ΠΑΝΕΠΙΣΤΗΜΙΟ ΜΑΚΕΔΟΝΙΑΣ
ΔΙΑΤΜΗΜΑΤΙΚΟ ΠΡΟΓΡΑΜΜΑ ΜΕΤΑΠΤΥΧΙΑΚΩΝ ΣΠΟΥΔΩΝ
ΤΜΗΜΑΤΟΣ ΟΙΚΟΝΟΜΙΚΗΣ ΕΠΙΣΤΗΜΗΣ

Η ΕΠΙΔΡΑΣΗ ΤΗΣ ΧΡΗΜΑΤΟΟΙΚΟΝΟΜΙΚΗΣ ΑΝΑΠΤΥΞΗΣ ΣΤΗΝ ΟΙΚΟΝΟΜΙΚΗ ΑΝΑΠΤΥΞΗ: ΜΙΑ ΟΙΚΟΝΟΜΕΤΡΙΚΗ ΜΕΛΕΤΗ ΣΤΙΣ ΛΙΓΟΤΕΡΟ ΑΝΑΠΤΥΓΜΕΝΕΣ ΧΩΡΕΣ.

Διπλωματική Εργασία

του

Καρτσωνάκη Μαδεμλή Δημήτρη

Θεσσαλονίκη, 09/2017

UNIVERSITY OF MACEDONIA
MASTER IN ECONOMICS

THE EFFECT OF FINANCIAL DEVELOPMENT ON ECONOMIC GROWTH: AN ECONOMETRIC INVESTIGATION IN LESS DEVELOPED COUNTRIES.

Master's thesis

of

Kartsonakis Mademlis Dimitrios

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Πτυχίο Μαθηματικών, ΑΠΘ, 2011

Διπλωματική Εργασία

υποβαλλόμενη για τη μερική εκπλήρωση των απαιτήσεων του

ΜΕΤΑΠΤΥΧΙΑΚΟΥ ΤΙΤΛΟΥ ΣΠΟΥΔΩΝ ΣΤΗΝ ΟΙΚΟΝΟΜΙΚΗ ΕΠΙΣΤΗΜΗ

Επιβλέπων Καθηγητής
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Εγκρίθηκε από την τριμελή εξεταστική επιτροπή την ηη/μμ/εεεε

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Abstract

This thesis investigates the long run relationship between financial development and economic growth, trying to utilize the data in the most efficient manner via panel unit root tests and panel cointegration analysis. Moreover, popular time series methodologies such as the Johansen's cointegration and Granger causality are employed. The sample consists of 49 countries, the data frequency is annual and the time span ranges from 1970 to 2015. The long run relationship is estimated using fully modified OLS. For 19 out of 49 less developed countries, the empirical results provide support for the hypothesis that there is at least one equilibrium relation between financial depth, growth and ancillary variables. The same result derived from the four panels (World, Asia, Africa and America). In the long run, the panel causality tests point out one-sided causality from finance to growth in the case of Africa and America and a bi-directional causality in the case of Asia and World, while individual countries' causality tests give contradictory results of the direction of causations.

Keywords: Financial Development; Economic Growth; Panel unit roots; Panel cointegration; Cross-Sectional Dependence

……to my beloved Cynthia

Acknowledgments

I would first like to thank my thesis advisor professor Fotios Siokis of the School of Economic and Regional Studies at University of Macedonia. He consistently allowed this paper to be my own work, but steered me in the right direction whenever he thought I needed it.

I would also like to acknowledge Emmanouil Gkiourkas of the department of Economics at University of Macedonia as the second reader of this thesis, and I am gratefully indebted to him for his very valuable comments on this thesis.

Finally, I must express my very profound gratitude to my parents for providing me with unfailing support and continuous encouragement throughout my years of study and through the process of researching and writing this thesis. This accomplishment would not have been possible without them. Thank you.

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1. Introduction

As a result of global crises caused by real sector in 1970's, many less developed countries transformed their economic policies towards economic liberalization as suggested by neoclassical vision after 1980's. Therefore, there is an increasing interaction between financial and real sector in recent years. Furthermore, Levine (1997) declares that financial development helps to identify more attractive investment opportunities, decreases productive costs, promotes technological innovation and mobilizes savings. However, some economists just do not believe that the link between finance and growth is important such as Lucas (1988) and Kuznets (1955).

The improvements in theoretical and empirical analysis methods and the availability of statistical data allowed the examination of the relations between economic variables. These improvements helped to determine the relationship between financial development and economic growth in the last few decades. Economists have generally reached a consensus on the positive correlation between financial development and economic performance, however, this link in not a recent finding. In this context, macroeconomists question whether the direction of causality runs from financial development to economic growth or vice versa or there is a bi-directional causality. However, as Lawrence (2003) underline, it is not necessary to demonstrate causation from finance to growth to prove that less developed economies need properly functioning financial institutions. She also declares that financial development prospers where real economy activity is strong and that financial markets are weak when there is plenty of space for the government to mediate in credit supply. Two years earlier, Sinha and Macri (2001) state that if causality be established from financial sector development to growth then the policies which boost financial development will lead to economic growth via the amelioration of market failures by the provision of services that facilitate transactions, the mobilization of capital and the exertion of corporate governance.

The empirical studies that attempt to examine the relationship between economic growth and financial depth, defined as the level of development of financial markets can be distinguished in two categories. First, empirical papers using cross-country and panel data surveys show positive effects of financial development on growth even after accounting for potential biases impelled by simultaneity, missing variables and unobserved country-specific effect on the link between finance and growth (King and Levine, 1993). Second, time-series studies give conflicting results. Jalil and Ma (2008) investigate the relationship between financial development and economic growth for China and Pakistan over the period 1960-2005 by using two indicators for financial development, the deposit liability ration (DLR) and credit to private sector (CPS). They conclude that in the case of Pakistan both indicators have a significant impact on the growth whereas in the case of China, only the DLR has a significant impact on growth, while CPS has an insignificant influence on growth. Demetriades and Hussein (1996) find meager evidence in favor of the view that finance is a leading sector in the process of economic growth. However, their findings contend a considerable evidence of bi-directionality, while some evidence supports a reverse causation. These inferences show that there is not a consensus on the role of financial development in the economic growth process.

There are some crucial issues which authors of an empirical study have to take into account. A small sample may significantly distort the power of standard tests and bring incorrect results even if the nature of $I(1)$ variables has been recognized as critical and the appropriate estimation techniques have been used. Conclusively, as Christopoulos and Tsionas (2004) highlight, all efforts must be made to utilize the data in the most efficient way in order to conclude a precise result.

The aim of this master's thesis is to revisit and investigate empirically the relationship between financial development and economic growth for 49 less developed countries over the period 1970-2015. In order to achieve this goal, we will construct an econometric model, by using representative variables of economic growth and financial development, and we will estimate it with panel econometric techniques taking into account cross-section dependence.

More specifically, this thesis contributes the following:

- We use time series unit root tests along with panel unit root test to examine the stationarity properties of the data. Panel-based tests are useful because of the lack of power of time-series unit root tests given a small sample.
- We use Johansen's cointegration test on a per country basis along with panel cointegration tests to seek for cointegration relationships and to ensure that Johansen's tests do not suffer power loss due to finite samples respectively.

- An approach developed by Phillips and Hansen (1990) and then by Pedroni (2000) will be used in estimating the cointegrating vector in a fully modified OLS principles (FMOLS). This methodology (FMOLS) takes into account serial correlation effects and the endogeneity issue in the regressors resulted from the existence of a cointegrating relationship (Phillips, 1995) and contemporaneously it allows the consistency of the long-run relation with the short-run adjustment (Christopoulos and Tsionas, 2004). In addition, Pedroni (1996) complements that an appropriately modified FMOLS estimator performs well for inferences in cointegrated panels with heterogeneous dynamics as the cross-sectional dimension becomes wide.
- The last important issue is to discriminate between long-run and short-run causality. Testing only for long-run causality would lead to an erroneous result that is the general absence of causal relationship between economic growth and financial development. Lastly, the estimation of an error correction model appropriate for heterogeneous panels will be conducted.

The present thesis is structured as follows: This chapter presents a brief introduction of the subject under investigation. In chapter 2, we provide a literature review dealing with the relationship between financial development and economic growth. The presentation of the data and the econometric techniques employed are included in chapter 3. The empirical results are discussed in Chapter 4. The thesis concludes with a summary of results.

2. Literature Review

The relationship between economic growth and financial development has occupied many economists and has been studied both theoretically and empirically. Although the literature has yielded mixed results, the majority of authors agree that there is a positive relationship between economic growth and financial development. However, they disagree on the direction of causality. On one hand, studies have shown that the development of financial sector leads to economic growth (Rousseau and Sylla, 2003; Christopoulos and Tsionas, 2004; Bittencourt, 2012) and on the other hand, some authors have concluded that the economic growth increases the financial development (Al-Awad and Harb, 2005; Zang and Kim 2007) or that there is a bi-directional causality **(**Apergis, Filippidis, and Economidou, 2007; Levine, 1999).

Additionally, the empirical approaches (econometric techniques) vary in the literature and the results are ambiguous. Some cross-country and panel data studies suggesting that the causality runs from finance to growth while other studies, using time-series techniques, found that the causality is bi-directional for the majority of countries.

Another critical issue is the choice of the appropriate proxy measuring financial depth. The choice of that proxy may conclude to different results according to the literature. Kar and Pentecost (2000) find that the direction of causality in Turkey runs from financial development to growth when financial development is measured by the money to income ratio, while the direction is reversed when the bank deposits, private credit and domestic credit ratios are used to proxy financial development.

2.1 Theoretical Studies

The first one who attempts to investigate the theoretical relationship between financial and economic growth was Schumpeter (1911). Schumpeter stresses the importance of banking system to economic growth via financing of productive investments. In other words, a strong banking system is crucial for economic growth and also It stresses the finance of technological innovations in producing more efficiently and new products.

According to Goldsmith (1969), there is a positive relationship between the financial sector and the growth of the economies. By using data from 35 countries, 19 developed and 16 less developed for the period 1860-1963 he argues that the positive correlation between financial development and economic growth was driven by financial intermediation improving also the efficiency.

Mckinnon (1973) and Shaw (1973), claim that government restrictions in the banking system such as interest rate caps have negative effects on the development of the financial sector and thus slow down economic growth. Additionally, King and Levine (1993b) find that government intervention in the financial system has a negative effect on economic growth.

Robinson (1953) supports that the financial system is a by-product of the overall process of economic development. He claims that "where enterprise leads, finance follows". Similarly Kuznets (1955) argues that the financial market is starting to grow as the economy is approaching the intermediate stage of development and is growing once the economy becomes mature. Lucas (1988), states that economists have overestimated the importance of financial matters.

2.2 Empirical Studies

Alongside with theoretical studies, there are also empirical studies for the investigation of the relationship between economic and financial growth. Empirical studies test models with real data from various economies in order to test the relationship and the causality of financial development and output.

In empirical studies, the existence of a positive relationship between economic growth and financial depth is almost given as mentioned before (the economists have generally reached a consensus). So the real aim is to identify the direction of causality between them.

2.2.1. Cross-Country Regressions

King and Levine (1993), used data for a sum of 80 countries over the period 1960-1989 to conclude firstly, that there is a positive relationship between economic growth and financial indicators and secondly that their financial proxy can significantly predict subsequent rates of economic growth.

Levine and Zervos (1998) used various measures of stock market development for a sample consisting of 47 countries over the period 1976-1993 to conclude that there is a significant and positive long-run relationship between financial and economic growth. More specifically they indicate that stock market liquidity and banking development are both positively and robustly correlated with economic growth. Finally, they suggest that financial factors are a critical part of the growth process.

Neusser and Kugler (1998) used manufacturing data from 13 OECD countries for 22 years (1970-1991) in order to investigate the hypothesis that the development of the financial sector is beneficial for economic growth. By performing several tests including Johansen maximum likelihood and residual-based panel cointegration tests, they show that the majority of their countries are cointegrated not so much between financial sectors' GDP and manufacturing GDP but mostly between financial sector GDP and manufacturing total factor productivity (TFP). Later, causality tests gave conflicting results. For some countries, financial sector causes both manufacturing GDP and TFP, for others financial activity cause manufacturing GDP while for others there is a feedback from manufacturing to the financial sector.

Rousseau and Sylla (2003) indicate a robust correlation between financial indicators and economic growth with a leading role for finance over the period 1850-1997 in a board cross-section of 17 countries among them huge economies (such as United States, France, Germany, Japan, England), with stronger effect of finance to economic growth prior to the Great Depression.

Calderon and Liu (2003) examine the direction of causality between financial depth and economic growth using pooled data of 109 industrial and less developed countries over the period 1960-1994. Their general result is that financial depth leads to economic growth through a capital accumulation and productivity growth, with the second channel being the most effective. Additionally, they find a bi-directional Granger causality between financial deepening and economic growth plus that the financial development has a greater impact in the less developed countries than in the industrial. Last but not least, they emphasize that the longer the sample is, the larger the effect of financial deepening on economic growth.

Christopoulos and Tsionas (2004) support the aspect that financial development propels economic growth. By employing a panel data of 10 less developed countries from 1970 to 2000, they conclude that there is only one cointegrating vector which according to Brooks (2014, 554) dubiously implies unidirectional causality from financial depth to economic growth.

Another study which deals with the relationship between economic and financial growth is from Mohtabi and Agarwal (2001). By using a dynamic panel method for 21 emerging markets over 21 years, their results suggest a directly and an indirectly positive relationship between indicators of the stock market and economic growth.

Apergis, Filippidis and Economidou (2007) examined the long-run relationship between financial development and economic growth using a dynamic heterogeneous panel of 50 non-OECD and 15 OECD countries over the period 1975-2000. By using three different measures of financial deepening, their findings support the presence of a single long-run equilibrium relation between financial development and economic growth for all groups of countries. Concerning to auxiliary variables, international trade, human capital, and investment share, their effect on growth is found to be positive and significant, in contrast with government spending which demonstrates a positive impact for the OECD countries, but a negative effect for the non-OECD countries. Subsequently, they prove a bi-directional causality between financial deepening and growth.

In a recent research Nyamongo, Misati, and Kipyegon (2012) attempt to investigate the role of remittances and financial depth on economic growth using panel econometrics framework consisting of 36 countries in Africa over the period 1980-2009. Their findings show that the remittances seem to work as a complement to financial development and appear to be a significant source of growth for these countries. However, the volatility of remittances seems to have a negative impact on the growth of countries in Africa and that there is a weak importance of financial depth in boosting economic growth.

By pooling the data from 11 countries, 5 developed and 6 less developed countries, over the period 1972-94 except for China (1975-1994), Lin, Tsai and Wu (1999) examined the relationship between financial market development and economic growth. They claim that the interest rate has a negative relation with economic growth while the capital absorption and saving rates have a positive and robust relation. Consequently, they imply that financial intermediation plays a major role in economic growth. Their result suggests that the absence of efficient financial markets of these economies may have obstructed the economic performance.

Dawson (2008), by using annual panel data for 44 less developed countries over the period 1974-2001 attempts to consider a different approach for the relationship between financial development and economic growth. He estimates three equations, two are theoretically consistent and the third uses a proxy for financial depth. The results are ambiguous, the theoretical models produce a positive and significant relationship between financial development and economic growth, whereas the proxy model shows the opposite. Consequently, he suggests that the measure of financial depth appears critical for policy advice.

Caporale, Rault, A.D.Sova, and R.Sova (2009), review the relationship between financial development and economic growth in 10 new European Union members over the period 1994-2007, through banking and financial sector, by estimating a dynamic panel model. Their result suggests that in these economies, the stock and credit markets are underdeveloped and their impact on economic growth is limited due to a lack of financial depth.

Hassan, Sanchez, and Yu (2011) provide evidence about the role of financial development on economic growth. For this purpose, they estimate both variance decompositions and panel regressions of annual data (1980-2007) for 168 countries to examine which is the appropriate proxy of financial development and how much it contributes to explaining economic growth. Based on their findings, in less developed countries, there is a positive relationship between finance and growth. The short-term multivariate analysis shows conflicting results. For the most regions, they conclude to a bi-directional causality between finance and growth, conversely, for the two most underdeveloped regions, they find one-way causality from growth to finance. Lastly, they state “that a well-functioning financial system is a necessary but not sufficient condition to reach steady economic growth in less developed countries”.

Another important research which attempts to shed some light on the particularities of the relationship between financial development and economic growth was conducted by Estrada, Park, and Ramayandi (2010). In this paper, they used an econometric analysis on a panel data of 125 Asian countries and confirmed that financial development has a significant positive effect on growth, especially in less developed countries. Authors' findings also indicate that the contribution of financial development on growth has weakened since the Asian financial crisis. Conclusively, they argue that further development of the financial sector matters for sustaining less developed Asia's prosperity in the post-crisis period.

Samargandi, Fidrmuc, and Ghosh (2015) utilize panel data of 52 middle-income countries over the 1980-2008 period in order to identify the relationship between financial development and economic growth. They show that in the long run, there is an inverted U-shaped relationship between finance and growth. But, in the short run, the relationship is insignificant. Consequently, they conclude that too much finance can drive to a negative influence on growth in countries with middle income. Finally, they confirm a non-monotonic effect of financial depth on growth by estimating a threshold model.

Dawson (2010), examines the finance-growth nexus for a panel of 58 less developed countries (LDCs) using panel methods. He concludes that there is a positive relationship between GDP and financial development in LDCs and this result substantiates the conclusions from other studies such as Christopoulos and Tsionas (2004). However, the dimension of his estimation of the impact of financial development on GDP is not directly comparable with other studies that use alternative measures of financial development.

Akimov, Wijeweera, and Dollery (2009) occupy with the impact of financial intermediation on the growth of real GDP by using data for 27 countries over the period 1989-2004 in transition economies. With various proxies for financial sector development and by using panel data analysis methods and an endogenous growth model, they establish a robust positive link between financial development and economic prosperity in transition economies.

