial system development.

Therefore, overall, causality results suggest that linkages exist between financial development and growth in Africa in the short-run. The nature of these linkages however differs as to the specific financial development measure employed. More specifically, these causality results show two distinctive finance-growth causal patterns. (i) Uni-directional causality from LGDP to BD, suggesting that economic growth has a causal effect on banking sector development, in terms of size (i.e. LLL and LPSC) in the sample of African countries. (ii) Bi-directional causality between LGDP and OD, and between LGDP and SD, suggesting that overall financial development (i.e. LOFD and OFD2) and stock market development in terms of liquidity (i.e. LVLT) have mutually causal relationships with economic growth within the panel of countries. These findings are, in general, in line with the trend analysis provided in Chapter 3 which suggested potential linkages between financial development and economic growth.

5.5 CONCLUSIONS

This chapter presented and examined the estimation results pertaining to the empirical relationship between economic growth and various measures of financial development for a panel of African countries. Firstly, in Section 5.2, a brief discussion of the two overall financial development measures derived from the PCA and the Findex formula. It was revealed that these two measures have large scaling differences inherent in their computational methods; however, a plot of these values overtime revealed that they capture similar trends in the data. Section 5.3 then analysed the long-run linkages between finance and growth. This section started by examining the stationarity properties of the data by employing formal unit root tests based on two deterministic trend assumptions (i.e. assume an intercept exists alone, and assume both an intercept and trend exists). Across all unit root tests INF and POP were found to be stationary at levels and were not included in the cointegration testing, while five of the variables (i.e. LGDP, LLL, LVLT, LGOV and LTRA)

were found to be integrated of order one (i.e. I(1)) and were included in the cointegration analysis. Of the remaining three variables, LOFD was largely found to be non-stationary (I(1)), while LPSC and LMCP displayed conflicting results when differing deterministic trend assumptions were applied (alternating between status as I(0) and I(1) variables). These three variables were however also included in the cointegration analysis. Consequently, all the variables except INF and POP were carried forward into the cointegration analysis.

Next, the Pedroni panel cointegration test was performed on 12 different specifications of the empirical model under investigation, with different combinations of the I(1) variables. Pedroni cointegration findings indicated that there was cointegration present in five of the twelve models considered. Specifically, Pedroni results showed that LOFD, OFD2, LPSC, LMCP, and LVLT individually are cointegrated with economic growth when they are considered as the only financial development measure in a model with two control variables (i.e. LGOV and LTRA). The Kao cointegration test however failed to show cointegration in any of the twelve models specified. However, on the balance, findings largely support a conclusion of cointegration between financial development and economic growth since the Kao test is a homogeneous panel cointegration approach and we were cautious not to incorrectly conclude that there was no long-run finance-growth relationship. We then proceeded to estimate these long-run cointegrating relationships and found that all five financial development measures displayed the expected positive sign with growth. However, only four of the five financial development measures were found to have significant long-run linkages with growth, as the LOFD and growth relationship was found not to be significant.

Lastly, in Section 5.4, Holtz-Eakin *et al.* (1989) type causality tests were performed to investigate in which direction causality flows between finance and growth, in the short-run. Estimations were performed using the GMM framework. Causality results show that economic growth Granger causes banking system development irrespective of the measure of banking development used. Furthermore, bi-directional, reciprocal causality was found between economic growth and both of the measures of overall financial development and one measure of stock market development (i.e. LVLT). Finally, these short-run linkages were found to be similar to previous empirical literature findings (e.g. Agbetsiafa, 2003; N'zue, 2006; Odhiambo, 2007; Agu and Chukwu, 2008; Acaravci *et al.,* 2009; Odhiambo, 2010) and could be explained by the progression of Africa economies.

CHAPTER 6:
CONCLUSIONS, RECOMMENDATIONS AND LIMITATIONS

6.1 SUMMARY OF STUDY AND CONCLUSIONS

This study examined whether there exist any linkages between financial system development and economic growth within a panel of seven African countries between 1988 and 2008. This was done to assess whether financial development is related to economic growth in the long-run and/or if there are short-run linkages between financial development and growth.

The first step in this study was to review the existing relevant finance-growth literature. In this step the elements and functions of the financial system as well as the structural differences across financial systems were outlined. Theoretical literature on the key issues pertaining to the role of the financial system in the economy was reviewed, namely, the early finance-growth linkages, endogenous growth theory, competing causal views and its implications for empirical studies. After this, the empirical literature was reviewed in three broad groups (namely: bank-based, market-based and hybrid-based [bank- and market-based] studies), with an additional sub-section accompanying each broad group providing a review of the purely African based studies. The empirical literature finds, in general, that financial system development and economic growth are in some way related (i.e. either in the short-term or long-term or both the short- and long-term). However, the strength of this relationship and the direction of causality which prevails are sensitive to the financial development measures used, control variables included, estimation techniques employed, study period and the countries covered. Furthermore, African studies generally find linkages (short-term, or long-term, or both short- and long-term), however only a small number of African studies have investigated these linkages of overall financial system development measures.

In order to address our first sub-objective, we compared the banking systems and stock markets of the selected countries in terms of size and liquidity. This allowed us to examine the varying levels of advancement as well as to uncover any evidence/trends that could suggest that banking systems and/or stock markets move together with economic growth. Findings revealed that African countries are amongst the poorest nations worldwide, while banking systems are relatively better

developed than stock markets in Africa. Furthermore, preliminary trend analysis suggested that there exist potential linkages between financial development and growth in the sample countries.

Based on an extensive review of the finance-growth literature, an analysis of the financial systems in the selected countries and on data availability, an empirical model linking financial development to economic growth was specified. The variables included in this model to measure banking system development, stock market development and overall financial system development included the liquid liabilities ratio (LLL) and private sector credit ratio (LPSC), the stock market capitalisation ratio (LMCP) and total value traded ratio (LVLT), and two overall financial development measures (LOFD and OFD2).

In order to address our second and third sub-objectives, two empirical analyses were carried out. Since our aim was to determine whether any long-run linkages exist between the various financial development measures and economic growth using panel cointegration analysis, first we test for the stationarity of the variables. To this end the study uses the M-W (1998), Choi (2001) and IPS (2003) panel unit root tests. Unit root test results showed that all the variables, except inflation and population growth, were I(1) variables and could be used in the cointegration analysis. Pedroni cointegration and Kao cointegration tests were then used to examine whether any long-run relationships could be found between finance and growth. Using the Pedroni approach, cointegration was found between financial development and economic growth. More specifically, overall financial development (i.e. when using LOFD and OFD2) and economic growth are related in the long-run; banking system development (i.e. only when using LPSC) and economic growth are cointegrated; and there is a long-run relationship between stock market development (i.e. when using LMCP and LVLT) and economic growth. The Kao cointegration analysis provided sharply different results as it failed to find cointegration between finance and growth, irrespective of the financial development measure employed. Since the Pedroni method is more appropriate for testing for cointegration in heterogeneous panels and guarding against drawing incorrect conclusions, the Pedroni results were deemed appropriate for further analysis.

The long-run cointegrating relationships found were then estimated using Panel OLS estimation. Results indicated that all five financial development measures estimated had the expected positive sign, however, only four of the financial development measures (i.e. OFD2, LPSC, LMCP, and

LVLT) had a positive and significant effect on economic growth. It was found that LOFD did not have a statically significant relationship with economic growth.

Next, the study examines the short-run finance-growth linkages by studying the direction of causality which exists between the various measures of financial development and economic growth. Consequently, the Holtz-Eakin *et al.* (1989) panel Granger causality test was employed and estimated using a GMM estimator. Causality results showed that there were no linkages between LMCP and economic growth in the short-run, while demand-following finance (i.e. economic growth Granger causes financial development) exists when the banking development measures (i.e. LLL and LPSC) were used. Furthermore, bi-directional causality was found between economic growth and overall financial development (irrespective of the overall financial development measure used), and between economic growth and stock market development (specifically with respect to stock market liquidity - LVLT) in the African countries.