Khan and Senhadji (2000) employ a dataset, consisting of 159 countries and generally cover the period 1960-1999. The focus of their empirical exercise is to test the robustness of previous conclusions with respect to alternative financial depth indices, estimation method, data frequency and nonlinearities in the relationship. In the cross-section analysis, they confirm a positive and significant relationship between financial development and economic growth. This result is robust to four financial depth indices covering the stock markets and the banking system. However, the magnitude of the effect varies with the particular index. Additionally, by correcting for simultaneity bias, the result marginally changes. Furthermore, by estimating the growth equations with non-overlapping five-year-average panel data, the results are generally weaker when a time dimension is introduced in the regression. Lastly, they experiment with a quadratic relationship between financial depth and growth and find conditional convergence, meaning that poor countries tend to grow faster than rich ones and that the negative sign on the square of the financial development indicator may capture the slowing development path of advanced economies.

Demirguc-Kunt and Maksimovic (1998) employ a sample of 30 less developed and developed countries and estimate a financial planning model to find that financial development accommodates the firm's prosperity. The main result of their study is that both an active stock market and a well-developed legal system are significant for the further growth of the firms.

To this end, Chortareas, Magkonis, Moschos and Panagiotidis (2015) examine the relationship between financial development and economic activity taking into account cross-sectional dependence. They used annual data for 20 advanced countries and 17 emerging economies while the time span covers the period 1970-2007. Their findings firstly indicate that there is no long-run relationship between the variables, however when they account for economic openness the relationship re-established again. Their results also show that the trade openness is more important for less developed countries while the financial openness is more important for advanced countries. They did not find any short-run causality between finance and output, while in the long run they find evidence for bidirectional causality in less developed countries and one-way causality that runs from finance to growth in advanced economies.

2.2.2. Time-Series Regressions

The above process is often used in the literature, however, is unable to explain the relationship that may have the financial development and the economic growth in the frame of a single country. The fact that the observations used resulting by averages observations of different countries, leads only to general conclusions regarding the above relationship. The need to include the specific characteristics of each country has led much of the scientific community in the time series analysis.

Demetriades and Hussein (1996) conduct causality tests between financial development and real GDP using time series techniques such as cointegration analysis and error correction model, for a sample of 16 countries which are not highly developed in 1960 and their population exceeds 1 million in 1990. Their results provide little support to the aspect that finance is a leading sector in the process of economic prosperity. However, they also find considerable evidence of a two-way causality relationship and some evidence of reverse causation. Consequently, they point out the hazard of statistical conclusions based on cross-section country studies which treat different countries as homogeneous entities.

Similar results came through Shan, Morris, and Sun (2001), who estimate a vector auto-regressive model for 9 OECD countries and China. They claim that a time-series approach is better than a cross-sectional one. They deduce that there is a weak support for the hypothesis that finance leads growth based on their evidence, which presents a bi-directional causality between finance and growth in half of the countries and a reverse causality in three countries.

Rousseau and Wachtel (1998) examine the links between financial intermediation and economic growth that operated in five countries over the period 1870-1929. Their first inference is that even if these links differ across countries, there are several commonalities namely, measures of the deepness of intermediation share appear same long-run characteristics with output and monetary base, as well as, the coefficients of VECM show a positive response of output to increases in the intensity of intermediation, while financial magnitude is impassive to fluctuations in the long-run relationship of each system. Authors' results also offer support for the concept that a rapidly augmenting financial system can play a major role in improving both resource portions and economic growth. Lastly, their paper suggests that real sector activity is a less significant factor of intermediary performance during the phase of rapid growth.

The study of Arestis, Demetriades, and Luintel (2001) regards 5 developed countries and time-series methods. They separate stock markets by the banking system and claim that stock markets may be able to boost to long-term output growth, however, is a small fraction compares to the banking system. Specifically, in France, Japan and Germany both banks and stock markets appeared to have made significant contributions to output growth. In addition, in the United Kingdom and the United States, the link between financial development and economic performance was found to be weak and to run from growth to financial development. Summarizing, they state that “bank-based financial systems may be more able to promote long-term growth than capital-market-based ones”.

Shan and Morris (2002) use time-series quarterly data of 19 OECD countries and China over the period 1985-1998. They construct a VAR model to test the causal relationship between financial development and economic growth. They also use, total credit and interest spread as an indicator of financial development. Their findings give a meager support to the hypothesis that financial development leads economic growth. However, they were unable to find evidence of causality in some countries, but they found proofs for a two-way causality and a reverse causality in others.

Ghirmay (2004) seeks to explore the casual link between the financial development and economic growth in 13 African countries. His research is carried out in a VAR framework based on cointegration and error correction model. In 12 out of 13 countries, he finds a long-run relationship between financial depth and economic growth. Additionally, in 8 countries the direction of long-term causality runs from financial development to growth. However, in 9 countries his empirical results, yield that economic growth causes financial development and in 6 countries there is a bi-directional causal relationship.

Another research that comes to complement the literature is by Dritsakis and Adamopoulos (2004). They examine the causal relationship between the financial development, economic growth and the degree of openness in the economy of Greece over the period 1960: I – 2000: IV. They managed to find one cointegrated vector among financial development, GDP and the degree of openness by using the cointegration analysis. After this, they wage Granger causality tests based on error correction model and argue that there is a causal link between the degree of openness of Greece and economic growth, and also between financial development and economic growth.

Adu, Marbuah, and Mensah (2013) investigate the long-run growth effects of financial development in Ghana over the period 1961-2010. Their findings suggest that whether financial development has a positive or a negative influence on growth depends on the indicator used to proxy for financial deepening. Specifically, both the credit to the private sector as a ratio to GDP and the total domestic credit are beneficial for growth, while the broad money stock to GDP ratio doesn't lead to growth.

Majumder and Eff (2012) employ regional data from Bangladesh over the period 1997-2000. They conclude that political interference with the economy guide to misallocation of resources and reduce economic growth. They also state that economic growth in Bangladesh patently needs the creation of a financial system free of political manipulation.

Nain and Kamaiah (2014) provide evidence for the relationship between financial development and economic growth in the context of India over the period 1990-2010. The results of both linear and non-linear in the framework of causality tests indicate that there is no causal relationship between financial depth and economic performance. Also, based on a comprehensive measure of financial development, the authors propose that India should adopt pro-growth policies in order to support the financial development and for the case of the accelerating economic growth, the role of financial sector development should not be highlighted.

Kenourgios and Samitas (2007) on their turn examine the long-run relationship between finance and economic growth for a transition economy namely, Poland using quarterly data over the period 1994: Q1- 2004: Q4. Their results reveal that in the long-run, credits to the private sector have been one of the major forces in economic growth of Poland. Moreover, they find that economic growth is not driven by financial development.

Summarizing all these papers, there are 3 different views on the relationship between financial development and economic growth. The domain one maintains that financial development leads economic growth (Levine, Loyaza and Beck, 2000; Khan, Qayyum, Sheikh and Siddique, 2005; Shahbaz, Ahmaed and Ali, 2008; Bittencurt, 2012; Grassa and Gazdar, 2014; Pradhan, Arvin, Half and Nair, 2016). According to this view, an efficient financial system may reduce the cost of borrowed funds, increase lenders' gain and secure that savings placed in products that promise higher returns, and all of these can exert the economic growth.

The second view deals with the reverse relationship (Al-Awad and Harb, 2005; Liang and Teng, 2006; Abu-Bader and Abu-Qarn, 2006; Guryay, Safakli and Tuzel, 2007; Zang and Kim, 2007; Chakraborty, 2008). In agreement with this view, the financial development follows economic growth as a developed economy creates additional demand for several financial services, this demand, in turn, leads to a more advance financial sector.

The last view agrees with both previous views, i.e. the causal link between financial development and economic growth is bi-directional (Levine,1999; Luintel and Khan, 1999; Al-Yousif, 2002; Liu and Shu, 2002; Abu-Bader and Abu-Qarn, 2008; Sani, Najwa, Ismail, Mahmood and Mansor, 2014;). This aspect indicates that the financial depth may promote economic performance, nevertheless this high economic growth, in turn, would be equally likely to facilitate the development of the financial sector.

3. Data and Methodology

In this chapter we present the variables and the methodology that will be used in order to analyze the data.

3.1 Data

In an econometric study, one of the most important issue is choosing the appropriate variables (indicators) in order to test the relationship between the financial development and economic growth. A sufficient number of indicators arises from the literature especially for proxying financial development.

In the case of economic growth, almost all empirical studies use gross domestic product (GDP) as the indicator, and in our case it couldn't be otherwise. However, when it comes to choosing the appropriate financial variable on has to take into account that the financial system consists of two major markets namely, the banking industry and the financial sector. In this thesis, it was chosen to be used the domestic credit to private sector as a percentage of GDP as an indicator of financial development. The selection of this specific indicator was made, by following Caporale, Rault, A.D.Sova, and R.Sova (2009) and because it refers to financial resources provided to the private sector, such as trade credits, purchases of nonequity securities and loans. This indicator points out the magnitude of domestic investment and measures the size of financial institutions according to the World Bank's description. When it comes to ancillary variables, consumer price index and output share of investment were used as independent variables.

The datasets were collected from international resources like Federal Reserve Economic Data, various issues of the International Financial Statistics published by International Monetary Fund and World Bank database. The sample consists of 49 less developed countries[1] among them the 10 countries sample of Christopoulos and Tsionas (2004), namely Colombia, Paraguay, Peru, Ecuador, Jamaica, Honduras, Kenya, Thailand, Dominican Republic and Mexico. The identification of the less developed countries was based on World Bank's list. The data frequency is annual and the time span ranges from 1970 to 2015.

[1] A map with the countries is listed in the Appendix

3.2 Methodology

Previous studies have examined for cointegration on the country by country basis by using time-series techniques, like Dickey-Fuller tests for unit root, and Johansen's maximum likelihood cointegration methodology. However, given the short size of the dataset, appeared the need of utilization the information in the most efficient way, so we make use of panel-based unit root and cointegration tests.

In order to investigate the relationship between growth and financial development, the following model was used:

$$y_{it} = \beta_{0i} + \beta_{1i}F_{it} + \beta_{2i}S_{it} + \beta_{3i}p_{it} + u_{it} \tag{1}$$

Since the causality is not clear the following model was specified too

$$F_{it} = \beta_{0i} + \beta_{1i}y_{it} + \beta_{2i}S_{it} + \beta_{3i}p_{it} + v_{it} \tag{2}$$

where y is the quantity of output expressed as an index number (2010=100), financial development (F) is the domestic credit to private sector as a percentage of GDP, the share of investment (S) is the share of gross fixed capital formation to nominal GDP,(p) is the consumer price index and u/v are the error terms. All variables have been transformed into natural logarithms.

3.2.1. Panel

A panel data set is formulated from a sample that contains N cross-sectional units that are observed at different T time periods. The panel data analysis consists of two categories.

- Balanced Panel: A panel is defined as balanced when the number of time periods T is the same for all units i.
- Unbalanced Panel: A panel is defined as unbalanced when the number of time periods is not the same for all units i.

In general terms the basic linear model is expressed as:

$$y_{it} = \alpha_i + x_{it}\beta_{it} + u_{it} \tag{3}$$

for i = 1,2,…,N sections and t = 1,2,…,T time periods

Where y_{it} is the dependent variable, x_{it} are 1 x k vectors of observations on the independent variables, β_{it} are k x 1 vectors parameters to be estimated for the independent variables x_{it}. The u_{it} is an error term and α_i is the intercept term. The coefficients α_i and β are estimated using three different methods.

- Pooled Regression (OLS) estimates a single equation using all data, under the principal assumption that there are no differences among the data matrices of the cross-sectional dimension (N). Particularly, the model estimates a common constant α for all cross-sections i.e. it assumes that the data set is a priori homogeneous.
- The fixed effects method treats the constant as section-specific. This means that the model allows for different constants for each section. The fixed effects estimator a.k.a. the least squares dummy variable (LSDV) estimator includes a dummy variable for each group. This model is expressed as:

$$y_{it} = \alpha_i + x_{it}\beta_{it} + u_{it} \tag{4}$$

$$u_{it} = \mu_i + v_{it}\ , \qquad v_{it} \sim N(0, \sigma^2) \tag{5}$$

  Where μ_i are individual specific and time invariant effects and v_{it} is a remainder of disturbance.
- The random effects method handles the constants for each section not as fixed, but as random parameters. This method incorporates an assumption that the different studies are estimating different intervention effects. This model is expressed as:

$$y_{it} = \alpha_i + x_{it}\beta_{it} + \theta_{it} \tag{6}$$

$$\theta_{it} = \varepsilon_i + v_{it}\ , \qquad v_{it} \sim N(0, \sigma^2) \tag{7}$$

  Where ε_i is the error term of cross-section and $v_{it} \sim N(0, \sigma^2)$ is the error term of individual observations.

In general, the difference between Random effects and Fixed effects model is that the random effects model assumes that each country differs in its error term, whereas the fixed effects model assumes that each country differs in its intercept term. According to Asteriou and Hall (2015:420), when the panel is balanced, fixed effects model will work better. In other cases, where the sample contains limited observations of the existing cross-sectional units, the random effects model is more appropriate. Specifically, the Random effects is more efficient and has fewer parameters to estimate than Fixed effects model. Fixed effects model has different coefficients for different individual units, while the random effects model has only one coefficient for different individual units. One last difference is that the random effects model investigates differences in error variance components across units and time periods, while the fixed effects explores the intercept across groups.

The Hausman test is formulated in order to decide which of these models is more appropriate for the estimation. The null hypothesis is that the preferred model is random effects, while the alternate hypothesis is that the model is fixed effects. Essentially, the test seeks if there is a correlation between the unique error and the regressors in the model. Consequently, the null hypothesis is that there is no correlation between the two (Chmelarova, 2007:6).

3.2.2. Testing for Unit Roots

The most important step before the construction of the model is to test if the time-series which are going to be used are stationary, namely, if they do not contain unit roots. If the time-series are not stationary, the tests that are going to be applied might lead to unreliable results. For this reason, the time series of the model will be tested for stationarity in levels and in the case they are not stationary in levels, their degree of integration will be determined.

A stochastic process y_t is stationary if:

$$E(y_t) = \mu_y \text{ for all } t \in T \tag{8}$$

$$E(y_t - \mu_y)(y_t - \mu_y) = \sigma^2 < \infty \text{ for all } t \in T \tag{9}$$

$$E[(y_t - \mu_y)(y_{t-h} - \mu_y)] = \gamma_h \quad (10)$$

for all $t \in T$ and all integers h such that $t - h \in T$.

The first condition means that all components of a stationary stochastic process have the same constant mean. The second condition ensures that the variance are also time invariant because, for $h = 0$, the variance $\sigma_y^2 = E[(y_t - \mu_y)^2] = \gamma_0$ does not depend on t. Moreover, the covariances $E[(y_t - \mu_y)(y_{t-h} - \mu_y)] = \gamma_h$ do not depend on t but just on the distance in time h of the two components of the process (Lütkepohl and Krätzig, 2004:38).

There are three widespread tests in order to check for unit roots.

- **Augmented Dickey-Fuller (ADF).**

Dickey and Fuller (1979) detect three different equations which should reckon in unit root test. The first one includes only the coefficient δ_2 assuming that $\delta_0 = \delta_1 = 0$, that is, there is not trend or constant (random walk). The second equation counts the constant but not the trend ($\delta_1 = 0$), while, the third one reckons in both the constant and the trend. The ADF test in a time-series y is based on the following equation:

$$\Delta Y_t = \delta_0 + \delta_1 t + \delta_2 Y_{t-1} + \sum_{\rho=1}^{k} \alpha_\rho \Delta Y_{t-\rho} + u_t \quad (11)$$

Where Y_t are the values of the time series, u_t is an independent and stationary process (white noise), t is the interpretative variable which describes the time trend and ρ = 1,2,..., k is the number of lags.

The hypotheses are:

- H_0: $\delta_2 = 0$, there is a unit root and so the variable is not stationary, if $t-$ statistic > critical value Dickey-Fuller.
- H_1: $\delta_2 < 0$, there is no unit root and so the variable is stationary, if $t-$ statistic < critical value Dickey-Fuller.

- **Phillips-Perron test.**

Phillips and Perron (1988) develop a new methodology in order to test the existence of non-stationarity in time-series when the hypotheses of the residuals of the tested equation do not fill. Particularly, this test encounters the possible non-randomness of the residuals modifying the statistical criteria of t-distribution with the help of non-parametric methods. The asymptotic distribution of t-statistic of PP is the same with the one of ADF and so the same critical values can be used.

- **KPSS test.**

The KPSS test introduced by Kwiatkowski, Phillips, Schmidt, and Shin (1992) and it differs from the above two methods (ADF and Phillips-Perron) for the existence of unit root, over the null hypothesis, where it assumes that the time series is stationary. This process provides an important alternative solution in order to make hypothesis test, given the fact that in many cases it is more interested, the null hypothesis to test for stationarity instead of non-stationarity.

In this thesis, we are going to use the augmented Dickey-Fuller and the PP tests for the stationarity of the time series in the country by country analysis but since the power of individual unit root tests can be misrepresented when the span of the data is short (Pierse and Snell, 1995), we will also use panel unit root tests.

- **Im-Pesaran-Shin (IPS) test.**

Im, Pesaran, and Shin (1997) introduce the following model:

$$y_{i,t} = \alpha_i + \rho_i y_{i,t-1} + \varepsilon_{i,t}\,, \qquad t = 1,2,\dots,T \tag{12}$$

IPS test's statistic is based on averaging individual Dickey-Fuller unit root tests according to:

$$t_{IPS} = \sqrt{N}\frac{(\overline{t_N} - \mu)}{\sigma} \rightarrow N(0,1) \tag{13}$$

where $\overline{t_N} = \frac{1}{N}\sum_{i=1}^{N} t_i$, $\mu = E(t_i)$ and $\sigma^2 = V(t_i)$

In order to compute μ and σ^2 they use Monte Carlo methods and tabulate them in IPS. The important thing to underline is that the IPS test is a way of combining the evidence on the unit root hypothesis from the N unit root tests performed on the N cross-section units (Maddala and Wu, 1999). The IPS test can be used in cooperation with any parametric unit root test, but only when the panel is balanced and the t-statistics for the unit root in every cross-section have the same variance and mean. Although the IPS test demands a balanced panel, it is the most widely used in practice.

- **Fisher type test: Maddala and Wu.**

Panel unit root tests based on a heterogeneous model consist in testing the significance of the results from N independent individual tests (IPS use an average statistic). An alternative testing strategy based on combining the observed significant levels from the individual tests was notably used by Maddala and Wu (1999). According to the following heterogeneous model:

$$\Delta y_{i,t} = a_i + \rho_i y_{i,t-1} + \sum_{z=1}^{p_i} \beta_{i,z} \Delta y_{i,t-z} + \varepsilon_{i,t} \tag{14}$$

They test the same hypothesis as IPS, $H_o: \rho_i = 0$ for all $i = 1,\dots,N$ against the alternative hypothesis $H_1: \rho_i < 0$ for $i = 1,\dots,N_1$ and $\rho_i = 0$ for $i = N_1 + 1,\dots,N$, with $0 < N_1 \leq N$. Under the assumption of pure time series unit root test statistics are continuous, the corresponding p-values, signified as p_i, are uniform (0,1) variables and the critical assumption of cross-sectional independence, Maddala and Wu (1999) propose a statistic defined as:

$$P = -2 \sum_{i=1}^{N} ln p_i \tag{15}$$

The P test is distributed as χ^2 with degrees of freedom twice the number of cross section units (Christopoulos and Tsionas, 2004).

As Hoang and McNown (2006) claim "the *Maddala and Wu's test is promising for two reasons, firstly, it can be performed with any unit root test on a single time-*

series and secondly, it does not require a balanced panel as the IPS test does, so T can differ over cross-sections. The main disadvantage of the MW test is that the p-values for each t-statistic in a cross-section have to be derived by Monte Carlo simulation.” The IPS test suffers from a harsh loss of power when individual trends are contained, and the test is sensitive to the specification of deterministic trends, supplemented by Breitung (1999).

- **Cross-Sectional Augmented Dickey-Fuller (CADF)**

A shortcoming of the IPS test is that it does not take into account the possible cross-sectional dependence among the variables of the panel. Such dependence distorts the inference as the asymptotic analysis is no longer valid. For this reason we adopt the Pesaran (2004) cross-section dependence (CD) test. We then proceed to perform the panel unit root tests proposed by Pesaran (2007) that take into account cross-sectional dependence. Pesaran (2007) proposed a test that remedies this drawback incorporating the lag of cross-section mean of $y_{i,t}$ and its differences into the ADF equation and the cross-sectionally augmented Dickey-Fuller (CADF) is given by:

$$\Delta y_{i,t} = a_i + \beta_i y_{i,t-1} + c_i \bar{y}_{t-1} + \sum_{j=0}^{p} d_j \Delta \bar{y}_{t-j} + \varepsilon_{i,t} \tag{16}$$

Estimating the above equation (16) for each single cross-section unit, the test statistic can be obtained as the cross-sectional average of the ADF statistic, the cross-sectional IP (CIPS):

$$t_{CIPS} = N^{-1} \sum_{i=1}^{N} t_i$$

3.2.3. Testing for Cointegration

The next process is to test for the existence of a long-run relationship between y, F and the ancillary variables S and p. An ordinary process to test for cointegration is Johansen’s method. The cointegration analysis refereed to group of variables that reveal the same time trend, although individually these variables are not stationary. Because of this common path of the variables, there is a stable linear long run relationship between the variables (Katos, 2004:1003). Thus, the analysis of cointegration might be considered as a technique that is used for the estimation of the long run equilibrium coefficients, in a relation where the variables are not stationary.

- **Johansen test for cointegration.**

The Johansen test for the existence of cointegration is accomplished in the context of a vector autoregressive model (VAR). In order to estimate a VAR model, it is necessary to determinate the order of the model. This determination takes place with the information criteria of Schwartz and Akaike. Johansen (1988) proposes that a vector Y_t which consists of first order integrated variables is expressed of a VAR model with degree k as follows:

$$Y_t = \sum_{j=1}^{k} A_j Y_{t-j} + u_t \tag{17}$$

The model can be written in first differences form with error correction as follows:

$$\Delta Y_t = \Pi Y_{t-1} + \sum_{j=1}^{k-1} \Pi_j \Delta Y_{t-j} + u_t \tag{18}$$

where $\Pi = \sum_{j=1}^{k} A_j - I$ and $\Pi_j = -\sum_{i=j+1}^{k} A_i, \quad j = 1,2, \dots, k$

The matrix Π is named equilibrium matrix and its order determines the existence of cointegration among the series. If the $\operatorname{rank}(\Pi) = 0$, then the variables are not cointegrated. If the $\operatorname{rank}(\Pi) = k$, then the vector Y_t is stationary and so all the variables are cointegrated of zero degree, while, if $\operatorname{rank}(\Pi) = r$, where $0 < r < k$, then the variables are cointegrated of order r. For the test of the degree of cointegration, the Johansen's procedure suggests two paths:

- Trace Test.

$$\lambda_{trace}(r) = -T \sum_{j=r+1}^{k} \log\left(1 - \hat{\lambda}_j\right), \quad \text{where } r = 0,1, \dots, k-1 \tag{19}$$

The hypotheses which are tested sequentially are as follows:

$$H_0: r = 0 \; vs \; H_1: r \geq 1 \; (if \; \lambda\_trace \; (r) > \; critical \; value)$$

$$H_0: r = 1 \; vs \; H_1: r \geq 2 \; (if \; \lambda\_trace \; (r) > \; critical \; value)$$

$$\dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots ..$$

$$H_0: r = k-1 \; vs \; H_1: r \geq k \; (if \; \lambda\_trace \; (r) > \; critical \; value)$$

where r declares the number of cointegrated relationships and $\lambda_{trace}(r)$ is the likelihood ratio statistic.

- Maximum Eigenvalue Test.

$$\lambda_{max}(r, r+1) = -Tlog(1 - \hat{\lambda}_j), \quad \text{where } r = 0,1, \dots, k-1 \tag{20}$$

$\lambda_{max}(r, r+1)$ is the likelihood ratio test statistic and does not have the usual asymptotic χ^2distribution.

The hypotheses which are tested sequentially are as follows:

$$H_0: r = 0 \; vs \; H_1: r = 1 \; (if \; \lambda\_max \; (r) > \; critical \; value)$$

$$H_0: r \leq 1 \; vs \; H_1: r = 2 \; (if \; \lambda\_max \; (r) > \; critical \; value)$$

$$\dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots ..$$

$$H_0: r \leq k-1 \; vs \; H_1: r = k \; (if \; \lambda\_max \; (r) > \; critical \; value)$$

This is a test using the largest eigenvalue. If the rank of the matrix is zero, the largest eigenvalue is zero and there is no cointegration. If the eigenvalue λ_1 is other than zero, the rank of the matrix is at least one and there might be more cointegrating vectors. After this, the second largest eigenvalue λ_2 is tested whether it is zero. If $\lambda_2 = 0$, there is exactly one cointegrating vector. In the other case that is, $\lambda_2 \neq 0$ the same process continues until the null hypothesis of an eigenvalue equal to zero cannot be rejected (Dwyer, 2015).

However, as mentioned before the power of the Johansen test with small sample sizes can be strictly distorted. To this end, it is necessary to merge information from time series and cross-section data. In this framework three panel cointegration tests are implemented:

- **Pedroni**

First, it will be used a test, in the context of panel unit roots, which is introduced by Pedroni (1999, 2004) and it is based on the single equation method of Engle-Granger. Its setup is general and allows for separate intercepts for each group of potentially cointegrating variables and separate deterministic trends (Brooks, 2014:551). For a set of variables $Y_{i,t}$ and explanatory variables $X_{m,i,t}$ that are individually integrated of order one $I(1)$ and thought to be cointegrated.

$$Y_{i,t} = \alpha_i + \delta_i t + \sum_{m=1}^{M} \beta_{m,i} X_{m,i,t} + u_{i,t} \tag{20}$$

where $m = 1, \dots, M$, $t = 1, \dots, T$ and $i = 1, \dots, N$.

The residuals from this regression (21), $\hat{u}_{i,t}$ are then subjected to separate augmented Dickey-Fuller type regressions for each group of variables to determine whether they are $I(1)$ i.e.:

$$u_{i,t} = \rho_i u_{i,t-1} + \sum_{j=1}^{p_i} \psi_{i,j} \Delta u_{i,t-j} + \upsilon_{i,t} \tag{21}$$

where the hypotheses are:

$$H_o: \rho_i = 1, \forall i, there\ is\ no\ cointegration$$

$$H_1^1: \rho_i = \rho < 1, \forall i, there\ is\ cointegration$$

$$H_1^2: \rho_i < 1, \forall i, there\ is\ cointegration$$

The first alternative hypothesis (H_1^1), proposes that all of the autoregressive dynamic are the same stationary process, hence no heterogeneity is permitted. While, the second alternative hypothesis (H_1^2), proposes that the dynamics from each test equation follow a different stationary process, hence heterogeneity is permitted.

➢ Fisher

Another test which overcomes the problem of heterogeneity is developed by Fisher and it aggregates the p-values of individual Johansen maximum likelihood cointegration test statistics (Maddala and Wu, 1999). Letting p_i be the asymptotic p-value of a unit root test for cross-section i, then we have the result:

$$-2\sum_{i=1}^{n} log\, p_i \sim \chi^2_{2N} \tag{22}$$

according to Maddala and Wu (1999) and Choi(2001).

➢ Westerlund

In order to account for dependence in the context of cointegration, we apply a test developed by Westerlund (2007) which implements four panel cointegration tests. The underlying idea is to test for the absence of cointegration by determining whether there exists error correction for individual panel members or for the panel as a whole. Consider the error correction model of (25) equation, where all variables in levels are I(1). The term π_i provides an estimate of the speed of error-correction towards the long run equilibrium. The Ga and Gt tests statistics test $H_0: \pi_i = 0$ for all i versus $H_1: \pi_i < 0$ for at least one i. These statistics start form a weighted average of the individually estimated π_i and their t-ratio's respectively. Rejection of H_0 should therefore be taken as evidence of cointegration of at least one of the cross-sectional units. The Pa and Pt tests statistics pull information over all the cross-sectional units to test $H_0: \pi_i = 0$ for all i versus $H_1: \pi_i < 0$ for all i. Rejection of H_0 should therefore be taken as an evidence of cointegration for the panel as a whole. However, in order to take into account cross-sectional dependence Westerlund (2007) suggests the bootstrapping way.

3.2.5. Estimating the long run relationship

Having established that a long-run equilibrium relationship exists between the dependent and the independent variables, the next step is to estimate the long run relationships by the method of fully modified OLS which was originally designed by Phillips and Hansen (1990), Pedroni (1996 and 2000), and Phillips and Moon (1999) to provide optimal estimates of cointegration regressions. According to Kalim and

Shahbaz (2009), *"this method utilizes Kernal estimators of the Nuisance parameters that affect the asymptotic distribution of the OLS estimator. In order to achieve asymptotic efficiency, this technique modifies least squares to account for serial correlation effects and test for the endogeneity in the regressors that result from the existence of cointegrating relationships."*

3.2.6. Testing for short run causality

Last but not less important is to test for the short run causality between the financial development and the economic growth. If two variables Y_t and X_t are cointegrated then by definition $\hat{e}_t \sim I(0)$, $\hat{e}_t = y_t - \hat{\beta}_0 - \hat{\beta}_1 F_t - \hat{\beta}_2 S_t - \hat{\beta}_3 p_t$ and $\hat{v}_t = F_t - \hat{\beta}_0 - \hat{\beta}_1 y_t - \hat{\beta}_2 S_t - \hat{\beta}_3 p_t$. In this way, the Error Correction Model (ECM) constructed as follows:

$$\Delta y_t = \mu + \sum_{i=1}^{m} a_i \, \Delta y_{t-i} + \sum_{i=1}^{m} b_i \, \Delta F_{t-i} + \sum_{i=1}^{m} c_i \, \Delta S_{t-i} + \sum_{i=1}^{m} d_i \, \Delta p_{t-i} + \pi \hat{e}_{t-1} + \varepsilon_t$$

$$\Delta F_t = \mu + \sum_{i=1}^{m} a_i \, \Delta F_{t-i} + \sum_{i=1}^{m} b_i \, \Delta y_{t-i} + \sum_{i=1}^{m} c_i \, \Delta S_{t-i} + \sum_{i=1}^{m} d_i \, \Delta p_{t-i} + \pi \hat{v}_{t-1} + w_t \tag{24}$$

which has the benefit of including both long-run and short-run information. Utmost importance is the interpretation of π which is the error correction coefficient a.k.a. the adjustment coefficient. Specifically, π shows how much of the equilibrium error is corrected (Asteriou and Hall, 2015:363) and it should be $-1 < \pi < 0$, while $\hat{e}_{t-1}$ represents the equilibrium error, that is the deviation from the long run relationship and this term (which is the estimated cointegrating vector) includes the long-run information. Since the last equation contains only stationary variables an OLS regression should perform well. After the estimation of the model, if the estimated π is statistically significant and belongs in [-1,0] then there is a short-run relationship between the variables otherwise there is not.

Again in the context of panel the VECM model takes the form as represented below:

$$\Delta y_{it} = c_i + \sum_{j=1}^{m} a_j \, \Delta y_{i,t-j} + \sum_{j=1}^{m} b_j \, \Delta F_{i,t-j} + \sum_{j=1}^{m} c_j \, \Delta S_{i,t-j} + \sum_{j=1}^{m} d_j \, \Delta p_{i,t-j} - \pi \hat{e}_{i,t-1} + \varepsilon_{it} \tag{25}$$

$$\Delta F_{it} = c_i + \sum_{j=1}^{m} a_j\, \Delta F_{i,t-j} + \sum_{j=1}^{m} b_j\, \Delta y_{i,t-j} + \sum_{j=1}^{m} c_j\, \Delta S_{i,t-j} + \sum_{j=1}^{m} d_j\, \Delta p_{i,t-j} - \pi \hat{e}_{i,t-1} + \varepsilon_{it} \quad (26)$$

4. Empirical Results

Time series ADF with constant tests are reported in Table 1.1 to 1.3 for all 49 countries which are distinguished relative to the continent they belong. Asia contains 10 countries, America contains 17 countries and Africa contains 22 countries. The ADF with constant and trend, the PP with constant and the PP with constant and trend tests are reported in Tables 2, 3 and 4 in Appendix.

Table 1.1 ADF WITH C ASIA

	Output		Finance		Investment share		CPI	
	Level	Diff	Level	Diff	Level	Diff	Level	Diff
INDIA	1,00000(0)	0,99860(3)	0,93880(2)	0,06980(1)	0,66950(0)	0,00000(0)	1,0000(5)	0,58250(0)
FIJI	0,99230(0)	0,00000(0)	0,96250(0)	0,00010(0)	0,01510(0)	0,00000(0)	0,9999(0)	0,00060(0)
IRAN	0,92110(1)	0,00110(1)	0,98690(0)	0,00000(0)	0,07510(0)	0,00000(0)	0,9480(6)	0,98340(5)
MALAYSIA	1,00000(0)	0,00100(0)	0,51170(0)	0,00000(0)	0,11280(1)	0,00030(0)	0,9972(0)	0,00000(0)
PAKISTAN	1,00000(1)	0,31960(0)	0,54110(0)	0,00000(0)	0,36270(0)	0,00020(0)	1,0000(9)	0,43010(0)
P.N.GUINEA	0,99990(1)	0,07110(0)	0,21040(1)	0,00190(0)	0,00000(1)	0,00020(0)	1,0000(1)	0,09100(0)
PHILIPPINES	1,00000(0)	0,16920(0)	0,15370(1)	0,00070(0)	0,02550(1)	0,00010(0)	1,0000(0)	0,00700(0)
SRI LANKA	1,00000(0)	0,19550(0)	0,63980(0)	0,00000(0)	0,10770(1)	0,00010(0)	1,0000(8)	0,04700(0)
THAILAND	0,99990(0)	0,00030(0)	0,63400(1)	0,00970(0)	0,10360(1)	0,00040(1)	0,9881(0)	0,00020(0)
TURKEY	1,00000(0)	0,00000(0)	1,00000(0)	0,00560(0)	0,17610(0)	0,00000(0)	0,9949(1)	0,84050(0)

Notes:
-Level and Diff denote the augmented Dickey-Fuller p-values for a unit root in levels and first differences respectively.
-Figures in parentheses denote the optimal lag length, which was automatically selected based on Schwarz Information Criterion (SIC).
-C = Constant.