Overall, the results of this study show that there are long-run cointegrating relationships between financial development and economic growth. More specifically, positive long-run linkages exist between economic growth and banking development (in terms of LPSC), stock market development (in terms of LMCP and LVLT), as well as overall financial development (in terms of LOFD and OFD2). Regarding short-run linkages, all measures of financial development, except LMCP, are found to have a causal link with economic growth. In particular, economic growth is found to have a leading short-run causal effect on banking system development, while there is bi-directional, mutual causality between overall financial development and growth, as well as between economic growth and stock market development in terms of liquidity in the short-run. On balance, these findings suggest that there is an important role for financial development in real activity in African countries, while advancements in economic growth are essential for financial development in Africa.

6.2 POLICY IMPLICATIONS AND RECOMMENDATIONS

The findings of this study have a number of policy implications. These findings most importantly imply that all future policy and regulatory reforms – pertaining to the sample African countries – should inherently reflect the nature of the finance-growth relationship, which was found to be both short-term and long-term in nature. Several authors have found similar linkages between finance and

growth in Africa, and have discussed their implications for policy (see for example: Ghali, 1999; N'zue, 2006; Odhiambo, 2007; Agu and Chukwu, 2008; Nurudeen, 2009; amongst others).

In terms of the long-run relationships found in this study, these linkages were shown to be positive in nature. Therefore, on this basis, the long-run linkages in this study imply that policies aimed at promoting both economic development and financial system development, in general, should be adopted. With regards to the short-run linkages, this study found that there was, on the balance, bi-directional[48] causality between finance and growth. These short-run findings imply that the African countries in the panel could benefit from policies which are tailored towards stimulating the real sector of the economy (in this way influencing the demand for financial services) as well as policies which promote the expansion of African banking systems and stock markets (with the aim of stimulating economic growth).

Keeping in mind that country specific policy recommendations cannot be advanced since the sample countries were analysed as a panel, therefore – for all countries – policies aimed at stimulating economic growth should:

(i) *Promote macroeconomic stability* – since low and stable inflation reduces the degree of uncertainty about the macroeconomic environment, which in turn plays an important role in encouraging investment and long-term lending by financial institutions. In this way, the promotion of economic growth has positive implications for financial development;

(ii) *Increase investment in physical and human capital* – since the accumulation of physical assets (i.e. infrastructure) and a better educated population, with critical skills, who are able to enforce laws and rules as well as supervision, together will improve the attractiveness of prospective investments in African countries. A well capitalised (both physical and human) economy with numerous investable projects will create greater demands for financial services;

(iii) *Improve the productivity and efficiency of government spending* – since government consumption spending can adversely impact growth by crowding out domestic investment by increasing interest rates, reducing the funds in the markets, and raising investment taxes (Ndikumana, 2000:284). This was found to be the case in this study, where LGOV had a negative impact on growth when LPSC was taken into consideration. Consequently, more effective, well

[48] Bi-directional short-run causality was, on average, found since LOFD, OFD2 and LVLT showed bi-directional causality with LGDP; while LLL and LPSC showed uni-directional causality with LGDP, where causality ran from growth to finance.

directed economic policy will likely improve the impact government expenditure has on the general economic climate of a country, and thus positively influence the demand for the products and services of the stock markets and banking systems; and

(iv) Expand trade openness – since trade liberalisation and regional/global integration promotes cross border capital flows, greater participation in the domestic economy and the transfer of skills, thus positively influencing economic performance as well as financial development.

Furthermore, policies should also be tailored towards promoting the expansion and improvement of African banking sectors and stock markets (i.e. overall financial system), since all[49] measures of financial development (OD, BD, and SD) are found to have some linkages with economic growth in the short- and long-term. Specifically, policy aimed at promoting both banking system and stock market development should, in addition to the above recommendations, also:

(i) Reduce government control and borrowing privileges extended to government – since privatisation of national banks and cutting back on public ownership of financial institutions (as has occurred in the North African countries), in a cautious way, allows for less/no hindrances in the lending decisions process of banks, allocating credit based on purely commercial criteria, selecting the most profitable (growth enhancing) projects (Naceur and Ghazouani, 2007:313). Also the lessening of borrowing privileges improves private investors' access to credit, which in turn stimulates activity in the real sector of the economy. Whereas government usage of funds is often strategic in nature rather than targeted at the most profitable, growth stimulating usage;

(ii) Foster a well regulated, transparent banking system with a high level of competition – since sound regulation and supervision in the banking system contributes to transparency, effectiveness and efficiency. These properties are essential for reducing banking instability, uncertainty, enhancing investor confidence, promoting good quality institutions, and creating conditions for the efficient provision of growth promoting financial services. Banking systems which display these properties are more likely to attract greater capital (savings) and encourage borrowing. Also the greater number of 'sound' banks within a system, the greater the levels

[49] All financial development measures are related to economic growth in some way. LOFD, OFD2, LPSC and LVLT are found to have both Short-run and Long-run relationships with economic growth, while LLL is found to be related to economic growth only in the Short-run, and LMCP is related to economic growth only in the Long-run.

of financial innovation and the lower the transaction costs associated, which encourages greater demand for funds (Seetanah *et al.*, 2009:132);

(iii) Reduce the barriers to investment on the stock markets – since African governments (particularly in North Africa) often adopt inappropriate tax and regulatory policies that restrict participants' access to markets as well as removes incentives to invest when a large proportion of gains are removed through taxing (Enisan and Olufisayo, 2009:170). Therefore, more appropriate policies which are less restrictive will likely stimulate market activity and growth;

(iv) Improve infrastructure and trading systems of stock markets – since this improves stock market operations, allowing stocks to trade more frequently and speeds up the purchase and sale process of stocks, in this way enhancing stock market liquidity and efficiency;

(v) Promote greater regulation, supervision, and security of stock markets – since this is a major hindrance to investment activity in Africa, where there is low investor confidence in the stock market and its ability to safeguard investments. Thus the improvement of security and regulation procedures will likely stimulate information disclosure and reduce misrepresentation and other financial crimes, leading to improved investor confidence. This will enhance market participation, investment and stimulates growth.

Hence, overall, policies should encourage faster paced economic growth in order to stimulate financial development, while at the same time, policies should promote the balanced expansion of the financial system which in turn reduces market frictions[50] and encourages investment activities, thus augmenting economic growth.

6.3 LIMITATIONS OF THE STUDY AND AREAS FOR FURTHER RESEARCH

The main issue faced in this study, and which has also confronted previous researchers, concerns the unavailability of African data on stock market development. This means that some of the data for the other variables included in the empirical model (i.e. economic growth, banking system development, and control variables) which are available prior to 1988 have to be excluded from the empirical model in order to maintain a balanced panel, albeit with a reduction in the size of the

[50] Market frictions refer to the problems of information asymmetry, enforcement of contracts and transactions costs.

sample. However, this problem seems not to have significantly affected the findings presented in this study, since we employed panel cointegration analysis (which is said to use the given data in the most efficient manner) and the findings in this study are in agreement with previous empirical knowledge on the finance-growth nexus in Africa.

The second issue which was faced in this study relates to the limitations with respect to the availability of the software capable of estimating the Pedroni panel cointegration regressions. The cointegrating regressions are commonly estimated using the Regression Analysis of Time Series (R.A.T.S) Econometric Software, wherein Pedroni has extended the FMOLS estimation to panel data (using Pedroni panel FMOLS). This estimation procedure is however not available in the software that was used for this study (i.e. Eviews 7).

This study contributes to the limited empirical literature that examines the finance-growth case for Africa by using measures of banking system, stock market and overall financial system development. The first proposal emerging from the limitation of this study is that, as further data becomes available, future empirical research on Africa should move towards a hybrid-based (bank-market based) approach to studying the finance-growth nexus, since such an approach is more appropriate for the discovery of the overall effects of financial development on economic performance. Secondly, future hybrid-based empirical studies should incorporate a larger number of African countries into panels and cover longer time periods, as data becomes available, since this would increase the panel size and reduce the likelihood of reaching incorrect conclusions. Furthermore, given more recent emerging interest in maximum likelihood based panel cointegration analysis, future empirical studies could employ maximum likelihood based panel cointegration techniques and compare the results with ours.

Finally, this study has focused on one panel which included all seven sample African countries. Future studies, which incorporate a larger number of African countries, could analyse countries in terms of different panels, such as an 'African' panel which includes all sample countries, 'Location' panels which group nations according to geographical positioning (i.e. North Africa, East Africa, West Africa, Southern Africa) and also 'Financial Ranking' panels (i.e. low income, low-middle income, middle income countries etc.). Such research could derive more specific and appropriate conclusions about the state of the finance-growth relationship in the countries being studied and in this way provide important policy insight and recommendations.

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APPENDIX

Table A.1: Summary of Studies on the Relationship between Financial Development and Economic Growth

I. BANK-BASED STUDIES

Study	Countries Covered	Years Covered	Estimation Method(s)	Variables		Summary of Findings
				Dependent	FD Measure(s)	
King and Levine (1993)	80 Countries	1960 - 1989	- Simple Correlation - Cross-Country OLS - 3 Stage Least Squares (3SLS)	i.] Real *per capita* GDP growth rate ii.] Rate of physical capital accumulation iii.] Ratio of Investment to GDP iv.] Efficiency of physical capital allocation	(i) BLL (ii) Deposit money bank domestic assets as a percentage of deposit money bank domestic assets plus central bank domestic assets (iii) PSC (iv) Credit to private firms as a percentage of credit to central and local governments plus credit to public and private firms.	High levels of FD (across all measures) are positively related to faster GDP growth, faster rates of physical capital accumulation, future rates of capital accumulation, faster rates of improvements in the efficiency of capital allocation and future improvements in the efficiency. Furthermore, the predetermined component of financial development is a good predictor of long-run growth.
Arestis and Demetriades (1996)	12 Developed and Developing Countries	1949 - 1992	- Johansen Cointegration	Real GDP *per capita*	(i) BLL (ii) M2 less currency held outside the banking sector as a percentage of GDP (iii) PSC	Results indicated two cases of finance causing growth, three cases of growth leading finance, and thirteen cases of bi-directional causality. Findings thus indicate that the specific FD measure used is of considerable importance.
Demetriades and Hussein (1996)	16 Countries (included South Africa)	1960 - 1990	- Engle-Granger Cointegration - Johansen Cointegration - Granger Causality	Real GDP *per capita*	(i) M2/GDP (ii) PSC	Overall evidence supports a view that the relationship between finance and growth is bi-directional, finding little support for finance being the leading sector for growth, rather more evidence indicated FD was systematically caused by growth. Causality results are very much country specific.

Odedokun (1996)	71 LDC's (included Egypt, Kenya, Morocco, Nigeria, South Africa, and Tunisia)	1961 - 1988	- Time series OLS	Growth rate of Real GDP	(i) BLL (ii) Growth of BLL (iii) Composite Index [include BLL and Growth of BLL]	FD, represented using banking sector indicators, promotes economic growth in most of the countries (85% of the 71 countries).
Beck *et al.* (2000)	63 Countries (included Egypt, Ivory Coast, Kenya, Morocco, Nigeria, and South Africa)	1960 - 1995	- Cross-country instrumental variables - Dynamic GMM panel estimator	i.] Real *per capita* GDP growth ii] Total factor productivity (TFP) growth iii] Physical capital accumulation iv] Private savings rates	(i) PSC	Robust, positive links were found between financial intermediation and both real *per capita* GDP growth and TFP growth. No robust relations were found between financial intermediation and physical capital accumulation or private savings. Hence, financial intermediaries influence economic growth by influencing TFP growth.
Christopoulos and Tsionas (2004)	10 Developing Countries (included Kenya)	1970 - 2000	- Panel Cointegration	Real Output	(i) Total bank deposits liabilities as to GDP	Statistically significant and positive impact of FD on economic growth.
Apergis *et al.* (2007)	15 OECD countries and 50 non-OECD countries (included Egypt, Kenya, and South Africa).	1975 - 2000	- Panel Cointegration	GDP *per capita*	(i) BLL (ii) PSC (iii) BDC	Positive and statistically significant equilibrium relationship in existence between FD and economic growth for all measures employed across all groups of countries.
Aslan (2008)	9 Middle East Countries (included Egypt)	1990 - 2003	- Panel Cointegration	GDP *per capita*	(i) BLL	Positive statistically significant relationship between financial development and economic growth for the Middle East countries
Kiran *et al.* (2009)	10 Emerging countries (included Egypt and Tunisia)	1968 - 2007	- Panel Cointegration	GDP *per capita*	(i) BLL (ii) BDC (iii) PSC	FD has a positive and statistically significant impact on economic growth across all FD measures employed.
	(I.a) PURELY AFRICAN BANK-BASED STUDIES					
Ghali (1999)	Tunisia	1963 - 1993	- Johansen Cointegration	Real *per capita* GDP growth	(i) Ratio of bank deposit liabilities as to GDP (ii) PSC	Results suggest a statistically significant relationship between FD and economic growth, with causality running from finance to economic growth.

Ndikumana (2000)	30 sub-Saharan African Countries (included Ivory Coast, Kenya, Nigeria, and South Africa)	1970 - 1995	- Panel Dynamic Fixed Effects estimator	Ratio of Investment as to GDP	(i) PSC (ii) BLL (iii) BDC (iv) Aggregate FD index [includes PSC, BLL and BDC]	Financial factors are important determinants of domestic investment. Positive relationship between domestic investment and different FD measures.
Kelly and Mavrotas (2003)	17 African Countries (included Egypt, Ivory Coast, Kenya, Morocco, and South Africa)	1972 - 1994	- Panel Cointegration	Private Savings Rate	(i) PSC (ii) BLL (iii) Importance of deposit banks as to the central bank	Results varied notably as to different FD measures used. For most countries, a positive relationship between FD and private savings was found.
Ghirmay (2004)	13 sub-Saharan African Countries (Included Kenya, Nigeria and South Africa)	1965 - 2000	- Johansen Cointegration	Real *per capita* GDP growth	(i) PSC	There is support for a long-run relationship between FD and economic growth in 12 of 13 countries, while long-term causality indicates that FD is causal on economic growth in 8 countries.
Aziakpono (2005a)	4 SACU Countries (excluded Namibia)	1990 - 2001	- Zellner SURE Method (Seemingly Unrelated Regressions Estimation)	Growth in Real GDP, or Log of Real GDP	(i) PSC (ii) BLL	Overall, there is only weak support for FD (when using PSC and BLL) effecting growth positively in the SACU region. South Africa enjoys the most gains from FD, Botswana experiences gains but there is weak evidence of such, while Lesotho experiences positive but non-significant effects of FD. Lastly, Swaziland is worst off with negative non-significant effects of FD.
Aziakpono (2005b)	Lesotho	1980 - 2001	- Johansen Cointegration - Granger Causality	Growth in Real GDP	(i) BLL (ii) PSC (iii) PSC as a percentage of BLL	Findings reveal a lack of a long-run impact of FD on growth (irrespective of the measure used) and a lack of mutual causality between FD and growth. However, these results do not suggest that there is no role for FD in promoting Lesotho's economic growth; rather FD has a weak impact on growth.
Odhiambo (2007)	3 African countries (included Kenya, South Africa and Tanzania)	1980 - 2005	- Johansen Cointegration - Granger Causality	Real GDP *per capita*	(i) BLL (ii) PSC (iii) Currency as a percentage of narrow money (M1)	All three countries have stable long-run relationships between FD and growth, while causality is sensitive to the FD measure used. On the balance, growth is found to lead FD in Kenya and South Africa, while Tanzania has finance led growth.