Table 1.2 ADF WITH C AMERICA

	Output		Finance		Investment share		CPI	
	Level	Diff	Level	Diff	Level	Diff	Level	Diff
ARGENTINA	0,98500(0)	0,00000(0)	0,03750(0)	0,00000(0)	0,44540(0)	0,00010(0)	0,9387(1)	0,00100(0)
BOLIVIA	0,99990(1)	0,44420(0)	0,82070(0)	0,00010(0)	0,34160(0)	0,00000(0)	1,0000(0)	0,00770(0)
BRAZIL	0,94850(0)	0,00070(0)	0,01980(0)	0,00000(2)	0,02770(0)	0,00000(0)	0,9994(1)	0,07220(0)
COLOMBIA	1,00000(0)	0,01890(0)	0,73220(0)	0,00000(0)	0,80830(0)	0,00000(0)	0,9889(1)	0,65050(0)
COSTA RICA	1,00000(2)	0,01580(0)	0,98960(1)	0,00490(0)	0,04090(0)	0,00000(0)	0,8040(0)	0,45470(0)
DOMINIC REP	1,00000(0)	0,03700(0)	0,03690(0)	0,00000(0)	0,03160(0)	0,00000(0)	1,0000(0)	0,00170(0)
ECUADOR	1,00000(0)	0,00110(0)	0,37950(3)	0,00080(0)	0,28270(0)	0,00000(0)	0,9657(1)	0,15060(0)
EL SALVADOR	0,97920(2)	0,07000(0)	0,37730(0)	0,00000(0)	0,10090(1)	0,00000(0)	0,9208(1)	0,07060(0)
GUATEMALA	1,00000(2)	0,19750(0)	0,95070(0)	0,00000(0)	0,25200(0)	0,00000(0)	1,0000(0)	0,52600(2)
GUYANA	0,99490(1)	0,01170(0)	0,23800(2)	0,03140(1)	0,00060(1)	0,00000(1)	0,9830(1)	0,01650(0)
HONDURAS	1,00000(0)	0,00070(0)	0,94240(0)	0,00010(0)	0,15610(0)	0,00000(1)	0,8905(3)	0,79600(2)

JAMAICA	0,83020(1)	0,00100(0)	0,02520(1)	0,00010(0)	0,09600(0)	0,00000(0)	1,0000(0)	0,65930(1)
MEXICO	0,98240(0)	0,00000(0)	0,32460(0)	0,00000(0)	0,16390(0)	0,00000(0)	0,9709(1)	0,33070(0)
PANAMA	1,00000(2)	0,80010(2)	0,39650(0)	0,00000(0)	0,85700(0)	0,00000(0)	0,8473(1)	0,02950(0)
PARAGUAY	0,99970(0)	0,76950(2)	0,99960(0)	0,00110(0)	0,61850(0)	0,00010(0)	0,3390(5)	0,78650(7)
PERU	0,99970(1)	0,01150(0)	0,62000(1)	0,00810(0)	0,04980(1)	0,00030(0)	0,9032(1)	0,27980(0)
VENEZUELA	0,75020(1)	0,00090(0)	0,62610(1)	0,00050(0)	0,20170(0)	0,00060(0)	0,0005(6)	0,00660(7)

Notes:
-Level and Diff denote the augmented Dickey-Fuller p-values for a unit root in levels and first differences respectively.
-Figures in parentheses denote the optimal lag length, which was automatically selected based on Schwarz Information Criterion (SIC).
-C = Constant.

Table 1.3 ADF WITH C AFRICA

	Output		Finance		Investment share		CPI	
	Level	**Diff**	**Level**	**Diff**	**Level**	**Diff**	**Level**	**Diff**
ALGERIA	0,99900(1)	0,00000(0)	0,62420(1)	0,00020(0)	0,46520(1)	0,00000(0)	0,9922(1)	0,16920(0)
BOTSWANA	0,99990(0)	0,00000(0)	0,97040(0)	0,00030(0)	0,18230(0)	0,00000(0)	0,1899(3)	0,68860(1)
BURKINA FASO	1,00000(0)	0,53800(1)	0,70350(1)	0,00250(0)	0,09870(0)	0,00000(0)	0,9471(0)	0,00000(0)
BURUNDI	0,84260(1)	0,00130(0)	0,49000(0)	0,00000(0)	0,36960(0)	0,00000(0)	1,0000(7)	0,99980(8)
CAMEROON	0,98450(1)	0,03140(0)	0,69250(0)	0,00020(0)	0,18130(0)	0,00000(0)	0,9833(0)	0,00000(0)
CONGO	0,99490(1)	0,00250(0)	0,60950(0)	0,00020(0)	0,03390(0)	0,00000(0)	0,9998(0)	0,00010(0)
COTE D'IVOIRE	0,99860(0)	0,01060(0)	0,80670(0)	0,00050(0)	0,60230(0)	0,00000(0)	0,9899(0)	0,00010(0)
EGYPT	1,00000(4)	0,14100(0)	0,28320(2)	0,08380(1)	0,26980(0)	0,00010(0)	1,0000(1)	0,95780(0)
GABON	0,72160(0)	0,00010(0)	0,17950(0)	0,00000(0)	0,07600(0)	0,00000(0)	0,8022(0)	0,00000(1)
GAMBIA	1,00000(2)	0,00000(0)	0,53620(0)	0,00000(0)	0,07680(0)	0,00000(0)	0,9999(1)	0,18460(0)
GHANA	1,00000(1)	0,20770(0)	0,95520(0)	0,00000(0)	0,59240(0)	0,00000(0)	1,0000(3)	1,00000(5)
KENYA	1,00000(1)	0,14850(0)	0,97890(1)	0,00000(0)	0,03440(0)	0,00000(0)	1,0000(0)	0,84890(2)
MADAGASCAR	0,99870(0)	0,00000(0)	0,60590(2)	0,00020(1)	0,25730(0)	0,00000(0)	1,0000(0)	0,36890(0)
MOROCCO	0,99970(3)	0,69880(2)	0,97030(0)	0,00000(0)	0,15890(0)	0,00000(2)	0,7092(0)	0,00280(0)
NIGER	1,00000(0)	0,05090(1)	0,49010(2)	0,01030(1)	0,85800(0)	0,00000(0)	0,7944(0)	0,00010(0)
NIGERIA	1,00000(0)	0,00130(0)	0,02350(1)	0,00000(0)	0,46780(2)	0,00000(1)	1,0000(1)	0,88530(0)
RWANDA	1,00000(0)	0,00040(0)	0,18950(0)	0,00000(1)	0,77080(0)	0,00000(0)	1,0000(0)	0,00120(0)
SENEGAL	1,00000(0)	0,68670(2)	0,52260(0)	0,00010(0)	0,61360(0)	0,00000(0)	0,7557(0)	0,00010(0)
SOUTH AFRICA	0,99810(1)	0,00280(0)	0,90020(0)	0,00000(0)	0,34250(1)	0,00050(0)	0,9956(5)	0,92530(4)
TOGO	0,99960(0)	0,00000(0)	0,70460(0)	0,00000(0)	0,15510(0)	0,00000(0)	0,9815(0)	0,00020(0)
TUNISIA	0,99990(0)	0,00000(0)	0,59700(0)	0,00000(0)	0,05930(1)	0,00010(0)	0,9993(2)	0,81910(1)
ZAMBIA	1,00000(0)	0,70260(1)	0,56110(2)	0,00010(1)	0,21700(0)	0,00000(0)	0,9999(1)	0,98630(0)

Notes:
-Level and Diff denote the augmented Dickey-Fuller p-values for a unit root in levels and first differences respectively.
-Figures in parentheses denote the optimal lag length, which was automatically selected based on Schwarz Information Criterion (SIC).
-C = Constant.

According to the majority of tests, the most series involved contain unit roots and they are I(1). However, when three or all four tests agree that a series isn't stationary at first differences, it is excluded from the model. According to the tests the following series are not I(1), CPI for Algeria, Colombia, Ecuador, Egypt, Gambia, India, Iran, Mexico, Nigeria, Pakistan, Ghana, Peru, South Africa, Tunisia, Turkey, Venezuela and Zambia, share of investment for Congo, Brazil, Dominic Republic, Fiji, Gabon and Papua New Guinea and last both CPI and share of investment for Costa Rica. In addition to that, the tests show that output for Bolivia, Panama and Ghana and financial development for Argentina and Brazil are not stationary in first differences. Thus, the last five countries are not tested from now on. Tables 5.1 to 5.4 (and 6.1 to 6.4 in Appendix) report the panel unit root tests with constant (with constant and trend).

Table 5.1 UNIT ROOT SUM WITH C ASIA

	Output		Finance		Investment Share		CPI	
	Level	Diff	Level	Diff	Level	Diff	Level	Diff
Levin, Lin & Chu t*	24,3445	-5,74313*	3,19888	-12,2454*	-3,04049*	-17,6727*	10,3352	-1,46175***
Im, Pesaran and Shin W-stat	23,2939	-7,01392*	3,56465	-11,5787*	-4,90273*	-15,5099*	13,3802	-4,44257*
ADF - Fisher Chi-square	0,18017	112,857*	11,4656	160,649*	67,4673*	222,152*	0,14678	75,8948*
PP - Fisher Chi-square	0,11482	110,992*	8,17993	179,583*	43,1901*	224,018*	0,0378	74,7485*

Notes:
-***, **, * Indicate statistical significance at 10%, 5% and 1%, respectively.
-C = Constant.

Table 5.2 UNIT ROOT SUM WITH C AFRICA

	Output		Finance		Investment Share		CPI	
	Level	Diff	Level	Diff	Level	Diff	Level	Diff
Levin, Lin & Chu t*	19,8246	-11,4973*	0,91046	-22,4604*	-2,29071**	-27,452*	13,9584	-1,43836***
Im, Pesaran and Shin W-stat	22,244	-12,5227*	1,67411	-22,0988*	-2,83353*	-27,539*	18,1162	-4,67325*
ADF - Fisher Chi-square	1,04983	268,584*	30,3433	473,404*	67,7432**	604,703*	5,69802	196,2160*
PP - Fisher Chi-square	0,95549	343,677*	26,6591	536,46*	64,185**	638,355*	2,17205	206,622*

Notes:
-***, **, * Indicate statistical significance at 10%, 5% and 1%, respectively.
-C = Constant.

Table 5.3 UNIT ROOT SUM WITH C AMERICA

	Output		Finance		Investment Share		CPI	
	Level	Diff	Level	Diff	Level	Diff	Level	Diff
Levin, Lin & Chu t*	14,2741	-9,13371*	1,8532	-18,4901*	-2,01776**	-24,1444*	9,48533	2,85117
Im, Pesaran and Shin W-stat	16,4424	-9,18172*	0,46072	-18,9818*	-3,71213*	-22,1042*	11,5762	-4,41799*

ADF - Fisher Chi-square	1,17228	166,639*	42,3921	356,115*	71,9212*	420,473*	19,1969	86,2232*
PP - Fisher Chi-square	0,9284	192,444*	37,4291	404,823*	63,8073*	457,095*	0,18264	87,2971*

Notes:
-***, **, * Indicate statistical significance at 10%, 5% and 1%, respectively.
-C = Constant.

Table 5.4 UNIT ROOT SUM WITH C WORLD

	Output		Finance		Investment Share		CPI	
	Level	**Diff**	**Level**	**Diff**	**Level**	**Diff**	**Level**	**Diff**
Levin, Lin & Chu t*	34,2063	-15,5182*	3,42595	-31,3616*	-4,17841*	-40,5171*	19,3132	0,11076
Im, Pesaran and Shin W-stat	35,0853	-16,968*	3,0029	-31,2213*	-6,30481*	-38,4797*	25,0244	-7,73587*
ADF - Fisher Chi-square	2,40228	548,08*	84,201	990,169*	207,132*	1247,33*	25,0417	358,334*
PP - Fisher Chi-square	1,99871	647,113*	72,2682	1120,87*	171,182*	1319,47*	2,39249	368,667*

Notes:
-***, **, * Indicate statistical significance at 10%, 5% and 1%, respectively.
-C = Constant.
-World contains all 49 countries of our sample.

According to LLC, IPS, ADF and PP panel unit root tests with constant (and trend) all variables are stationary at first differences, I(1), except for the share of investment for all regions. Table 5.5 present the results for the CD and PES tests. The CD test reject the null of cross-sectional independence for all cases, implying the inference that IPS test is not valid. The PES test in levels rejects the null of a unit root for all regions only for the investment share variable. Thus, the share of investment is excluded from the following models in panel analysis.

Table 5.5 PANEL UNIT ROOT WITH CROSS-SECTIONAL DEPENDENCE TESTS

Region	Variable	CD	PES(level)	PES(Diff)
Africa	Output	96.69*	-1.607	-4.167*
	Finance	14.05*	-1.324	-4.606*
	Investment Share	15.67*	-2.295*	-5.019*
	CPI	96.37*	-0.200	-2.306*
Asia	Output	43.80*	-1.123	-3.311*
	Finance	17.45*	-1.050	-4.033*
	Investment Share	3.76*	-2.768*	-4.631*
	CPI	42.52*	-1.059	-3.064*
America	Output	74.57*	-1.761	-3.925*
	Finance	16.45*	-1.881	-3.949*
	Investment Share	8.82*	-2.457*	-4.862*
	CPI	72.99*	-1.002	-2.089*

World	Output	219.24*	-1.718	-3.970*
	Finance	42.02*	-1.794	-4.169*
	Investment Share	21.24*	-2.566*	-4.936*
	CPI	216.23*	-0.728	-2.292*

Notes:
-* denotes statistical significance at 1% level.
- CD stands for the cross-sectional dependence test of Pesaran (2004), which tests the null of independence against the alternative of dependence.
- PES stands for the Pesaran (2007) panel unit root tests.

The next step is to test whether the variables are cointegrated in the country by country analysis using Johansen maximum likelihood cointegration. All tests are conducted by including an intercept in the cointegrating equation following the Pantula (1989) approach. The results are reported in Tables 7.1 to 7.3.

Table 7.1 JOHANSEN AMERICA

Country	**Max eigenvalue statistic $H_0: rank = r$**			
	$r = 0(28,58)$	$r \leq 1(22,29)$	$r \leq 2(15,89)$	$r \leq 3(9,16)$
EL SALVADOR	26,98487	13,29707	7,239599	3,179218
GUATEMALA	30,08707*	15,32853	7,344176	1,785168
GUYANA	29,67332*	19,56136	17,80179*	6,772923
HONDURAS	33,64501*	24,19289*	11,23473	4,504893
JAMAICA	34,71023*	19,01704	4,266527	1,433395
PARAGUAY	36,96083*	21,22036	16,86155	4,641994
	$r = 0(22,29)$	$r \leq 1(15,89)$	$r \leq 2(9,16)$	
ECUADOR	19,71562	14,00681	11,3993	
COLOMBIA	20,12031	14,76813	7,439258	
DOMINIC REP	18,86656	6,982627	2,56969	
PERU	26,20245*	8,800953	7,87385	
VENEZUELA	14,02165	6,23751	3,086481	
MEXICO	19,07989	8,292425	6,948957	
	$r = 0(15,89)$	$r \leq 1(9,16)$		
COSTA RICA	20,90892*	4,619196		

Notes:
-the optimal lag length for the VARs was selected by minimizing the Schwarz criterion plus one.
-numbers in parentheses next to $r = 0, r \leq 1, r \leq 2, r \leq 3$ represent the 5% critical values of the test statistic.
-* denotes statistical significance at 5% level.
-r denotes the number of cointegrating vectors.

Table 7.2 JOHANSEN AFRICA

Country	**Max eigenvalue statistic $H_0: rank = r$**

	$r = 0(28,58)$	$r \leq 1(22,29)$	$r \leq 2(15,89)$	$r \leq 3(9,16)$
BOTSWANA	59,11216**	25,99729**	12,67877	4,555331
BURKINA FASO	27,0921	20,44277	16,09159	10,00948
BURUNDI	29,38539**	14,53565	10,15801	3,593288
CAMEROON	22,22665	19,00571	10,82632	2,068259
COTE D'IVOIRE	39,17758**	8,910774	7,252507	3,50565
GABON	15,54094	12,29562	9,26778	5,009372
KENYA	20,76172	12,21144	7,197847	3,893819
MADAGASCAR	28,12094	11,9785	10,56297	2,214684
MOROCCO	53,02806**	23,13664**	13,54317	4,634621
NIGER	30,93719**	18,86806	8,437862	2,498496
RWANDA	23,19119	12,38254	10,0651	3,507611
SENEGAL	32,20146**	19,62414	13,11616	7,490117
TOGO	19,23989	15,02247	8,781572	1,843761
	$r = 0(22,29)$	$r \leq 1(15,89)$	$r \leq 2(9,16)$	
EGYPT	17,40396	13,27003	4,2509	
GAMBIA	30,85846*	8,911027	3,397389	
NIGERIA	15,1833	11,76311	2,429392	
CONGO	16,27062	9,356936	1,49763	
SOUTH AFRICA	22,49102*	11,36705	5,272708	
ALGERIA	20,82055	9,674661	2,006747	
TUNISIA	16,96934	14,08246	3,125141	
ZAMBIA	17,38932	9,298723	3,496911	

Notes:
-the optimal lag length for the VARs was selected by minimizing the Schwarz criterion plus one.
-numbers in parentheses next to $r = 0, r \leq 1, r \leq 2, r \leq 3$ represent the 5% critical values of the test statistic.
-* denotes statistical significance at 5% level.
-r denotes the number of cointegrating vectors.

Table 7.3 JOHANSEN ASIA

Country	Max eigenvalue statistic $H_0: rank = r$			
	$r = 0(28,58)$	$r \leq 1(22,29)$	$r \leq 2(15,89)$	$r \leq 3(9,16)$
MALAYSIA	40,42151**	24,11405**	14,84476	7,183323
PHILIPPINES	24,78763	22,50625	19,29593	3,160679
SRI LANKA	30,7072**	9,038397	7,973823	3,472012
THAILAND	21,9434	17,02161	11,96323	7,88703
	$r = 0(22,29)$	$r \leq 1(15,89)$	$r \leq 2(9,16)$	
PAKISTAN	37,66191*	16,51483*	5,857321	
P. N. GUINEA	21,15966	13,15217	8,364516	
TURKEY	20,98272	8,597386	4,091515	
INDIA	37,98879*	6,246609	3,124573	

FIJI	21,29723	11,2903	8,776367
IRAN	17,81622	9,392626	4,625264

Notes:
-the optimal lag length for the VARs was selected by minimizing the Schwarz criterion plus one.
-numbers in parentheses next to $r = 0, r \leq 1, r \leq 2, r \leq 3$ represent the 5% critical values of the test statistic.
-* denotes statistical significance at 5% level.
-r denotes the number of cointegrating vectors.

The hypothesis of no cointegration is rejected for 19 countries and the hypothesis of one cointegrating vector is accepted for 13. However, the tests show that for 25 countries the hypothesis of no cointegration is not rejected. Panel cointegrating tests (Pedroni and Kao) are reported in Table 8.1. We test for cointegration including an intercept in the individual series but no trend.