Agu and Chukwu (2008)	Nigeria	1970 - 2005	- Johansen Cointegration - Toda-Yamamoto (1995) version of Granger Causality	Real *per capita* GDP	(i) PSC (ii) M2/GDP (iii) Bank deposit liabilities as a percentage of GDP (iv)Loan deposit ratio	A positive, long-run relationship exists between FD and economic growth. Uni-directional causality runs from economic growth to FD when PSC and M2/GDP were used, while uni-directional causality from FD to growth exists when using Bank deposit liabilities to GDP, and Loan deposit ratio
Aziakpono (2008)	4 SACU Countries (excluded Namibia)	1970 - 2004	- Johansen Cointegration - Granger Causality	*per capita* output	(i) PSC (ii) BLL	Each country has a long-run relationship between FD and output, and causality largely runs from FD to output except in Lesotho where two-way causality exists. Overall, the effect of PSC on output is largely negative except in Swaziland where it is ambiguous, while the effect of BLL is largely ambiguous except in Swaziland where it is positive.
Acaravci *et al.* (2009)	24 sub-Saharan African Countries (included Ivory Coast, Kenya, Nigeria and South Africa).	1975 - 2005	- Panel Cointegration - Panel GMM	Real GDP *per capita* growth	(i) BDC (ii) PSC (iii) BLL	No long-run relationship was found between FD and economic growth. While, there is bi-directional causality between GDP growth and PSC, and uni-directional causality from BLL to GDP.

II. MARKET-BASED STUDIES

Study	Countries Covered	Years Covered	Estimation Method(s)	Variables		Summary of Findings
				Dependent	FD Measure(s)	
Atje and Jovanovic (1993)	39 Developing and Developed countries (included Egypt and Nigeria)	1980 - 1988	- Cross-Country OLS	Growth in *per capita* Output	(i) Initial Value traded (ii) Initial Market Capitalisation	Find strong effects of stock market development on economic growth.
Levine and Zervos (1996)	41 Countries (included Nigeria)	1976 - 1993	- Cross-Country OLS - Instrumental Variables - 2 Stage Least Squares (2SLS)	Real GDP *per capita* growth rate	(i) MCP (ii) VLT (iii) TURN (iv) IAPT pricing error	Stock market development has a positive and strong association with economic growth after controlling for other factors.

Harris (1997)	49 Countries	1980 - 1991	- 2 Stage Least Squares (2SLS)	Growth in *per capita* Output	(i) Initial Value traded (ii) Initial Market Capitalisation	Findings indicate no hard evidence that the level of stock market activity helps in explaining *per capita* output growth.
Filer *et al.* (1999)	64 Countries (included Egypt, Kenya, Morocco, Nigeria, South Africa, and Tunisia)	1985 - 1997	- Granger causality	Real *per capita* GDP	(i) MCP (ii) Turnover velocity [i.e. turnover as a percentage of market capitalisation] (iii) Change in the number of domestic listed shares	A strong, positive relationship is found between stock market development and economic growth, particularly in low and lower middle income countries but not in higher income countries.
Mohtadi and Agarwal (2004)	21 Developing countries (included Egypt, Nigeria, and South Africa)	1977 - 1997	- Dynamic Panel Regressions	Growth in Real GDP	(i) MCP (ii) VLT (iii) TURN	Stock market development positively influences growth both directly (when using the TURN) and indirectly (when employing the MCP); while VLT is not an effective measure of market liquidity.
Azarmi *et al.* (2005)	India	1981 - 2001	- OLS	Real GDP *per capita*	(i) MCP (ii) Trade volume as to GDP (iii) VLT (iv) Stock market volatility (v) Degree mkt concentration	For the entire twenty-one year period there is no support for an association between the Indian stock market development and economic growth.
Choong *et al.* (2005)	Malaysia	1978 - 2000	- ARDL bounds test - ECM based Granger causality tests	*Per capita* nominal GDP	(i) MCP (ii) TURN	A long-run relationship exists between FD and growth, with FD having a significant positive effect on growth. In the short-run, FD leads growth.
Van Nieuwerburgh *et al.* (2006)	Belgium	1832 - 2002 sub-periods: 1832 - 1914 1914 - 2002 1832 - 1873 1873 - 1935 1935 - 2002	- Johansen Cointegration	Real *per capita* GDP	(i) stock market capitalisation (ii) number of listed shares (iii) annual number of initial public offerings [IPOs] (iv) ratio of total listed firms as to total Belgium firms (v) share of total market capitalisation that the 3 largest Belgium firms hold.	FD is found to substantially influence Belgium's growth over this entire period. Of the sub-periods, stock market development played a smaller role in growth prior to 1873, while the stock market influenced Belgium's growth most significantly between 1873 & 1935, and there was a smaller influence of the stock market on growth after 1935.
Padhan (2007)	India	1991 - 2005	- Johansen Cointegration - Toda-Yamamoto (1995) causality	Index of Industrial Production	(i) Bombay Stock Exchange Sensex	Find support for the existence of bi-directional Granger Causality between stock markets and economic activity.

Shahbaz *et al.* (2008)	Pakistan	1971 - 2006	- Engle-Granger Cointegration - Johansen Cointegration - Autoregressive Distributed Lag (ARDL) test	Real income *per capita* growth rate	(i) MCP	Strong relationship between stock market development and growth. Bi-directional causality exists in the long-run, however, in short-run there is one-way causality from stock market development to economic growth.
Vazakidis and Adamopoulos (2009)	France	1965 - 2007	- Johansen Cointegration - Granger Causality	Growth rate of real GDP	(i) General Stock Market Index	Economic growth causes stock market development in France. Growth has a positive effect on FD
	(II.a) PURELY AFRICAN MARKET-BASED STUDIES					
Adjasi and Biekpe (2006)	14 African Countries (included Egypt, Ivory Coast, Kenya, Morocco, Nigeria, South Africa, and Tunisia)	1975 - 2001	- Panel GMM	Growth rate of Real GDP	(i) MCP (ii) TURN (iii) VLT	Overall, stock market development has a significant impact on economic growth. However, stock markets only play a significant positive role in the growth of African countries that are classified as Upper Middle Income and in countries with moderately capitalised markets.
N'zue (2006)	Ivory Coast	1976 - 2002	- Johansen Cointegration - Granger causality	Growth rate of Real GDP	(i) MCP (ii) VALT (iii) The stock market's 4-firm concentration ratio	A long-run relationship exists between stock market development and growth only when control variables were considered (such as public expenditure, public investment, public development aid and foreign direct investment). Also, uni-directional causality ran from stock market development to growth
Enisan and Olufisayo (2009)	7 sub-Saharan African Countries (included Egypt, Ivory Coast, Kenya, Morocco, Nigeria and South Africa)	1980 - 2004	- Autoregressive Distributed Lag (ARDL) test - Granger causality	*Per capita* Nominal GDP	(i) MCP (ii) VLT	Stock market development has a significant positive, long run impact on growth in Egypt and South Africa. There is uni-directional causality from finance to growth in Egypt and South Africa, with Nigeria showing weak evidence of growth-led finance, and the remaining four countries showing bi-directional causality.

Ezeoha *et al.* (2009)	Nigeria	1970 - 2006	- Johansen Cointegration	Ratio of gross domestic investment to GDP, and Ratio of foreign private investment to GDP	(i) MCP	Stock market development has a positive, significant relationship with domestic private investment in Nigeria, in this way positively influencing growth. While stock market development has a negative and non-significant impact on foreign private investment.
Nowbutsing and Odit (2009)	Mauritius	1989 - 2006	- Engle-Granger Cointegration	Real GDP *per capita*	(i) MCP (ii) VLT	Stock market development positively impacts Mauritius' economic growth in both the short-term and long-term.

III. HYBRID (BANK-MARKET) BASED STUDIES

Study	Countries Covered	Years Covered	Estimation Method(s)	Variables		Summary of Findings
				Dependent	FD Measure(s)	
Levine and Zervos (1998)	49 Developed and Developing Countries (included Morocco, Egypt and Nigeria)	1976 - 1993	- Cross-Country OLS - 2 Stage Least Squares (2SLS)	(i) Growth *per capita* real GDP (ii) Physical K accumulation (iii) Private savings rate (iv) Productivity growth	(i) PSC (ii) MCP (iii) TURN (iv) VLT (v) CAPM integration (vi) APT integration (vii) Market Volatility	Bank development in terms of PSC and stock market liquidity in terms of TURN and VLT are all positively and robustly correlated with economic growth, capital accumulation, and productivity growth, however not with savings. While stock market development in terms of MCP, CAPM integration, APT integration, and Market Volatility are not robustly related to any growth measures.
Rousseau and Wachtel (2000)	47 Developed and Developing Countries (included Ivory Coast, Kenya, Morocco, Nigeria and South Africa)	1980 - 1995	- Cross Country OLS - Panel GMM	*Per capita* Real GDP growth	(i) BLL (ii) MCP (iii) VLT	Cross-country evidence indicates FD is important for output growth but does not indicate a dominant causal direction. Panel results indicate BLL and VLT have a strong impact on output, while the MCP effects are weaker.
Arestis *et al.* (2001)	5 Developed economies	1968 - 1998	- Johansen Cointegration	Real GDP	(i) BDC (ii) MCP	Both banking system and stock market development contribute to long-run output growth, however stock market effects are not as pronounced as banking system effects.