Table 8.1 COINTEGRATION REGIONS PEDRONI/KAO TESTS

	Regions	**Pedroni**				**Kao**
		Panel v-Statistic	**Panel ρ-Statistic**	**Panel PP-Statistic**	**Panel ADF-Statistic**	**ADF**
Dependent y	World	1,290167***	1,833373	1,745353	0,780547	3,8324*
	Asia	0,590027	0,617271	0,509328	-0,06415	1,5176***
	Africa	2,258337**	1,1632	1,371333	1,599846	-1,3162***
	America	-0,456101	1,256915	0,991463	-0,45079	1,3270***
Dependent F	World	4,153571*	-1,32152***	-1,77802**	-0,00034*	-2,6182*
	Asia	1,230531***	0,190399	0,050724	-0,45395	-2,4238*
	Africa	2,918766*	-0,66177	-0,65049	-1,05099	0,065633
	America	3,145686*	-1,82325**	-2,23482**	-3,24134*	-2,5014*

Notes:
-***, **, * Indicate statistical significance at 10%, 5% and 1%, respectively.
- the optimal lag length was automatically selected based on Schwarz Information Criterion (SIC).

The null of no cointegration is rejected according to Panel v-statistic test in World and Africa regions and for all regions according to Kao test when y is the dependent variable. However, when F is the dependent variable, Panel v-statistic test rejects the null hypothesis in all regions, while Panel ρ, Panel PP and Panel ADF statistics reject the null of no cointegration in World and America regions. Lastly, Kao test does not reject the null hypothesis only in case of Africa. Thus, according to the majority of these tests, we can conclude that there is a cointegration between the variables *only for World and America regions when F is the dependent variable. This is* *a clue that there is a long-run causality from output to financial development and not an evidence for the direction of causality as mentioned by Brooks (2014:554).*

Another cointegration test (Fisher test) was conducted and the results are reported in Table 8.2.

Table 8.2 COINTEGRATION REGIONS FISHER TESTS

Country	Fisher(combined Johansen)-Max eigenvalue statistic $H_0: rank = r$		
	$r = 0$	$r \leq 1$	$r \leq 2$
World	388.2*	218.0*	138.9*
Asia	64.07*	40.94*	36.00**
Africa	207.8*	103.1*	62.08**
America	116.4*	73.88*	40.85

Notes:
-***, **, * Indicate statistical significance at 10%, 5% and 1%, respectively.
- the optimal lag length for the VARs was selected by minimizing the Schwarz criterion plus one.

Table 8.2 shows that the null hypothesis of no cointegration is rejected for all regions and in the case of America there are two cointegrating vectors while in the case of World, Aftica and Asia there are three cointegrating vectors.

The results of Westerlund cointegration test are presented in Tables 9.1 to 9.4 where both asymptotic and bootstrap p-values are reported. The null hypothesis of no cointegration is not rejected for all regions with the bootstrap way which accounts for cross-sectional dependence. Although the asymptotic p-values indicate the rejection of the null of no cointegration in the case of America when finance is the dependent variable.

Table 9.1 PANEL COINTEGRATION WESTERLUND WORLD

World	Asymptotic	Bootstrap (100)	Bootstrap (1000)
	y Dependent		
Gt	1.000	1.000	1.000
Ga	1.000	0.990	0.986
Pt	1.000	0.970	0.957
Pa	1.000	0.770	0.788
	F Dependent		
Gt	0.352	0.160	0.101
Ga	0.992	0.780	0.714
Pt	0.360	0.770	0.779
Pa	0.489	0.620	0.616

Notes:
- Table reports asymptotic and bootstrap p-values of Westerlund test which performed using the Stata “xtwest”

command.
- Numbers in parentheses indicates bootstrap replications.

Table 9.2 PANEL COINTEGRATION WESTERLUND ASIA

Asia	Asymptotic	Bootstrap (100)	Bootstrap (1000)
	y Dependent		
Gt	1.000	0.940	0.981
Ga	1.000	1.000	0.994
Pt	1.000	0.670	0.695
Pa	0.974	0.470	0.490
	F Dependent		
Gt	0.569	0.280	0.303
Ga	0.988	0.880	0.880
Pt	0.770	0.680	0.652
Pa	0.955	0.810	0.839

Notes:
- Table reports asymptotic and bootstrap p-values of Westerlund test which performed using the Stata “xtwest” command.
- Numbers in parentheses indicates bootstrap replications.

Table 9.3 PANEL COINTEGRATION WESTERLUND AMERICA

America	Asymptotic	Bootstrap (100)	Bootstrap (1000)
	y Dependent		
Gt	1.000	0.990	0.963
Ga	0.990	0.850	0.808
Pt	1.000	0.980	0.977
Pa	0.978	0.910	0.904
	F Dependent		
Gt	0.191	0.080	0.105
Ga	0.625	0.290	0.344
Pt	0.079	0.800	0.737
Pa	0.035	0.710	0.643

Notes:
- Table reports asymptotic and bootstrap p-values of Westerlund test which performed using the Stata “xtwest” command.
- Numbers in parentheses indicates bootstrap replications.

Table 9.4 PANEL COINTEGRATION WESTERLUND AFRICA

Africa	Asymptotic	Bootstrap (100)	Bootstrap (1000)
	y Dependent		
Gt	1.000	1.000	0.996
Ga	0.997	0.830	0.865
Pt	1.000	0.970	0.983
Pa	0.974	0.750	0.834
	F Dependent		
Gt	0.533	0.290	0.257

Ga	0.963	0.770	0.694
Pt	0.571	0.490	0.455
Pa	0.475	0.280	0.199

Notes:
- Table reports asymptotic and bootstrap p-values of Westerlund test which performed using the Stata "xtwest" command.
- Numbers in parentheses indicates bootstrap replications.

The next step is the estimation of the long-run relationships by the Fully Modified OLS method (FM-OLS). The results are reported in Tables 10.1 to 10.3 and Table 11 on a per country basis as well as for the panel as a whole, respectively.

Table 10.1 FMOLS AFRICA

Country	FMOLS					
	Dependent F			Dependent y		
	Output(y)	Investment Share (S)	CPI(p)	Financial(F)	Investment Share (S)	CPI (p)
BOTSWANA	-0,35198*	-0,188**	0,460934*	-1,59713*	-0,839*	1,104664*
GAMBIA	-0.10417**	0.511452*	-----	-2,79934*	2.02621*	-----
MOROCCO	0,635949*	-0,062	-0,03363	0,987668*	0,3568*	0,34287*
COTE D'IVOIRE	0,725512*	-0,151	-0,65276*	0,596936*	0,6178*	0,760008*
SOUTH AFRICA	1,1752***	-2,7134***	-----	0,7335***	1,5505**	-----
BURUNDI	0,167682*	-0,372*	0,064956*	1,925824*	1,4743*	0,012868
NIGER	-0,16943**	0,6616*	-0,05111	-1,20266**	1,7563*	0,33378*
SENEGAL	0,318148**	1,2679***	-0,46345**	0,642964**	-1,1996	1,016542*

Notes:
-***, **, * Indicate statistical significance at 10%, 5% and 1%, respectively.
-For the estimation, the Bartlett kernel is used.

Table 10.2 FMOLS AMERICA

Country	FMOLS					
	Dependent F			Dependent y		
	Output(y)	Investment Share (S)	CPI(p)	Financial(F)	Investment Share (S)	CPI (p)
HONDURAS	0,112081	-0,3426***	0,156427***	0,349842	0,5212	0,557683*
GUATEMALA	0,377744**	-0,1042	-0,10296	0,717102*	0,2047	0,553591*
PARAGUAY	0,048384	0,0024	0,162432	0,112148	0,5240	0,67734*
PERU	0.1606***	0,3490	-----	3,7424***	0,5575	-----
COSTA RICA	0,3506***	-----	-----	1,5082***	-----	-----
GUYANA	-0,61616***	-0,7070***	0,529688*	-0,36507*	-0,785*	0,534971*
JAMAICA	-0,45666**	0,3184	0,122129**	-0,6008*	1,4754*	0,225303*

Notes:

-***, **, * Indicate statistical significance at 10%, 5% and 1%, respectively.
-For the estimation, the Bartlett kernel is used.

Table 10.3 FMOLS ASIA

Country	FMOLS					
	Dependent F			Dependent y		
	Output(y)	Investment Share (S)	CPI(p)	Financial(F)	Investment Share (S)	CPI (p)
INDIA	0,1672***	1,1804***	-----	2,8834***	-0,4512	-----
PAKISTAN	-0,0412*	0,7447*	-----	-4,1261	-0,4911	-----
SRI LANKA	0,603761**	0,0095	-0,33702	0,365134**	0,5078**	0,750751*
MALAYSIA	-1,51323*	1,3895**	3,202702*	-0,24539*	-0,1224	1,645774*

Notes:
-***, **, * Indicate statistical significance at 10%, 5% and 1%, respectively.
-For the estimation, the Bartlett kernel is used.

On a per country basis when F is the dependent variable and more specifically in case of Botswana (-0,35), Niger (-0,16), Guyana (-0,61), Jamaica (-0,45), Pakistan (-0,04), Gambia (-0.10) and Malaysia (-1,51) the coefficient of output has a negative effect on financial development and it is statistically significant, *meaning that there is a negative relation between growth and financial depth*, while in case of Morocco (0,63), Cote D'Ivoire (0,72), South Africa (1,17), Burundi (0,16), Senegal (0,31), Guatemala (0,37), Peru (0,16), Costa Rica (0,35), India (0,16) and Sri Lanka (0,60) the coefficient of output has a positive effect on financial development and it is statistically significant, *meaning that there is a positive relation in financial-growth nexus*. When y is the dependent variable, the coefficient of financial development in case of Botswana (-1,59), Niger (-1,20), Guyana (-0,36), Jamaica (-0,60), Gambia (-2.79) and Malaysia (-0,24) has a negative effect on output, while in case of Morocco (0,98), Cote D'Ivoire (0,59), South Africa (0,73), Burundi (1,92), Senegal (0,64), Guatemala (0,71), Peru (3,74), Costa Rica (1,50), India (2,88) and Sri Lanka (0,36) the coefficient of financial development has a positive effect on output. In addition to that, when F is the dependent variable, the coefficient of CPI is statistically significant in 8 out of 13 countries and positive in 6 out of 8 cases. The coefficient of the share of investment is statistically significant in 11 out of 18 countries and it is positive in 6 out of 11 cases. When y is the dependent variable, the coefficient of the share of investment is statistically significant in 10 out of 18 countries and positive in 8 out of 10 cases, while the coefficient of C.P.I is statistically significant in 12 out of 13 countries and positive in all cases.

Table 11 FMOLS REGIONS

Country	FMOLS					
	Dependent F			Dependent y		
	Output(y)	Investment Share(S)	CPI(p)	Financial (F)	Investment Share(S)	CPI(p)
World	0.378438*	-----	-0.010251***	0.383239*	-----	0.070631*
Africa	0.321073*	-----	-0.038990	0.172068*	-----	0.195525*
America	0.351205*	-----	-0.006846	0.357553*	-----	0.045486*
Asia	0.532677*	-----	-0.001586	0.773415*	-----	0.117763*

Notes:
-***, **, * Indicate statistical significance at 10%, 5% and 1%, respectively.
-For the estimation, the Bartlett kernel is used.

For the panel, the coefficients of output and financial development, when F is the dependent variable and when y is the dependent variable, respectively, are all statistically significant and positive *for all regions and thus we can conclude that there is a positive relation between output and financial development*. Concerning the coefficient of CPI, when F is the dependent variable, it is statistically significant in the case of World and it has a negative effect on financial development. However, when y is the dependent variable, the coefficient of CPI is statistically significant and positive for all regions.

Tables 12.1 to 12.3 display the Granger causality Tests and the error correction term of the Error Correction Model (ECM) as well as the corresponding diagnostic statistics (normality Jarque-Bera Test, autocorrelation Lagrange Multiplier Test) on a per country basis. In 12 countries the results of the Granger causality tests are consistent with the cointegration results base on the idea that if two or more variables are cointegrated then at least one directional Granger-causation must exists in the system to take it towards equilibrium (Engle and Granger,1987 and Granger, 1988).

Table 12.1 Short run causality tests between Output (y) and Finance Depth (F): Error Correction Models (ECM) with Diagnostic Tests and Granger Causality AMERICA

Country	Granger Causality	ECT_{t-1}	p-value ECT_{t-1}	JB	p-value of JB	LM^2	p-value of LM^2
GUYANA	$F \rightarrow Y$	0,0073	0,8952	13,5213	0,0011	0,7309	0,6939
	$Y \rightarrow F$	**-0,2510**	**0,0169**	0,8719	0,6466	4,8447	0,0887
JAMAICA	$F \rightarrow Y$	0,0431	0,5529	0,5818	0,7475	9,3216	0,0095
	$Y \rightarrow F$	-0,1085	0,3212	41,9351	0,0000	0,6144	0,7355
COSTA RICA	$F \rightarrow Y$	**0,0288**	**0,0739**	1,5775	0,4544	0,4102	0,8145
	$Y \rightarrow F*$	-0,0345	0,3619	1,3524	0,5085	5,2345	0,073
GUATEMALA	$F \rightarrow Y$	-0,0327	0,5044	0,6651	0,7170	2,9725	0,2262

	$\boldsymbol{Y \rightarrow F*}$	**-0,4603**	**0,0069**	2,2062	0,3318	0,2028	0,9036
HONDURAS	$F \rightarrow Y$	-0,0299	0,5672	3,1146	0,2106	1,5636	0,4576
	$Y \rightarrow F*$	-0,1532	0,1246	0,5369	0,7645	10,4139	0,0055
PARAGUAY	$F \rightarrow Y$	**-0,0948**	**0,0765**	17,0648	0,0001	4,6071	0,0999
	$Y \rightarrow F**$	-0,0535	0,4810	35,7804	0,0000	11,1568	0,0038
PERU	$F \rightarrow Y$	0,0469	0,1649	33,4026	0,0000	2,6344	0,2679
	$\boldsymbol{Y \rightarrow F*}$	**-0,2572**	**0,0068**	0,6783	0,7123	0,5436	0,7620
BRAZIL	$F \rightarrow Y$	-----	-----	-----	-----	-----	-----
	$Y \rightarrow F$	-----	-----	-----	-----	-----	-----
COLOMBIA	$F \rightarrow Y$	-----	-----	-----	-----	-----	-----
	$Y \rightarrow F**$	-----	-----	-----	-----	-----	-----
DOMINIC REP	$F \rightarrow Y**$	-----	-----	-----	-----	-----	-----
	$Y \rightarrow F$	-----	-----	-----	-----	-----	-----
PANAMA	$F \rightarrow Y$	-----	-----	-----	-----	-----	-----
	$Y \rightarrow F$	-----	-----	-----	-----	-----	-----
VENEZUELA	$F \rightarrow Y$	-----	-----	-----	-----	-----	-----
	$Y \rightarrow F$	-----	-----	-----	-----	-----	-----
ARGENTINA	$F \rightarrow Y*$	-----	-----	-----	-----	-----	-----
	$Y \rightarrow F$	-----	-----	-----	-----	-----	-----
BOLIVIA	$F \rightarrow Y$	-----	-----	-----	-----	-----	-----
	$Y \rightarrow F**$	-----	-----	-----	-----	-----	-----
ECUADOR	$F \rightarrow Y$	-----	-----	-----	-----	-----	-----
	$Y \rightarrow F*$	-----	-----	-----	-----	-----	-----
EL SALVADOR	$F \rightarrow Y$	-----	-----	-----	-----	-----	-----
	$Y \rightarrow F**$	-----	-----	-----	-----	-----	-----
MEXICO	$F \rightarrow Y$	-----	-----	-----	-----	-----	-----
	$Y \rightarrow F$	-----	-----	-----	-----	-----	-----

Notes:
- ***, **, * Indicate the rejection of null hypothesis of no Granger causality at 10%, 5% and 1%, respectively.
- ECT_{t-1} is the Error Correction Term with a lag.
- Jarque-Bera (JB) denotes the Jarque-Bera normality Test of errors.
- The Lagrange Multiplier (LM^2) tests for the null hypothesis that there is no second order autocorrelation.
- Boldface values indicate statistical significance.

In only 8 countries, the direction of Granger causality coincides with the direction of the ECM and out of these eight countries only for *South Africa there is evidence of one way causality that runs from financial development to output*. For the rest seven countries, namely, *Guatemala, Peru, Botswana, Morocco, India, Pakistan and Sri Lanka the results show one way causality that runs from output to financial development*. However, according only to error correction term's significance and negative sign, the results additionally show that *there is one way causality from output to financial development in the case of Guyana, Burundi and Niger, while the opposite direction exists in the case of Paraguay, Cote D'Ivoire, Costa Rica and Gambia. For the rest four countries and specifically, Jamaica, Honduras, Senegal, and Malaysia there is no evidence of causality in any direction according to error correction term and to Granger causality in the most of these four cases.* With regard to diagnostic tests, the null hypothesis of normality and the null hypothesis of no second order autocorrelation are not rejected in 9 out of 13 cases which discussed above.