Beck and Levine (2002)	42 Countries and 36 Industries (included Egypt, Nigeria, Morocco, South Africa, and Tunisia)	1980 - 1989	- OLS - 2 Stage Least Squares	Value Added annual average growth rate	(i) Finance-Activity [i.e. log of (VLT times PSC)] (ii) Finance-Size [i.e. log of (MCP times PSC)] (iii) Finance-Aggregate [i.e. first principal component of measures (i) and (ii)]	Significant positive relationship exists between external dependence and overall FD on industry growth. Financial structure does not have an independent impact on industrial growth Overall, having a bank-based or market-based financial system does not matter for industry expansion, rather the overall level of FD and legal systems matters
Beck and Levine (2004)	40 Developed and Developing countries (Included Egypt and South Africa).	1976 - 1998	- Panel GMM	Real *per capita* GDP growth	(i) Bank credit as to GDP (ii) TURN	Results indicate that after controlling for country specific effects and potential endogeneity, both stock market development and bank development significantly positively influence economic growth.
Law (2004)	14 Developing Countries (included Egypt and South Africa)	1978 - 2001	Dynamic Panel estimations, namely: - Mean Group [MG] estimator - Pooled Mean Group [PMG] estimator	Real *per capita* GDP growth	(i) BLL (ii) PSC (iii) BDC (iv) TURN (v) MCP (vi) VLT	Both banks and stock markets are important in promoting economic growth, irrespective of the different development measure used. However, banking sector development has a more influential impact on growth than stock market development in developing economies.
Al-Awad and Harb (2005)	10 Middle East countries (included Egypt and Morocco)	1969 - 2000	- Panel Cointegration - Johansen Cointegration	Real *per capita* GDP growth	(i) BDC (ii) TURN	In the short-run, economic growth drives the changes in FD, while in the long-run FD and growth could be related to some level.
Hondroyiannis *et al.* (2005)	Greece	1986 - 1999	- Johansen Cointegration - Granger causality	Real GDP	(i) PSC (ii) Bank credit to industries as a percentage of GDP (iii) MCP (iv) Market capitalisation of industrial shares as a percentage of GDP	In the long-run both bank and stock market development are related to growth, while there is two-way causality for both banks and stock markets. However, these finance-growth relations are weak in the long-run, with the contribution of stock market finance to growth substantially smaller than banks.
Naceur and Ghazouani (2007)	11 Middle East and North African countries (included Egypt and Morocco)	1979 - 2003	- Panel GMM	Real *per capita* GDP growth	(i) Composite Banking Index [includes PSC and BLL] (ii) Composite Stock Market Index [includes MCP, TURN and VLT]	Overall FD (both bank and stock market development) is unimportant or even harmful for economic growth in the MENA region.

Chakraborty (2008)	India	1996 - 2005	- Engle-Granger Cointegration - Johansen Cointegration - Granger causality	3 Models: - GDP growth - Industrial Sector growth - Services Sector growth	(i) PSC (ii) BLL (iii) MCP (iv) TURN (v) Stock price volatility	Long-run relationships exist between GDP growth and PSC, BLL and MCP. Economic growth leads FD in India. While, PSC, BLL, MCP and TURN are related to Industrial Sector growth and Services Sector growth in the long-run.
(II.a) PURELY AFRICAN HYBRID-BASED STUDIES						
Bolbol *et al.* (2005)	Egypt	1974 - 2002	- Time Series OLS	Real *per capita* GDP growth	(i) PSC (ii) Ratio of commercial bank assets to central bank assets. (iii) MCP (iv) TURN	Bank-based development had a negative effect on total factor productivity (TFP) unless they were related to a threshold level of *per capita* income, while market-based development measures had a positive effect on TFP.
Frank (2007)	South Africa	1989 - 2001	- Engle-Granger Cointegration - Johansen Cointegration	Real GDP *per capita*	(i) PSC (ii) Conglomerate Stock Market Index [equally weighted to capture market size, liquidity and integration]	Findings uncover a statistically significant negative relationship between stock market development and economic growth.
Gondo (2009)	South Africa	1970 - 1999	- Time Series OLS - Instrumental Variables	Growth of Real *per capita* GDP	(i) BLL (ii) PSC (iii) VLT (iv) Composite Index of FD [includes BLL, PSC and VLT]	A more active stock market and banking sector can drive economic growth in South Africa, with evidence that PSC and VLT statistically significantly impacting on economic growth. While, in the short-run at least, BLL exerts a negative impact on growth.

Source: Summary Table compiled by the author

Note: FD – Financial Development
BLL – Ratio of Bank Liquid Liabilities as to GDP
M2/GDP – Ratio of Broad Money (M2) as to GDP
PSC – Ratio of Bank Credit to the Private Sector as to GDP
BDC – Ratio of Domestic Credit provided by Banks as to GDP
MCP – Ratio of Stock Market Capitalisation as to GDP
VLT – Ratio of Total Value of Stocks Traded as to GDP
TURN – Ratio of Total Value of Stocks Traded as to Average Market Capitalisation

Table A.2: Number of listed companies on each countries stock market (1988 – 2008)

YEAR	EGP	IVC	KEN	MOR	NIG	SA	TUN
1988	483	24	55	71	102	754	..
1989	510	23	57	71	111	748	..
1990	573	23	54	71	131	732	13
1991	627	25	53	67	142	688	..
1992	656	27	57	62	153	683	17
1993	674	24	56	65	174	647	19
1994	700	27	56	51	177	640	21
1995	746	31	56	44	181	640	26
1996	649	31	56	47	183	626	30
1997	654	35	58	49	182	642	34
1998	861	35	58	53	186	668	38
1999	1033	38	57	55	194	668	44
2000	1076	41	57	53	195	616	44
2001	1110	38	57	55	194	542	46
2002	1148	38	57	55	195	450	47
2003	967	38	51	53	200	426	46
2004	792	39	47	52	207	403	44
2005	744	39	47	56	214	388	46
2006	603	40	51	65	202	401	48
2007	435	38	51	74	212	422	50
2008	373	38	53	77	213	425	49

Source: Table compiled by author based on data from World Bank Development Indicators (2009)

NOTE: EGP – Egypt
IVC – Ivory Coast
KEN – Kenya
MOR – Morocco
NIG – Nigeria
SA – South Africa
TUN – Tunisia

Table A.3: Pairwise Correlation results between Financial Development Measures and Growth