Table 12.2 Short run causality tests between Output (y) and Finance Depth (F): Error Correction Models (ECM) with Diagnostic Tests and Granger Causality AFRICA

Country	Granger Causality	ECT_{t-1}	p-value ECT_{t-1}	JB	p-value of JB	LM^2	p-value of LM^2
BOTSWANA	$F \to Y$	0,0020	0,9567	3,0937	0,2129	6,5395	0,0380
	$\boldsymbol{Y \to F^{**}}$	**-0,2642**	**0,0410**	0,1280	0,9379	2,9133	0,2330
COTE D'IVOIRE	$F \to Y$	**-0,2563**	**0,0574**	13,6612	0,0010	6,3650	0,0415
	$Y \to F^{***}$	-0,1001	0,1975	7,8629	0,0196	2,3547	0,3081
MOROCCO	$F \to Y$	0,0289	0,6442	1,8363	0,3992	10,886	0,0043
	$\boldsymbol{Y \to F^{*}}$	**-0,1650**	**0,0999**	19,8223	0,0000	1,4187	0,4920
SOUTH AFRICA	$\boldsymbol{F \to Y^{**}}$	**-0,0625**	**0,0615**	0,3108	0,856	3,7075	0,1566
	$Y \to F$	-0,1212	0,3339	5,5727	0,0616	0,1654	0,9206
BURUNDI	$F \to Y$	-0,0761	0,1016	0,5983	0,7414	2,4117	0,2994
	$Y \to F$	**-0,2842**	**0,0379**	1,1046	0,5756	1,0700	0,5856
NIGER	$F \to Y$	-0,0943	0,1160	0,6059	0,7386	4,6559	0,0975
	$Y \to F$	**-0,0961**	**0,0747**	3,2556	0,1963	3,0847	0,2139
SENEGAL	$F \to Y$	0,0048	0,9051	0,6694	0,7155	3,1775	0,2042
	$Y \to F$	-0,0309	0,6362	66,7023	0,000	1,2239	0,5423
GAMBIA	$F \to Y$	**0,0231**	**0,075**	2,2896	0,3182	1,472	0,479
	$Y \to F$	-0,0938	0,2355	11,4276	0,0033	3,3474	0,1875
GHANA	$F \to Y$	-----	-----	-----	-----	-----	-----
	$Y \to F^{*}$	-----	-----	-----	-----	-----	-----
ZAMBIA	$F \to Y^{***}$	-----	-----	-----	-----	-----	-----
	$Y \to F$	-----	-----	-----	-----	-----	-----
CONGO	$F \to Y$	-----	-----	-----	-----	-----	-----
	$Y \to F$	-----	-----	-----	-----	-----	-----
TUNISIA	$F \to Y$	-----	-----	-----	-----	-----	-----
	$Y \to F$	-----	-----	-----	-----	-----	-----
ALGERIA	$F \to Y^{*}$	-----	-----	-----	-----	-----	-----
	$Y \to F$	-----	-----	-----	-----	-----	-----
BURKINA FASO	$F \to Y$	-----	-----	-----	-----	-----	-----
	$Y \to F^{**}$	-----	-----	-----	-----	-----	-----
CAMEROON	$F \to Y$	-----	-----	-----	-----	-----	-----
	$Y \to F$	-----	-----	-----	-----	-----	-----
EGYPT	$F \to Y$	-----	-----	-----	-----	-----	-----
	$Y \to F$	-----	-----	-----	-----	-----	-----
GABON	$F \to Y$	-----	-----	-----	-----	-----	-----
	$Y \to F$	-----	-----	-----	-----	-----	-----
KENYA	$F \to Y$	-----	-----	-----	-----	-----	-----
	$Y \to F^{*}$	-----	-----	-----	-----	-----	-----
MADAGASCAR	$F \to Y$	-----	-----	-----	-----	-----	-----
	$Y \to F$	-----	-----	-----	-----	-----	-----
NIGERIA	$F \to Y$	-----	-----	-----	-----	-----	-----
	$Y \to F$	-----	-----	-----	-----	-----	-----
RWANDA	$F \to Y$	-----	-----	-----	-----	-----	-----
	$Y \to F$	-----	-----	-----	-----	-----	-----
TOGO	$F \to Y$	-----	-----	-----	-----	-----	-----
	$Y \to F^{***}$	-----	-----	-----	-----	-----	-----

Notes:

- ***, **, * Indicate the rejection of null hypothesis of no Granger causality at 10%, 5% and 1%, respectively.
- ECT_{t-1} is the Error Correction Term with a lag.
- Jarque-Bera (JB) denotes the Jarque-Bera normality Test of errors.
- The Lagrange Multiplier (LM^2) tests for the null hypothesis that there is no second order autocorrelation.
- Boldface values indicate statistical significance.

Table 12.3 Short run causality tests between Output (y) and Finance Depth (F): Error Correction Models (ECM) with Diagnostic Tests and Granger Causality ASIA

Country	Granger Causality	ECT_{t-1}	p-value ECT_{t-1}	JB	p-value of JB	LM^2	p-value of LM^2
INDIA	$F \rightarrow Y$	0,0078	0,7306	1,285	0,5259	10,2661	0,0059
	$Y \rightarrow F*$	**-0,1475**	**0,0577**	0,3154	0,854	9,0194	0,011
PAKISTAN	$F \rightarrow Y***$	**0,0262**	**0,0157**	2,7044	0,2586	4,4776	0,1066
	$Y \rightarrow F**$	**-0,259**	**0,0517**	2,7369	0,2544	2,9935	0,2239
SRI LANKA	$F \rightarrow Y$	-0,0207	0,7656	5,4784	0,0646	6,5649	0,0375
	$Y \rightarrow F**$	**-0,4235**	**0,0129**	45,4343	0,0000	1,6115	0,4467
MALAYSIA	$F \rightarrow Y$	-0,0160	0,8119	11,8642	0,0026	2,2460	0,3253
	$Y \rightarrow F$	-0,1050	0,2041	16,7454	0,0002	3,4658	0,1768
IRAN	$F \rightarrow Y$	-----	-----	-----	-----	-----	-----
	$Y \rightarrow F**$	-----	-----	-----	-----	-----	-----
P. N. GUINEA	$F \rightarrow Y**$	-----	-----	-----	-----	-----	-----
	$Y \rightarrow F$	-----	-----	-----	-----	-----	-----
PHILIPPINES	$F \rightarrow Y$	-----	-----	-----	-----	-----	-----
	$Y \rightarrow F$	-----	-----	-----	-----	-----	-----
THAILAND	$F \rightarrow Y$	-----	-----	-----	-----	-----	-----
	$Y \rightarrow F*$	-----	-----	-----	-----	-----	-----
TURKEY	$F \rightarrow Y$	-----	-----	-----	-----	-----	-----
	$Y \rightarrow F***$	-----	-----	-----	-----	-----	-----
FIJI	$F \rightarrow Y$	-----	-----	-----	-----	-----	-----
	$Y \rightarrow F**$	-----	-----	-----	-----	-----	-----

Notes:
- ***, **, * Indicate the rejection of null hypothesis of no Granger causality at 10%, 5% and 1%, respectively.
- ECT_{t-1} is the Error Correction Term with a lag.
- Jarque-Bera (JB) denotes the Jarque-Bera normality Test of errors.
- The Lagrange Multiplier (LM^2) tests for the null hypothesis that there is no second order autocorrelation.
- Boldface values indicate statistical significance.

Another important issue is whether causality between output and financial depth is short run as well. The results of the VECM are reported in Table 13.

Table 13 PANEL VECTOR ERROR CORRECTION MODEL (DEPENDENT F)

Variable	World	America	Asia	Africa
ECT_{t-1}	-0.000550***	-0.001348	0.001035*	5.32E-05
ΔF_{t-1}	0.072814*	0.039372	0.163882	0.060182***
ΔF_{t-2}	0.011676	0.013541	0.019871**	0.017387
ΔF_{t-3}	-0.001362	-0.012793	-----	-----
Δy_{t-1}	0.435762*	0.485881*	0.220542	0.485562*
Δy_{t-2}	0.139569***	0.102720	0.123343	0.145593

Δy_{t-3}	0.162831**	0.177795	-----	-----
Δp_{t-1}	-0.131966*	-0.111579*	-0.206494***	-0.294879*
Δp_{t-2}	0.077041*	0.053590***	0.180873***	0.221642*
Δp_{t-3}	0.041450**	0.041739**	-----	-----
G-C	$Y \rightarrow F$*	$Y \rightarrow F$*	$Y \rightarrow F$**	$Y \rightarrow F$*

Notes:
- ***, **, * Indicate statistical significance at 10%, 5% and 1%, respectively.
- ECT_{t-1} is the Error Correction Term with a lag.
- G-C stands for Granger causality Test.

Table 14 PANEL VECTOR ERROR CORRECTION MODEL (DEPENDENT Y)

Variable	World	America	Asia	Africa
ECT_{t-1}	-0.008275*	-0.004094*	-0.013211*	-0.009675*
Δy_{t-1}	0.236460*	0.440418*	0.295060*	0.174132*
Δy_{t-2}	0.044840**	-0.064258	0.004952	0.111020*
Δy_{t-3}	0.070025*	0.123958*	-----	-----
ΔF_{t-1}	-0.009106	-0.030307*	0.006363	-0.003554
ΔF_{t-2}	-0.005730	-0.017171***	-0.014107	0.008514
ΔF_{t-3}	0.009830	-0.012803	-----	-----
Δp_{t-1}	-0.016526*	-0.008560***	-0.024272	0.018649
Δp_{t-2}	0.008234	0.004877	0.016293	-0.040557***
Δp_{t-3}	-0.001223	0.001506	-----	-----
G-C	$Y \rightarrow F$*	$Y \rightarrow F$*	$Y \rightarrow F$**	$Y \rightarrow F$*

Notes:
- ***, **, * Indicate statistical significance at 10%, 5% and 1%, respectively.
- ECT_{t-1} is the Error Correction Term with a lag.
- G-C stands for Granger causality Test.

According to Table 13, *there is a long-run causality running from output and financial development for World and Asia* when financial development is the dependent variable since the coefficient of error correction term is statistically significant. Also, *there is evidence of short-run causality that runs from output to financial development in the case of World, America and Africa* since the coefficients of Δy_{t-i} are statistically significant. In contrast, Table 14 shows *evidence of long-run causality from financial development to economic growth in the case of World, Asia, America and Africa, while there is no evidence for short-run causality in any region with an exception of America.*

5. Conclusions

In this thesis, we investigate the relationship between economic growth and financial development for 49 less developed countries as a group using panel cointegration and as individual countries using popular time series methodologies. For the panel, the results indicate that in the long run financial development and economic growth may be related to some level as suggested by the panel cointegration test (Fisher). Moreover, according to error correction model, the evidence of linkages between economic growth and financial development shows that there is one way causality that runs from financial development to economic growth for all regions and the opposite direction in the case of World and Asia. The FMOLS estimations point out that for all regions there is a positive relation between growth and development. On a per country basis, methodologies are in favor of a relationship between growth and financial depth for 19 countries and according to ECM, in ten countries there is a causality that runs from output to financial development, while the reverse direction exists in five countries and in the rest four countries tests failed to establish any direction. Furthermore, the FMOLS estimations evidence that there is a positive relation between growth and financial development in ten countries, while a negative relation exists in seven countries.

More specific, our results of the direction of causality for Guatemala, India, Pakistan and Sri Lanka concur with the results of Demetriades and Hussein (1996) when they used the log of the ratio of bank deposit liabilities to nominal GDP as proxy for financial development. However, Ahmed and Ansari (1998) found reverse causality in the case of India, Pakistan and Sri Lanka. In addition, Akinboade (1998) found bidirectional causality in the case of Botswana while our results indicate that the causality runs from output to financial development. Moreover, Odhiambo (2009) found evidence for one way causality from output to financial depth in the case of South Africa, while our results imply the opposite direction. Our results in the case of Paraguay are in line with Christopoulos and Tsionas (2004), while they contradict for Peru. The evidences that the causality runs from economic growth to financial development for Morocco and Niger are not keep up with Al-Yousif's (2002) who did not find any direction of causality for the same countries. To this end, the result of one way causality from growth to financial development for Burundi and the reverse direction for Cote D'Ivoire are not concur with the results of Menyah, Nazlioglu and

Wolde-Rufael (2014) who did not find any causal relation between growth and financial development.

In the context of panel, our results of positive association between economic growth and financial development coincide with the results of Hassan, Sanchez and Yu (2011) in the case of Latin America, however, in contrary with our results, they did not find any relation for South Asia and Africa when they used domestic credit provided to private sector as a proxy for financial development. On the other hand, when they used domestic credit provided by banking sector as a proxy for financial depth, their results are converge to ours. When it comes to the direction of causality in regions, our results of bi-directional causality in case of World and Asia, according to ECM, are coincide with the findings of Shan et al. (2001) who found bi-directional causality, and in case of Africa and America with the findings of Christopoulos and Tsionas (2004) who found that the direction is from finance to growth. However, if we are based on Granger causality tests, all regions have causality that runs from output to finance, supporting the view of Goldsmith (1969) and Jung (1986), who hypothesized that in developing countries, growth leads finance due to the increasing demand for financial services.

Finally, summarizing the Granger causality tests results, we conclude that 22 countries and all four regions support the demand-following hypothesis which postulates a positive causal relationship from economic growth to financial development, while 6 countries support the supply-leading hypothesis which posits a positive causal relationship from financial development to economic growth. Hence, this thesis supports the point of view that “financial development may be necessary but it is not sufficient to attain a steady economic growth rate in less developed countries” (Hassan, Sanchez and Yu, 2011).

Table 15 SUMMARIZING RESULTS

Region/Country	Granger Causality between y-F	ECM long-run causality	Relation between y-F	Cointegration
World	$Y \rightarrow F$	$F \leftrightarrow Y$ / $(Y \rightarrow F)$	Positive	Yes
Africa	$Y \rightarrow F$	$F \rightarrow Y$	Positive	Yes
Asia	$Y \rightarrow F$	$F \leftrightarrow Y$ / $(Y \rightarrow F)$	Positive	Yes
America	$Y \rightarrow F$	$F \rightarrow Y$ / $(Y \leftrightarrow F)$	Positive	Yes
Guatemala	$Y \rightarrow F$	$Y \rightarrow F$	Positive	Yes
Peru	$Y \rightarrow F$	$Y \rightarrow F$	Positive	Yes
Botswana	$Y \rightarrow F$	$Y \rightarrow F$	Negative	Yes
Morocco	$Y \rightarrow F$	$Y \rightarrow F$	Positive	Yes

India	$Y \rightarrow F$	$Y \rightarrow F$	Positive	Yes
Pakistan	$Y \leftrightarrow F$	$Y \rightarrow F$	Negative	Yes
Sri Lanka	$Y \rightarrow F$	$Y \rightarrow F$	Positive	Yes
South Africa	$F \rightarrow Y$	$F \rightarrow Y$	Positive	Yes
Guyana	-----	$Y \rightarrow F$	Negative	Yes
Burundi	-----	$Y \rightarrow F$	Positive	Yes
Niger	-----	$Y \rightarrow F$	Negative	Yes
Paraguay	$Y \rightarrow F$	$F \rightarrow Y$	-----	Yes
Cote D'Ivoire	$Y \rightarrow F$	$F \rightarrow Y$	Positive	Yes
Honduras	$Y \rightarrow F$	-----	-----	Yes
Jamaica	-----	-----	Negative	Yes
Costa Rica	$Y \rightarrow F$	$F \rightarrow Y$	Positive	Yes
Senegal	-----	-----	Positive	Yes
Gambia	-----	$F \rightarrow Y$	Negative	Yes
Malaysia	-----	-----	Negative	Yes
Brazil	-----	-----	-----	NOT TESTED
Colombia	$Y \rightarrow F$	-----	-----	No
Dominic Rep.	$F \rightarrow Y$	-----	-----	No
Panama	-----	-----	-----	NOT TESTED
Venezuela	-----	-----	-----	No
Argentina	$F \rightarrow Y$	-----	-----	NOT TESTED
Bolivia	$Y \rightarrow F$	-----	-----	NOT TESTED
Ecuador	$Y \rightarrow F$	-----	-----	No
El Salvador	$Y \rightarrow F$	-----	-----	No
Mexico	-----	-----	-----	No
Ghana	$Y \rightarrow F$	-----	-----	NOT TESTED
Zambia	$F \rightarrow Y$	-----	-----	No
Congo	-----	-----	-----	No
Tunisia	-----	-----	-----	No
Algeria	$F \rightarrow Y$	-----	-----	No
Burkina Faso	$Y \rightarrow F$	-----	-----	No
Cameroon	-----	-----	-----	No
Egypt	-----	-----	-----	No
Gabon	-----	-----	-----	No
Kenya	$Y \rightarrow F$	-----	-----	No
Madagascar	-----	-----	-----	No
Nigeria	-----	-----	-----	No
Rwanda	-----	-----	-----	No
Togo	$Y \rightarrow F$	-----	-----	No
Iran	$Y \rightarrow F$	-----	-----	No
P. N. Guinea	$F \rightarrow Y$	-----	-----	No
Philippines	-----	-----	-----	No
Thailand	$Y \rightarrow F$	-----	-----	No
Turkey	$Y \rightarrow F$	-----	-----	No
Fiji	$Y \rightarrow F$	-----	-----	No

5.2 Proposals for further research

As it became clear, the direction of causality between economic growth and financial development is an important issue, notably in less developed countries. Generally, economists have not reached a consensus on the direction of causality between financial development and economic performance, thus it has to be done further research. An important issue is that the financial data used in the various studies are influenced by the general macroeconomic conditions or the economic growth itself. It may be necessary to develop better financial indicators that can better represent the quality and quantity of financial services and thus the level of financial intermediation. One more problem of empirical studies is that an increase in financial services will contribute to economic growth as the economic growth is gauged by GDP and the added value of the financial sector is one of the components of the GDP. Thus, it may be necessary to analyze the relationship between financial development and the GDP after removing the added value of the financial sector.

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Appendix

Graph 1 A MAP WITH THE LESS DEVELOPED COUNTRIES OF OUR SAMPLE

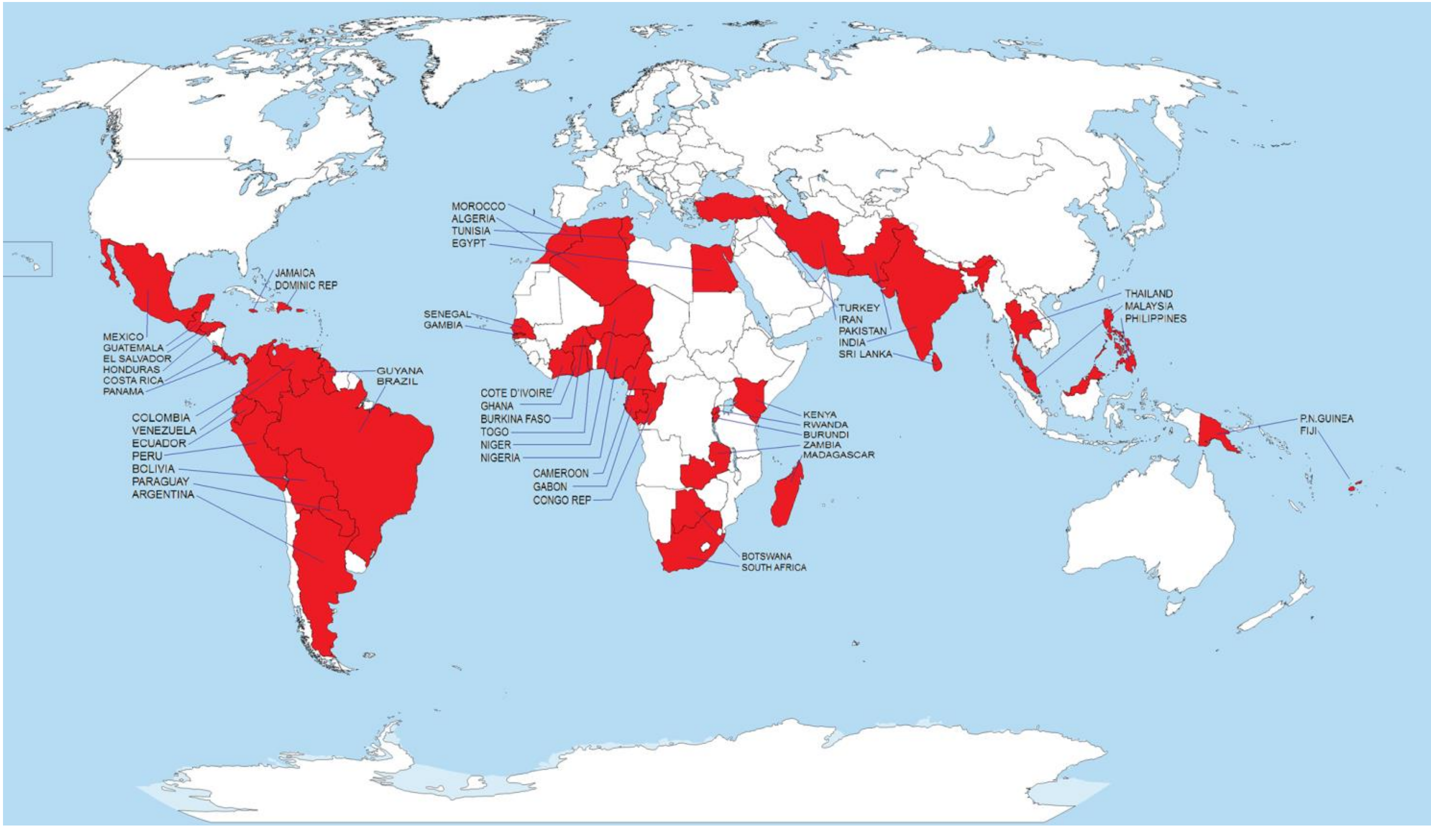

Table 2.1 ADF WITH C AND T ASIA

	Output		Finance		Investment share		CPI	
	Level	Diff	Level	Diff	Level	Diff	Level	Diff
INDIA	1,00000(0)	0,08460(0)	0,78740(2)	0,20100(1)	0,45180(0)	0,00000(0)	0,9999(5)	0,01950(4)
FIJI	0,85890(0)	0,00000(0)	0,27050(2)	0,00060(0)	0,05780(0)	0,00000(0)	0,8108(1)	0,00160(0)
IRAN	0,70830(1)	0,00350(1)	0,91810(0)	0,00010(0)	0,06950(0)	0,00000(0)	0,9941(6)	1,00000(5)

MALAYSIA	0,99630(0)	0,00000(0)	0,85390(0)	0,00020(0)	0,27110(1)	0,00180(0)	0,7935(0)	0,00030(0)
PAKISTAN	0,99400(1)	0,08260(0)	0,69930(0)	0,00010(0)	0,64730(0)	0,00130(0)	1,0000(9)	0,00210(6)
P. N. GUINEA	0,99820(1)	0,03530(0)	0,34680(1)	0,01170(0)	0,00000(1)	0,00110(0)	0,9944(1)	0,00460(0)
PHILIPPINES	1,00000(0)	0,03860(0)	0,23480(1)	0,00480(0)	0,05960(1)	0,00090(0)	0,2399(0)	0,00050(0)
SRI LANKA	1,00000(0)	0,00610(0)	0,19500(0)	0,00000(0)	0,22180(1)	0,00060(0)	1,0000(9)	0,00720(0)
THAILAND	0,59410(0)	0,00050(0)	0,31620(1)	0,04560(0)	0,29740(1)	0,00250(1)	0,1866(1)	0,00180(0)
TURKEY	0,97640(0)	0,00000(0)	1,00000(0)	0,00190(0)	0,45630(0)	0,00010(0)	0,9910(1)	0,44110(0)

Notes:
-Level and Diff denote the augmented Dickey-Fuller p-values for a unit root in levels and first differences respectively.
-Figures in parentheses denote the optimal lag length, which were automatically selected based on Schwarz Information Criterion (SIC).
-C = Constant and T = Trend.

Table 3.1 PP WITH C ASIA

	Output		Finance		Investment share		CPI	
	Level	Diff	Level	Diff	Level	Diff	Level	Diff
INDIA	0,99990[17]	0,93860[15]	0,97830[4]	0,00000[4]	0,66950[0]	0,00000[1]	1,00000[4]	0,64370[2]
FIJI	0,99540[1]	0,00000[2]	0,93170[3]	0,00010[1]	0,01370[3]	0,00000[2]	0,99980[2]	0,00050[3]
IRAN	0,94900[1]	0,00160[4]	0,97660[3]	0,00000[3]	0,06640[3]	0,00000[14]	0,99990[44]	0,82880[6]
MALAYSIA	1,00000[3]	0,00070[4]	0,50020[3]	0,00000[3]	0,21230[1]	0,00030[3]	0,99610[1]	0,00010[2]
PAKISTAN	1,00000[2]	0,35710[3]	0,54110[0]	0,00000[5]	0,22490[2]	0,00050[7]	1,00000[4]	0,39880[3]
P. N. GUINEA	1,00000[4]	0,07410[4]	0,43460[3]	0,00190[0]	0,00390[2]	0,00040[5]	1,00000[3]	0,13600[2]
PHILIPPINES	1,00000[2]	0,20870[3]	0,32520[2]	0,00090[5]	0,15600[0]	0,00020[4]	1,00000[3]	0,00730[4]
SRI LANKA	1,00000[7]	0,31260[4]	0,64930[3]	0,00000[6]	0,29120[1]	0,00010[7]	1,00000[2]	0,05930[1]
THAILAND	0,99970[2]	0,00030[2]	0,75720[3]	0,00930[1]	0,51310[0]	0,00930[9]	0,98540[1]	0,00020[1]
TURKEY	1,00000[10]	0,00000[0]	1,00000[1]	0,00690[2]	0,15760[2]	0,00000[5]	1,00000[5]	0,83850[4]

Notes:
-Level and Diff denote the Phillips-Perron p-values for a unit root in levels and first differences respectively.
-Figures in brackets followed by Phillips-Perron (PP) statistics represent the bandwidth selected based on Newey West (1994) method using Bartlett Kernel.
-C = Constant.

Table 4.1 PP WITH C AND T ASIA

	Output		Finance		Investment share		CPI	
	Level	Diff	Level	Diff	Level	Diff	Level	Diff
INDIA	1,00000[17]	0,08460[0]	0,90760[4]	0,00000[4]	0,41850[2]	0,00000[1]	1,00000[4]	0,30640[2]
FIJI	0,84690[2]	0,00000[2]	0,59100[3]	0,00060[1]	0,05130[3]	0,00000[2]	0,84250[3]	0,00160[1]
IRAN	0,88610[1]	0,01080[6]	0,89120[3]	0,00010[2]	0,09670[4]	0,00000[15]	0,99990[44]	0,58650[5]
MALAYSIA	0,99820[3]	0,00000[3]	0,75830[4]	0,00020[3]	0,43510[1]	0,00210[3]	0,63370[2]	0,00040[2]
PAKISTAN	0,98720[2]	0,07020[3]	0,69930[0]	0,00010[6]	0,53850[3]	0,00070[10]	1,00000[4]	0,37800[3]
P. N. GUINEA	0,99990[3]	0,03490[3]	0,59210[3]	0,01170[0]	0,03350[2]	0,00150[5]	0,99710[2]	0,00460[0]
PHILIPPINES	1,00000[0]	0,04430[2]	0,47560[2]	0,00600[5]	0,22840[1]	0,00140[4]	0,25270[1]	0,00060[2]
SRI LANKA	1,00000[6]	0,00670[1]	0,13770[2]	0,00000[6]	0,45700[1]	0,00080[7]	0,99740[1]	0,00660[1]

THAILAND	0,57900[1]	0,00050[0]	0,62240[3]	0,04380[1]	0,80960[0]	0,04550[9]	0,21680[1]	0,00200[1]
TURKEY	0,99690[6]	0,00000[9]	1,00000[1]	0,00210[2]	0,39260[1]	0,00000[6]	0,99980[4]	0,37700[3]

Notes:
-Level and Diff denote the Phillips-Perron p-values for a unit root in levels and first differences respectively.
-Figures in brackets followed by Phillips-Perron (PP) statistics represent the bandwidth selected based on Newey West (1994) method using Bartlett Kernel.
-C = Constant and T = Trend.

Table 2.2 ADF WITH C AND T AMERICA

	Output		Finance		Investment share		CPI	
	Level	Diff	Level	Diff	Level	Diff	Level	Diff
ARGENTINA	0,83270(0)	0,00020(0)	0,05070(0)	0,00000(0)	0,43750(0)	0,00070(0)	0,4220(1)	0,00510(0)
BOLIVIA	0,99800(1)	0,20010(0)	0,86210(0)	0,00070(0)	0,58260(0)	0,00000(0)	0,9317(0)	0,00070(0)
BRAZIL	0,86050(0)	0,00510(0)	0,08190(0)	0,00000(2)	0,06030(0)	0,00000(0)	0,9353(1)	0,02700(0)
COLOMBIA	1,00000(0)	0,00450(0)	0,67750(0)	0,00020(0)	0,44630(0)	0,00010(0)	0,5848(1)	0,57650(0)
COSTA RICA	0,99420(2)	0,00020(1)	0,96920(1)	0,00100(0)	0,05570(0)	0,00000(0)	0,6228(1)	0,75030(0)
DOMINIC REP	1,00000(0)	0,00170(1)	0,08180(0)	0,00000(0)	0,12350(0)	0,00010(0)	0,9573(0)	0,00050(0)
ECUADOR	0,99950(0)	0,00190(0)	0,02870(3)	0,00490(0)	0,25280(0)	0,00000(0)	0,6658(1)	0,05270(1)
EL SALVADOR	0,49320(1)	0,18850(0)	0,31200(0)	0,00000(0)	0,22010(1)	0,00010(0)	0,1669(3)	0,26940(0)
GUATEMALA	0,99840(2)	0,03610(1)	0,58290(0)	0,00000(0)	0,62320(0)	0,00000(0)	0,7812(0)	0,00060(0)
GUYANA	0,96810(1)	0,00980(0)	0,20810(2)	0,11630(1)	0,00370(1)	0,00000(1)	0,4301(1)	0,04270(0)
HONDURAS	0,99610(0)	0,00030(0)	0,85990(0)	0,00060(0)	0,23190(0)	0,00000(1)	0,9964(0)	0,01750(0)
JAMAICA	0,41380(1)	0,00620(0)	0,10060(1)	0,00060(0)	0,20060(0)	0,00000(0)	1,0000(0)	0,00470(0)
MEXICO	0,55820(0)	0,00010(0)	0,73310(0)	0,00000(0)	0,37460(0)	0,00010(0)	0,4433(1)	0,46940(0)
PANAMA	1,00000(2)	0,33430(2)	0,55160(0)	0,00000(0)	0,93410(0)	0,00040(1)	0,4914(1)	0,12580(0)
PARAGUAY	0,85200(3)	0,86400(2)	0,99900(0)	0,00070(0)	0,29620(0)	0,00050(0)	0,9145(0)	0,09390(6)
PERU	0,99550(1)	0,00690(0)	0,25170(1)	0,02800(0)	0,16970(1)	0,00320(2)	0,1796(1)	0,54820(0)
VENEZUELA	0,21060(1)	0,00240(1)	0,93780(0)	0,00310(0)	0,57860(0)	0,00390(0)	0,0046(6)	0,20560(7)

Notes:
-Level and Diff denote the augmented Dickey-Fuller p-values for a unit root in levels and first differences respectively.
-Figures in parentheses denote the optimal lag length, which were automatically selected based on Schwarz Information Criterion (SIC).
-C = Constant and T = Trend.

Table 3.2 PP WITH C AMERICA

	Output		Finance		Investment share		CPI	
	Level	Diff	Level	Diff	Level	Diff	Level	Diff
ARGENTINA	0,98020[1]	0,00000[0]	0,03750[0]	0,00000[9]	0,43420[4]	0,00010[9]	0,98150[1]	0,00090[1]
BOLIVIA	1,00000[4]	0,51660[3]	0,72930[4]	0,00000[4]	0,24290[2]	0,00000[1]	1,00000[3]	0,00930[3]
BRAZIL	0,94090[2]	0,00060[2]	0,02020[10]	0,00000[16]	0,02210[3]	0,00000[10]	1,00000[2]	0,08010[3]
COLOMBIA	1,00000[3]	0,02010[3]	0,67210[1]	0,00000[1]	0,80830[0]	0,00000[2]	0,99990[5]	0,63100[1]
COSTA RICA	1,00000[12]	0,01300[8]	0,99680[2]	0,00430[2]	0,04570[3]	0,00000[13]	1,00000[5]	0,45470[0]

DOMINIC REP	1,00000[12]	0,04680[2]	0,02510[3]	0,00000[1]	0,01870[2]	0,00000[6]	1,00000[2]	0,00200[2]
ECUADOR	1,00000[2]	0,00090[3]	0,59370[2]	0,00060[1]	0,28270[0]	0,00000[7]	0,99800[4]	0,11080[2]
EL SALVADOR	0,97080[3]	0,09660[7]	0,39560[2]	0,00000[4]	0,06830[4]	0,00000[4]	0,98590[5]	0,07580[4]
GUATEMALA	1,00000[3]	0,25650[3]	0,95720[1]	0,00000[1]	0,19280[2]	0,00000[1]	1,00000[4]	0,04930[4]
GUYANA	0,99930[3]	0,01170[0]	0,43090[3]	0,00000[3]	0,08580[16]	0,00000[24]	0,99770[4]	0,02030[2]
HONDURAS	1,00000[4]	0,00070[0]	0,94660[5]	0,00010[8]	0,18470[8]	0,00000[43]	1,00000[5]	0,46850[3]
JAMAICA	0,81400[3]	0,00130[2]	0,14870[5]	0,00000[22]	0,08460[1]	0,00000[4]	1,00000[4]	0,31600[2]
MEXICO	0,99390[9]	0,00000[9]	0,29850[4]	0,00000[3]	0,18000[6]	0,00000[22]	0,99980[5]	0,33090[2]
PANAMA	1,00000[9]	0,23750[7]	0,39650[0]	0,00000[4]	0,80500[2]	0,00000[6]	0,96470[4]	0,03070[2]
PARAGUAY	0,99950[4]	0,00000[4]	0,98890[4]	0,00050[4]	0,47910[3]	0,00010[1]	1,00000[4]	0,09320[4]
PERU	1,00000[1]	0,01200[1]	0,77590[3]	0,00760[2]	0,16580[1]	0,00060[7]	0,98230[5]	0,23710[1]
VENEZUELA	0,86890[3]	0,00280[8]	0,64980[3]	0,00050[1]	0,15080[3]	0,00390[6]	1,00000[3]	1,00000[4]

Notes:
-Level and Diff denote the Phillips-Perron p-values for a unit root in levels and first differences respectively.
-Figures in brackets followed by Phillips-Perron (PP) statistics represent the bandwidth selected based on Newey West (1994) method using Bartlett Kernel.
-C = Constant.

Table 4.2 PP WITH C AND T AMERICA

	Output		Finance		Investment share		CPI	
	Level	Diff	Level	Diff	Level	Diff	Level	Diff
ARGENTINA	0,78530[1]	0,00020[3]	0,05210[1]	0,00000[10]	0,32730[3]	0,00070[9]	0,65210[0]	0,00610[3]
BOLIVIA	1,00000[4]	0,23760[3]	0,67400[4]	0,00040[4]	0,46240[2]	0,00000[1]	0,91860[3]	0,00070[2]
BRAZIL	0,74810[3]	0,00480[2]	0,08690[10]	0,00000[16]	0,07450[4]	0,00000[10]	0,97820[0]	0,05280[5]
COLOMBIA	0,99990[2]	0,00490[2]	0,59260[1]	0,00020[2]	0,44630[0]	0,00010[3]	0,67800[5]	0,52030[1]
COSTA RICA	0,99880[12]	0,00010[43]	0,99390[1]	0,00130[9]	0,06360[2]	0,00000[14]	0,98150[4]	0,73290[1]
DOMINIC REP	1,00000[12]	0,00730[10]	0,07160[2]	0,00000[0]	0,07960[2]	0,00000[6]	0,95240[1]	0,00060[2]
ECUADOR	0,99880[2]	0,00200[2]	0,35620[2]	0,00380[1]	0,32040[1]	0,00000[12]	0,88940[3]	0,15590[2]
EL SALVADOR	0,85400[3]	0,27820[7]	0,31200[0]	0,00000[4]	0,17550[4]	0,00010[4]	0,34690[5]	0,27680[4]
GUATEMALA	0,99940[3]	0,10200[4]	0,57470[2]	0,00000[2]	0,52930[2]	0,00000[1]	0,80930[3]	0,00050[3]
GUYANA	0,99100[3]	0,00920[2]	0,49910[3]	0,00000[3]	0,29370[17]	0,00000[23]	0,50220[3]	0,04300[2]
HONDURAS	0,99520[3]	0,00030[5]	0,77340[3]	0,00060[10]	0,22020[6]	0,00000[43]	0,99300[4]	0,01410[4]
JAMAICA	0,68730[3]	0,00790[2]	0,39030[5]	0,00000[25]	0,20060[0]	0,00000[4]	1,00000[3]	0,00380[3]
MEXICO	0,49360[3]	0,00000[11]	0,78330[3]	0,00000[2]	0,39440[6]	0,00000[22]	0,66930[4]	0,46940[0]
PANAMA	1,00000[8]	0,03790[8]	0,49790[1]	0,00000[3]	0,93940[5]	0,00000[12]	0,89740[4]	0,13020[2]
PARAGUAY	0,97300[4]	0,00000[4]	0,98940[4]	0,00040[4]	0,29620[0]	0,00050[1]	0,91720[3]	0,00010[3]
PERU	0,99990[0]	0,00700[2]	0,61850[3]	0,02690[1]	0,41380[1]	0,00400[7]	0,58100[4]	0,48010[1]
VENEZUELA	0,48880[1]	0,01610[7]	0,85360[3]	0,00340[1]	0,47450[3]	0,02740[7]	1,00000[3]	1,00000[4]

Notes:
-Level and Diff denote the Phillips-Perron p-values for a unit root in levels and first differences respectively.
-Figures in brackets followed by Phillips-Perron (PP) statistics represent the bandwidth selected based on Newey West (1994) method using Bartlett Kernel.
-C = Constant and T = Trend.