BANKING DEVELOPMENT MEASURES AND GROWTH

EGYPT

	GDP	BLRA	LL	PSC
GDP	1.000			
BLRA	0.234	1.000		
LL	0.492	0.675	1.000	
PSC	0.789	0.127	0.505	1.000

IVORY COAST

GDP	1.000			
BLRA	-0.510	1.000		
LL	0.289	-0.089	1.000	
PSC	0.826	-0.525	0.614	1.000

KENYA

GDP	1.000			
BLRA	-0.240	1.000		
LL	0.121	0.652	1.000	
PSC	0.306	0.200	0.525	1.000

MOROCCO

GDP	1.000			
BLRA	0.648	1.000		
LL	0.935	0.557	1.000	
PSC	0.802	0.255	0.902	1.000

NIGERIA

GDP	1.000			
BLRA	0.119	1.000		
LL	-0.164	-0.499	1.000	
PSC	0.381	-0.486	0.672	1.000

SOUTH AFRICA

GDP	1.000			
BLRA	0.433	1.000		
LL	-0.139	0.398	1.000	
PSC	0.041	-0.679	-0.585	1.000

TUNISIA

GDP	1.000			
BLRA	0.741	1.000		
LL	0.920	0.599	1.000	
PSC	0.488	0.317	0.460	1.000

STOCK MARKET DEVELOPMENT MEASURES AND GROWTH

EGYPT

	GDP	MCP	VLT	TURN
GDP	1.000			
MCP	0.728	1.000		
VLT	0.844	0.848	1.000	
TURN	0.521	0.550	0.813	1.000

IVORY COAST

GDP	1.000			
MCP	-0.595	1.000		
VLT	-0.358	0.760	1.000	
TURN	0.400	0.051	0.473	1.000

KENYA

GDP	1.000			
MCP	0.808	1.000		
VLT	0.876	0.959	1.000	
TURN	0.656	0.897	0.907	1.000

MOROCCO

GDP	1.000			
MCP	0.796	1.000		
VLT	0.786	0.969	1.000	
TURN	0.770	0.950	0.975	1.000

NIGERIA

GDP	1.000			
MCP	0.784	1.000		
VLT	0.844	0.869	1.000	
TURN	0.893	0.832	0.964	1.000

SOUTH AFRICA

GDP	1.000			
MCP	0.729	1.000		
VLT	0.945	0.692	1.000	
TURN	0.539	0.296	0.662	1.000

TUNISIA

GDP	1.000			
MCP	-0.101	1.000		
VLT	0.353	0.448	1.000	
TURN	0.646	-0.001	0.787	1.000

Source: Estimates by the author

Table A.4: Overall Financial Development (OFD) Index derived using the Findex formula

YEAR	EGYPT	Iv-COAST	KENYA	MOROCCO	NIGERIA	S-AFRICA	TUNISIA
1988	48.04729	91.08609	60.24679	26.59752	64.05005	62.42206	59.07363
1989	45.09960	84.61934	61.23947	28.22971	48.78479	63.01837	66.98651
1990	44.89411	96.25721	63.07547	42.70647	53.74428	66.45950	57.11286
1991	46.41988	87.00572	65.53403	46.19332	59.97631	61.85396	59.20114
1992	45.42654	77.76372	72.24825	51.90158	54.88026	62.12820	63.36805
1993	46.83165	71.51775	82.45308	63.85214	49.98996	71.47425	68.39937
1994	51.67622	69.98494	126.10762	69.62164	69.36814	79.81259	118.65747
1995	56.39172	74.49679	99.37752	96.92116	52.04122	84.18712	162.96318
1996	70.62554	72.25541	76.91196	73.42098	54.69196	85.87000	120.35820
1997	85.34527	82.62556	81.12979	93.05810	62.01855	90.48184	100.50089
1998	88.35434	96.50363	74.97340	91.66628	70.86474	94.63033	91.13216
1999	107.25351	121.40159	72.36171	103.83168	73.82426	114.77752	115.92452
2000	104.58699	90.82884	66.34644	88.86979	75.62409	108.43267	142.28557
2001	87.93931	71.19266	58.98917	83.06615	95.36251	101.48921	107.34697
2002	90.79629	82.59211	64.42120	76.30932	88.49586	107.12269	95.09874
2003	97.87001	77.71247	106.86677	81.02480	104.14939	102.77495	86.29240
2004	117.52162	93.40026	118.10267	103.13262	115.31557	118.51474	87.56445
2005	198.93824	85.26472	140.03223	126.11415	110.47340	129.62769	103.32335
2006	233.87755	144.00703	220.16528	211.42458	131.64187	160.16491	114.93758
2007	237.66899	203.84030	203.16380	301.45927	351.85187	179.34332	121.40110
2008	194.43514	225.64289	186.25323	240.59876	312.85077	155.41412	158.07172

Source: Estimates by the author

Table A.5: Log of Overall Financial Development (LOFD) Index derived using the Findex formula

YEAR	EGYPT	Iv-COAST	KENYA	MOROCCO	NIGERIA	S-AFRICA	TUNISIA
1988	3.87219	4.51181	4.09845	3.28082	4.15966	4.13392	4.07878
1989	3.80887	4.43816	4.11479	3.34038	3.88742	4.14343	4.20449
1990	3.80431	4.56702	4.14433	3.75435	3.98424	4.19659	4.04503
1991	3.83773	4.46597	4.18257	3.83284	4.09395	4.12478	4.08094
1992	3.81610	4.35368	4.28011	3.94935	4.00515	4.12920	4.14896
1993	3.84656	4.26995	4.41223	4.15657	3.91182	4.26934	4.22536
1994	3.94500	4.24828	4.83714	4.24308	4.23943	4.37968	4.77624
1995	4.03232	4.31076	4.59893	4.57390	3.95204	4.43304	5.09352
1996	4.25739	4.28021	4.34266	4.29621	4.00172	4.45283	4.79047
1997	4.44671	4.41432	4.39605	4.53322	4.12743	4.50515	4.61017
1998	4.48136	4.56958	4.31713	4.51815	4.26077	4.54998	4.51231
1999	4.67520	4.79910	4.28168	4.64277	4.30169	4.74300	4.75294
2000	4.65002	4.50898	4.19489	4.48717	4.32577	4.68613	4.95784
2001	4.47665	4.26539	4.07735	4.41964	4.55769	4.61995	4.67607
2002	4.50862	4.41391	4.16544	4.33480	4.48296	4.67397	4.55492
2003	4.58364	4.35302	4.67158	4.39476	4.64583	4.63254	4.45774
2004	4.76662	4.53689	4.77155	4.63602	4.74767	4.77504	4.47238
2005	5.29299	4.44576	4.94187	4.83719	4.70477	4.86467	4.63786
2006	5.45480	4.96986	5.39438	5.35387	4.88009	5.07620	4.74439
2007	5.47088	5.31734	5.31401	5.70863	5.86321	5.18930	4.79910
2008	5.27010	5.41895	5.22711	5.48313	5.74573	5.04609	5.06305

Source: Estimates by the author

Table A.6: Principal Component Analysis (PCA) Results

Eigenvalues: (Sum = 4, Average = 1)				
Number	Value	Cumulative Value	Proportion	Cumulative Proportion
1	2.886172	2.886172	0.7215	0.7215
2	0.794191	3.680363	0.1985	0.9201
3	0.249484	3.929848	0.0624	0.9825
4	0.070152	4.000000	0.0175	1.0000