Table 2.3 ADF WITH C AND T AFRICA

	Output		Finance		Investment share		CPI	
	Level	Diff	Level	Diff	Level	Diff	Level	Diff
ALGERIA	0,99780(1)	0,00010(0)	0,60640(1)	0,00150(0)	0,93370(2)	0,00220(1)	0,5475(1)	0,20670(0)
BOTSWANA	0,84820(0)	0,00000(0)	0,95790(0)	0,00170(0)	0,30200(0)	0,00000(0)	0,2383(3)	0,08260(0)
BURKINA FASO	1,00000(0)	0,00000(0)	0,98150(0)	0,01240(0)	0,22480(0)	0,00000(0)	0,2482(0)	0,00000(0)
BURUNDI	0,36460(2)	0,00870(0)	0,36140(0)	0,00000(0)	0,68580(0)	0,00000(0)	1,0000(7)	0,98890(8)
CAMEROON	0,91130(1)	0,08700(0)	0,77720(0)	0,00110(0)	0,48280(0)	0,00000(0)	0,1361(0)	0,00010(0)
CONGO	0,94350(1)	0,00720(0)	0,95490(0)	0,00080(1)	0,09800(0)	0,00000(0)	0,6047(0)	0,00010(0)
COTE D'IVOIRE	0,99800(0)	0,03160(0)	0,61830(0)	0,00380(0)	0,93150(0)	0,00000(0)	0,1594(1)	0,00080(0)
EGYPT	0,99990(4)	0,00320(3)	0,70440(2)	0,00140(0)	0,06990(1)	0,00020(0)	1,0000(1)	0,75190(0)
GABON	0,32630(0)	0,00060(0)	0,25340(0)	0,00000(0)	0,05880(0)	0,00000(0)	0,1235(1)	0,00020(1)
GAMBIA	0,99870(2)	0,00000(1)	0,83180(0)	0,00000(0)	0,25670(0)	0,00000(0)	0,9703(1)	0,06120(0)
GHANA	0,99960(1)	0,01030(0)	0,61500(0)	0,00000(0)	0,11170(0)	0,00000(0)	1,0000(3)	1,0000(5)
KENYA	1,00000(0)	0,04050(0)	0,29830(0)	0,00000(1)	0,13590(0)	0,00000(2)	1,0000(0)	0,00060(0)
MADAGASCAR	0,91270(0)	0,00000(0)	0,53850(1)	0,00150(1)	0,32210(0)	0,00010(0)	1,0000(0)	0,00180(0)
MOROCCO	0,99680(3)	0,44830(2)	0,33000(2)	0,00030(0)	0,30490(0)	0,00000(2)	0,9942(0)	0,00960(0)
NIGER	0,99960(0)	0,00000(0)	0,77570(2)	0,04860(1)	0,91360(0)	0,00010(0)	0,3258(1)	0,00090(0)
NIGERIA	0,99990(0)	0,00010(0)	0,03140(1)	0,00010(0)	0,42730(2)	0,00020(1)	1,0000(1)	0,20980(0)
RWANDA	0,99990(0)	0,00010(0)	0,10520(0)	0,00000(1)	0,64520(0)	0,00000(0)	0,9772(0)	0,00020(0)
SENEGAL	0,99990(0)	0,00000(0)	0,81860(0)	0,00110(0)	0,02690(2)	0,00000(0)	0,1946(1)	0,00060(0)
SOUTH AFRICA	0,94300(1)	0,00500(0)	0,21120(0)	0,00000(0)	0,62830(1)	0,00020(1)	0,9806(5)	0,64470(4)
TOGO	0,99010(0)	0,00010(0)	0,88870(0)	0,00000(0)	0,29910(0)	0,00370(4)	0,2745(1)	0,00150(0)
TUNISIA	0,90310(0)	0,00000(0)	0,12100(3)	0,00000(0)	0,06900(1)	0,00060(0)	0,9981(1)	0,72890(1)
ZAMBIA	1,00000(0)	0,00410(0)	0,88320(2)	0,00090(1)	0,65080(0)	0,00000(0)	1,0000(1)	0,62980(0)

Notes:
-Level and Diff denote the augmented Dickey-Fuller p-values for a unit root in levels and first differences respectively.
-Figures in parentheses denote the optimal lag length, which were automatically selected based on Schwarz Information Criterion (SIC).
-C = Constant and T = Trend.

Table 3.3 PP WITH C AFRICA

	Output		Finance		Investment share		CPI	
	Level	Diff	Level	Diff	Level	Diff	Level	Diff
ALGERIA	0,99970[4]	0,00000[4]	0,62150[4]	0,00020[3]	0,48750[1]	0,00000[4]	0,99950[4]	0,16540[3]
BOTSWANA	1,00000[9]	0,00000[2]	0,94680[1]	0,00030[0]	0,25820[5]	0,00000[0]	1,00000[4]	0,52420[5]
BURKINA FASO	1,00000[1]	0,04760[4]	0,85840[3]	0,00250[2]	0,07900[4]	0,00000[1]	0,94700[2]	0,00000[2]
BURUNDI	0,89570[4]	0,00160[1]	0,51120[1]	0,00000[2]	0,33610[3]	0,00000[3]	1,00000[7]	0,08920[2]
CAMEROON	0,98680[4]	0,03570[3]	0,58260[3]	0,00020[0]	0,16950[1]	0,00000[2]	0,98130[1]	0,00000[2]
CONGO	0,99880[2]	0,00240[2]	0,57310[3]	0,00040[7]	0,03400[4]	0,00000[12]	0,99960[2]	0,00010[3]

COTE D'IVOIRE	0,98820[3]	0,00880[3]	0,71390[3]	0,00050[0]	0,49970[4]	0,00000[4]	0,98670[1]	0,00010[0]
EGYPT	1,00000[3]	0,14100[0]	0,47330[4]	0,00020[4]	0,22100[3]	0,00010[7]	1,00000[4]	0,99350[10]
GABON	0,71160[4]	0,00010[7]	0,21430[7]	0,00000[26]	0,08430[2]	0,00000[3]	0,78910[9]	0,00000[20]
GAMBIA	1,00000[10]	0,00000[1]	0,49040[2]	0,00000[0]	0,06810[3]	0,00000[2]	1,00000[2]	0,25000[7]
GHANA	1,00000[3]	0,25560[1]	0,97300[2]	0,00000[2]	0,70600[6]	0,00000[12]	1,00000[7]	1,00000[20]
KENYA	1,00000[2]	0,19780[2]	0,94300[3]	0,00000[2]	0,04450[4]	0,00000[43]	1,00000[3]	0,08360[5]
MADAGASCAR	1,00000[7]	0,00000[0]	0,57980[1]	0,00260[7]	0,22380[2]	0,00000[8]	1,00000[1]	0,61470[3]
MOROCCO	1,00000[2]	0,00000[5]	0,94830[3]	0,00000[3]	0,21200[25]	0,00000[32]	0,79780[4]	0,00380[1]
NIGER	1,00000[5]	0,00010[3]	0,56940[3]	0,00040[0]	0,80480[2]	0,00000[1]	0,78820[2]	0,00010[0]
NIGERIA	1,00000[3]	0,00070[4]	0,12010[9]	0,00000[43]	0,28310[5]	0,00000[22]	1,00000[0]	0,97920[8]
RWANDA	1,00000[2]	0,00030[3]	0,22540[12]	0,00000[43]	0,85150[2]	0,00000[0]	1,00000[3]	0,00100[3]
SENEGAL	1,00000[3]	0,00030[4]	0,39660[3]	0,00020[2]	0,68780[5]	0,00000[6]	0,76260[3]	0,00010[4]
SOUTH AFRICA	0,99980[1]	0,00260[1]	0,93550[7]	0,00000[8]	0,60350[4]	0,00100[12]	1,00000[1]	0,48230[12]
TOGO	0,99960[0]	0,00000[2]	0,65950[3]	0,00000[3]	0,15510[0]	0,00000[4]	0,97380[2]	0,00020[1]
TUNISIA	0,99990[2]	0,00000[3]	0,61250[2]	0,00000[2]	0,17290[2]	0,00010[1]	1,00000[4]	0,43070[4]
ZAMBIA	1,00000[4]	0,09300[3]	0,45550[2]	0,00000[7]	0,29350[2]	0,00000[3]	1,00000[5]	0,99990[19]

Notes:
-Level and Diff denote the Phillips-Perron p-values for a unit root in levels and first differences respectively.
-Figures in brackets followed by Phillips-Perron (PP) statistics represent the bandwidth selected based on Newey West (1994) method using Bartlett Kernel.
-C = Constant.

Table 4.3 PP WITH C AND T AFRICA

	Output		Finance		Investment share		CPI	
	Level	Diff	Level	Diff	Level	Diff	Level	Diff
ALGERIA	0,99060[4]	0,00000[4]	0,50450[4]	0,00150[3]	0,90220[2]	0,00010[4]	0,72110[4]	0,17600[3]
BOTSWANA	0,92560[5]	0,00000[12]	0,92530[1]	0,00180[2]	0,20910[3]	0,00000[1]	1,00000[4]	0,06590[4]
BURKINA FASO	1,00000[0]	0,00000[3]	0,88330[3]	0,01250[2]	0,16840[4]	0,00000[1]	0,15970[3]	0,00000[2]
BURUNDI	0,77370[4]	0,01060[1]	0,35570[1]	0,00000[2]	0,62550[3]	0,00000[3]	1,00000[7]	0,00080[0]
CAMEROON	0,92560[4]	0,09320[3]	0,66960[3]	0,00110[0]	0,46490[1]	0,00000[2]	0,13610[0]	0,00010[2]
CONGO	0,98380[2]	0,00750[3]	0,93950[3]	0,00230[8]	0,13090[5]	0,00000[12]	0,57840[2]	0,00010[2]
COTE D'IVOIRE	0,93260[3]	0,02880[3]	0,51520[3]	0,00380[0]	0,83650[4]	0,00000[4]	0,18810[2]	0,00080[0]
EGYPT	0,96710[3]	0,04600[0]	0,93920[4]	0,00100[3]	0,39330[9]	0,00020[12]	1,00000[4]	0,86860[3]
GABON	0,22440[3]	0,00100[7]	0,27140[5]	0,00000[30]	0,05510[2]	0,00000[3]	0,39640[4]	0,00000[24]
GAMBIA	0,98220[2]	0,00000[9]	0,79040[2]	0,00000[0]	0,23130[3]	0,00000[2]	0,98770[1]	0,12210[7]
GHANA	1,00000[3]	0,01060[2]	0,77590[8]	0,00000[3]	0,13640[2]	0,00000[12]	1,00000[12]	1,00000[11]
KENYA	1,00000[2]	0,04050[0]	0,29200[3]	0,00000[1]	0,16380[4]	0,00000[25]	1,00000[3]	0,00040[4]
MADAGASCAR	0,97240[6]	0,00000[11]	0,78510[1]	0,01330[7]	0,25170[2]	0,00000[8]	1,00000[4]	0,00210[2]
MOROCCO	0,99980[3]	0,00000[4]	0,62070[3]	0,00020[3]	0,51540[16]	0,00000[27]	0,95060[4]	0,01170[3]
NIGER	0,99990[3]	0,00000[1]	0,84210[3]	0,00280[0]	0,86130[2]	0,00010[1]	0,45650[3]	0,00090[0]
NIGERIA	0,99970[3]	0,00010[3]	0,26660[8]	0,00000[43]	0,30110[5]	0,00000[22]	1,00000[5]	0,24370[2]
RWANDA	0,99980[2]	0,00010[3]	0,14970[3]	0,00000[43]	0,70030[3]	0,00000[1]	0,97090[2]	0,00020[1]

SENEGAL	1,00000[2]	0,00000[1]	0,71600[3]	0,00120[2]	0,09690[2]	0,00000[6]	0,62980[0]	0,00100[5]
SOUTH AFRICA	0,98240[1]	0,00720[4]	0,25520[4]	0,00000[8]	0,83750[3]	0,00430[15]	0,99880[6]	0,03660[16]
TOGO	0,98620[1]	0,00010[1]	0,85760[3]	0,00000[3]	0,29910[0]	0,00020[4]	0,39400[3]	0,00140[1]
TUNISIA	0,89890[2]	0,00000[2]	0,36260[3]	0,00000[1]	0,31370[1]	0,00060[0]	0,99280[4]	0,14070[1]
ZAMBIA	1,00000[3]	0,00300[3]	0,80350[2]	0,00010[8]	0,81000[2]	0,00000[1]	1,00000[4]	0,85820[10]

Notes:
-Level and Diff denote the Phillips-Perron p-values for a unit root in levels and first differences respectively.
-Figures in brackets followed by Phillips-Perron (PP) statistics represent the bandwidth selected based on Newey West (1994) method using Bartlett Kernel.
-C = Constant and T = Trend.

Table 6.1 UNIT ROOT SUM WITH C AND T ASIA

	Output		Finance		Investment Share		CPI	
	Level	**Diff**	**Level**	**Diff**	**Level**	**Diff**	**Level**	**Diff**
Levin, Lin & Chu t*	10,5434	-11,691*	2,1137	-12,1095*	-2,28802**	-16,94*	5,31851	-3,1541*
Breitung t-stat	11,3791	-6,68404*	2,05193	-10,5237*	-3,67366*	-13,9266*	7,7177	-1,11046
Im, Pesaran and Shin W-stat	11,6412	-10,6027*	1,91089	-10,4639*	-3,54484*	-14,2524*	7,59702	-6,43298*
ADF - Fisher Chi-square	2,10644	136,797*	14,8822	131,93*	50,3187*	193,057*	7,13603	99,3403*
PP - Fisher Chi-square	1,70254	144,422*	10,1934	149,915*	28,8574***	206,378*	7,07553	84,3485*

Notes:
-***, **, * Indicate statistical significance at 10%, 5% and 1%, respectively.
-C = Constant and T = Trend.

Table 6.2 UNIT ROOT SUM WITH C AND T AFRICA

	Output		Finance		Investment Share		CPI	
	Level	**Diff**	**Level**	**Diff**	**Level**	**Diff**	**Level**	**Diff**
Levin, Lin & Chu t*	9,31199	-17,4171*	0,7475	-21,0487*	-1,62125***	-24,4215*	8,219970	-8,88457*
Breitung t-stat	14,2134	-9,58741*	0,12269	-15,9778*	-3,03807*	-17,0245*	8,385320	5,36985
Im, Pesaran and Shin W-stat	13,4048	-18,1001*	1,11401	-20,4205*	-1,66011**	-25,3171*	10,376900	-8,57699*
ADF - Fisher Chi-square	5,4333	352,493*	35,5324	401,649*	58,7778***	524,531*	27,974100	204,187*
PP - Fisher Chi-square	4,4397	488,882*	26,662	757,23*	49,6581	808,855*	19,156900	231,003*

Notes:
-***, **, * Indicate statistical significance at 10%, 5% and 1%, respectively.
-C = Constant and T = Trend.

Table 6.3 UNIT ROOT SUM WITH C AND T AMERICA

	Output		Finance		Investment Share		CPI	
	Level	**Diff**	**Level**	**Diff**	**Level**	**Diff**	**Level**	**Diff**
Levin, Lin & Chu t*	6,48701	-11,1638*	1,10886	-17,8862*	-2,02141**	-22,961*	-0,01243	4,35832
Breitung t-stat	5,18006	-5,35274*	0,76374	-12,2962*	-2,82247*	-13,2843*	6,92537	0,14586
Im, Pesaran and Shin W-stat	9,06322	-10,4954*	0,12056	-17,9041*	-2,36829*	-20,3949*	2,61377	-6,62336*
ADF - Fisher Chi-square	8,54896	174,587*	40,3611	309,694*	53,1351**	364,181*	28,1078	112,416*

PP - Fisher Chi-square	5,06121	196,506*	30,386	391,923*	44,551	528,305*	8,42582	120,538*

Notes:
-***, **, * Indicate statistical significance at 10%, 5% and 1%, respectively.
-C = Constant and T = Trend.

Table 6.4 UNIT ROOT SUM WITH C AND T WORLD

	Output		Finance		Investment Share		CPI	
	Level	**Diff**	**Level**	**Diff**	**Level**	**Diff**	**Level**	**Diff**
Levin, Lin & Chu t*	15,2927	-23,446*	2,22987	-30,0211*	-3,33382*	-37,4272*	7,05885	-4,45344*
Breitung t-stat	18,5371	-12,289*	1,69025	-22,6181*	-5,36425*	-25,3223*	12,9	4,6211
Im, Pesaran and Shin W-stat	19,5648	-23,0918*	1,6828	-28,9592*	-4,11151*	-35,4228*	11,9876	-12,5588*
ADF - Fisher Chi-square	16,0887	663,877*	90,7757	843,272*	162,232*	1081,77*	63,2179	415,943*
PP - Fisher Chi-square	11,2035	829,81*	67,2413	1299,07*	123,067**	1543,54*	34,6582	435,89*

Notes:
-***, **, * Indicate statistical significance at 10%, 5% and 1%, respectively.
-C = Constant and T = Trend.