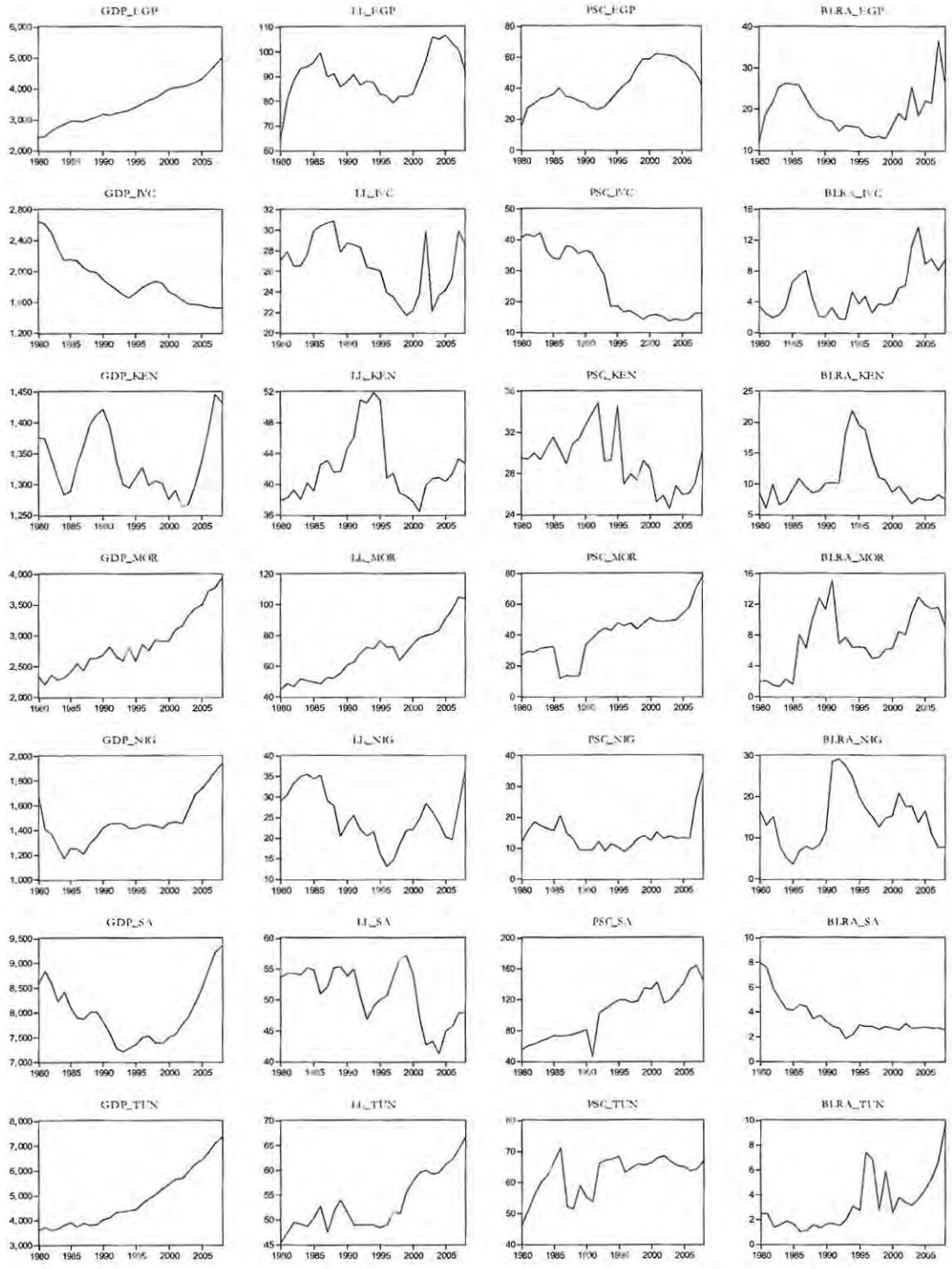
Source: Estimates by the author

Table A.7: Overall Financial Development (OFD2) Index derived by employing PCA

YEAR	EGYPT	Iv-COAST	KENYA	MOROCCO	NIGERIA	S-AFRICA	TUNISIA
1988	-0.94770	-1.25080	-1.11631	-1.01273	-1.91605	0.57685	-1.08079
1989	-0.80772	-1.52837	-1.11203	-1.36947	-2.03781	0.70653	-0.65622
1990	-0.69501	-0.95047	-1.13096	-0.78762	-1.64570	0.82392	-0.99409
1991	-0.57562	-1.36947	-1.05933	-0.93409	-1.72458	0.78431	-0.80978
1992	-0.47428	-1.63374	-1.02234	-0.77596	-1.59959	0.72854	-0.84398
1993	-0.58964	-1.52837	-0.78176	0.17884	-1.55758	0.97392	-0.65921
1994	0.06468	-1.04215	-0.18110	0.33679	-1.33064	1.03943	0.18765
1995	-0.05808	-1.07715	-0.26949	0.82857	-1.52837	1.03060	0.50118
1996	0.49666	-0.97910	-0.39089	-0.03594	-0.86437	1.27487	0.05685
1997	0.83589	-0.87372	-0.21438	0.42633	-0.59094	1.49325	0.03702
1998	0.72663	-0.66677	-0.38667	0.47423	-0.44292	1.66732	-0.13842
1999	0.97193	-0.29582	-0.37503	0.76037	-0.52788	1.77650	0.21878
2000	1.02453	-0.65177	-0.57814	0.39779	-0.37750	1.80634	0.43822
2001	0.54000	-1.30642	-0.67290	0.33405	-0.09837	1.81028	0.10290
2002	0.39087	-1.04215	-0.71992	0.06273	-0.21672	1.89990	-0.09021
2003	0.53536	-0.92348	0.04552	0.04248	-0.00121	1.83287	-0.31279
2004	0.81277	-0.68225	0.24579	0.39635	0.18840	1.92752	-0.21672
2005	1.46510	-0.89794	0.35429	0.80291	0.14404	1.97109	0.09961
2006	1.67496	-0.33944	0.71436	1.31425	0.30422	2.15188	0.13297
2007	1.63628	-0.21908	0.63271	1.56428	0.97880	2.25259	0.18011
2008	1.66147	0.02801	0.62070	1.40010	0.95593	2.23720	0.50502

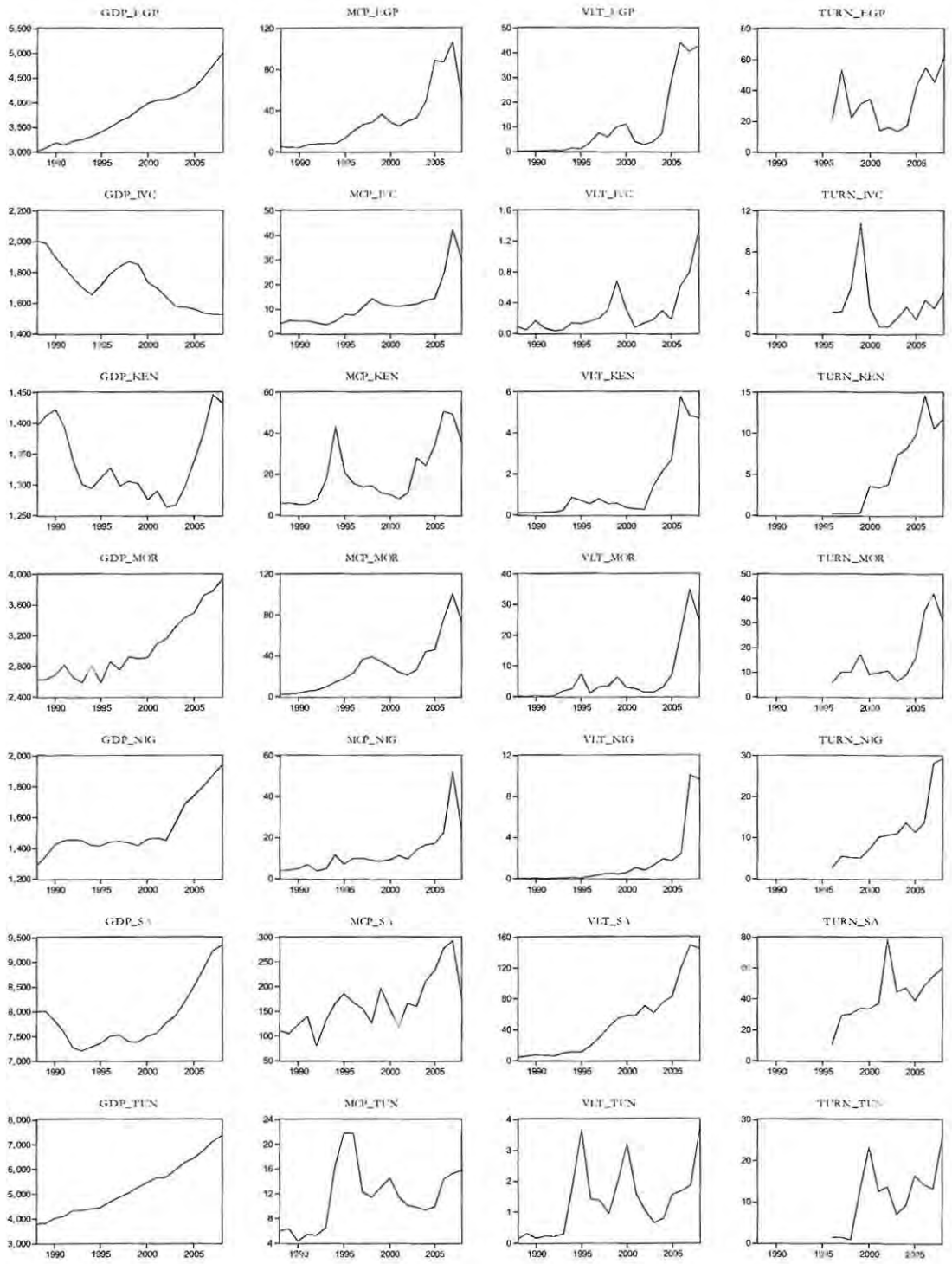
Source: Estimates by the author

Figure A.1: Movement of Banking Development Measures and Economic Growth



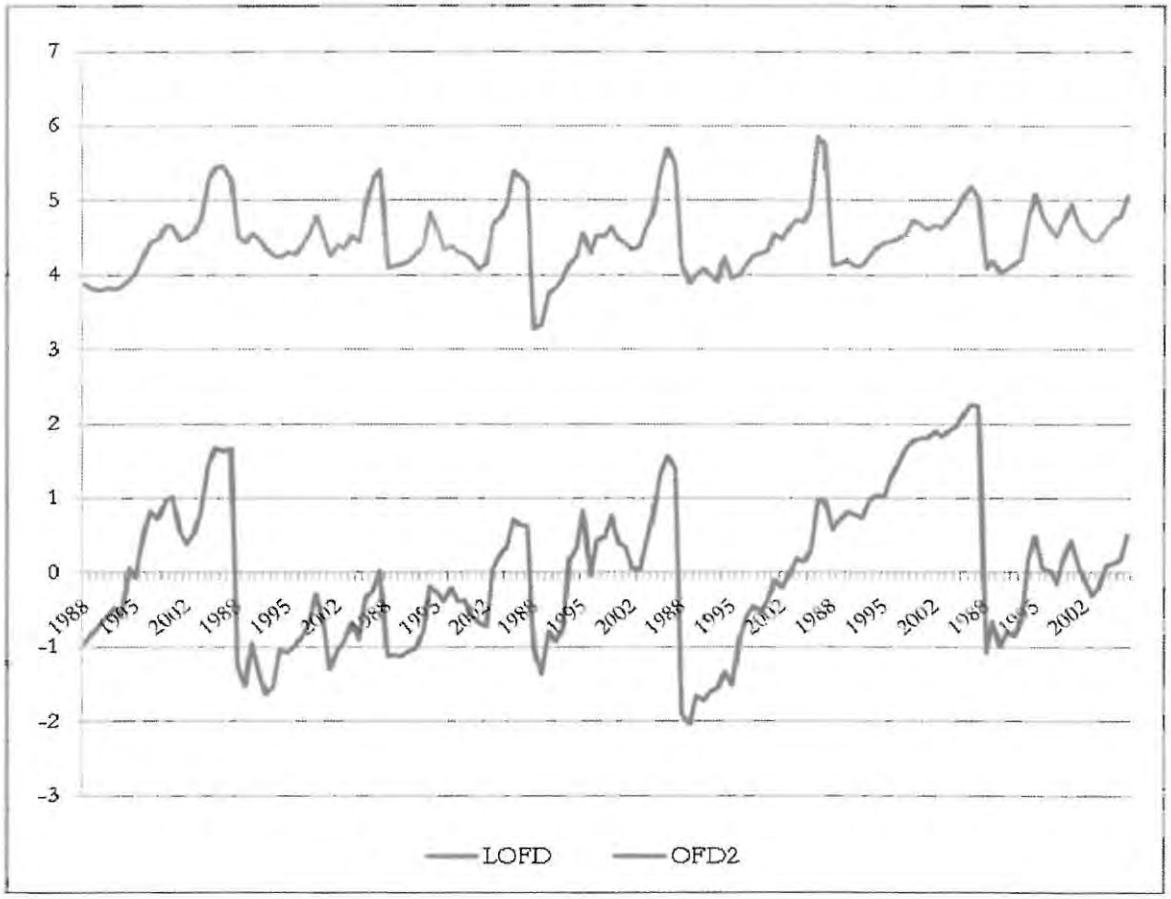
Source: Figures plotted by author using World Bank Development Indicators (2009) data

Figure A.2: Movement of Stock Market Development Measures and Economic Growth



Source: Figures plotted by author using World Bank Development Indicators (2009) data

Figure A.3: Movement of Overall Financial Development Measures



Source: Figure plotted by author using own estimates

Note A.1: Panel Fully Modified OLS (FMOLS)

If the results of the cointegration tests establish that a long-run relationship exists between the variables under investigation, there is then a need to estimate the relationship in question. This long-run relationship is commonly estimated using OLS estimation. However, it is well known that the OLS estimation of the cointegration regression equation in a panel context yields inconsistent and biased results where the residuals follow a non-normal distribution due to serial correlation and endogenously determined regressors in the I(1) case (Al-Awad and Harb, 2005:1042; Kiran *et al.*, 2009:92). According to Pedroni (2000:97), this bias - caused by endogeneity - results in distortions regarding size that is not automatically eradicated when the sample size increases in the panel dimension. Hence, Pedroni (2000) proposed the panel FMOLS method which is appropriate for heterogeneous cointegrated panels and produces consistent estimates of the β parameters within small samples, while also addressing the problems of endogeneity in the regressors and serial correlation in the errors (Aslan, 2008:8). The FMOLS estimator developed by Pedroni (2000) is called the Group-Mean estimator.

Pedroni's (2000) GM FMOLS estimator allows for both the short-run dynamics and long-run cointegrating vector to be heterogeneous, where the long-run coefficients are obtained by averaging the group estimates over N (Roudet *et al.*, 2007:13). Hence, the GM estimator for β takes the form:

$$\hat{\beta}^{*}_{NT} - \beta = \left(\sum_{i=1}^{N} \hat{L}_{22i}^{-2} \sum_{t=1}^{T} (X_{it} - \overline{X}_i)^2 \right)^{-1} \sum_{i=1}^{N} \hat{L}_{11i}^{-1} \hat{L}_{22i}^{-1} \left(\sum_{t=1}^{T} (X_{it} - \overline{X}_i) \mu^{*}_{it} - T \hat{\gamma}_i \right) \quad \text{..... (4.34)},$$

where $\mu^{*}_{it} = \mu_{it} - \frac{\hat{L}_{21i}}{\hat{L}_{22i}} \Delta X_{it}$, $\hat{\gamma}_i \equiv \hat{\Gamma}_{21i} + \hat{\Omega}^{0}_{21i} - \frac{\hat{L}_{21i}}{\hat{L}_{22i}} (\hat{\Gamma}_{22i} + \hat{\Omega}^{0}_{22i})$, and $\hat{L}_i$ is the lower triangular decomposition of Ω_i (Pedroni, 2000:103). Here Ω_i can be decomposed as $\Omega_i = \Omega_i^0 + \Gamma_i + \Gamma_i'$, where Ω_i^0 is the contemporaneous covariance and Γ_i is a weighted sum of autocovariances.

The associated t-statistic for the GM estimator takes the form:

$$t_{\beta^{*}_{NT}} = (\hat{\beta}^{*}_{NT} - \beta) \left(\sum_{i=1}^{N} \hat{L}_{22i}^{-2} \sum_{t=1}^{T} (X_{it} - \overline{X}_i)^2 \right)^{-1/2} \rightarrow N(0,1) \quad \text{..... (4.35)},$$

where this t-statistic is asymptotically standard normal as T and N approach infinity.

This GM estimator is robust to endogenous regressors, omitted variables and measurement errors. It also has satisfactory size and power properties even for small panels, as long as T is larger than N (Roudet *et al.*, 2007:14). Pedroni (2000:96) also finds that the t-statistic allows for a more flexible alternative hypothesis to test since the GM estimator is based on the 'between-dimension' of the panel, while the pooled estimators are based on the 'within-dimension' of the panel. Pedroni (2000:96) further notes that when the true slope coefficients are heterogeneous then GM estimators provide consistent point estimates of the sample mean of the heterogeneous cointegrating vectors, while pooled estimators do not. Pooled estimators provide consistent point estimates of the average regression coefficient but not the sample mean of the cointegrating vector (Pedroni, 2000:96).