# Modeling the Nexus of Financial Development, Trade openness and Economic Growth in Pakistan

By

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Pakistan
2016

MS
510
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Modeling

Unit Root Tests

Model and data description.

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بسم الله الرحمن الرحيم

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*A Dissertation*
*Submitted in the Partial Fulfillment of the*
*Requirements for the Degree of*
***MASTER OF SCIENCE***
***IN***
***STATISTICS***

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# Certificate

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A DISSERTATION SUBMITTED IN THE PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF THE MASTER OF SCIENCE IN STATISTICS

**We accept this dissertation as conforming to the required standard.**

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**Department of Mathematics & Statistics**
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**International Islamic University, Islamabad**
**Pakistan**
**2017**

# Dedication

***To my Parents and my Sisters ,***
***For the endless support and patience.***

***To my Teachers,***
***For the constant source of Knowledge and Inspiration.***

***To my Friends,***
***The ones that are close and the ones that are far.***

# Forwarding Sheet by Research Supervisor

The thesis entitled **"Modeling the Nexus of Financial Development, Trade Openness and Economic Growth in Pakistan"** submitted by **Rameez Malik** (Registration # 50-FBAS/MSST/F14) in partial fulfillment of M.S degree in Statistics has been completed under my guidance and supervision. I am satisfied with the quality of his research work and allow him to submit this thesis for further process to graduate with Master of Science degree from Department of Mathematics and Statistics, as per IIU Islamabad rules and regulations.

Dated: _____

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Assistant Professor
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# Acknowledgements

All the praises to Almighty ALLAH the most gracious, the most merciful and the creator of all the creature in the creature. Thanks to ALLAH and his Prophet (P.B.U.H). There are few people who made this journey easier for me with their encouragement and ideas.

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At this occasion, I am thankful to all my teachers who taught me at any stage of my studies. Especially, I express my sincere appreciation to all the helpful staff of the Mathematics and Statistics Department of IIUI. I would like to thanks to everybody who was important to successful realization of this thesis as well as expressing my apology to those that I could not mention.I am thank full to Sir **Prof. Dr.Zahid Iqbal**, Sir **Prof Dr. Ishfaq Ahmad**. My great thanks are extended to all the respected teachers specially Sir **Muhammad Sajid**. I am also thankful from the core of my heart to my sister husband **Safder Iqbal Maiken** and my best friends **Ubaid Ali, Azmat Ali, Haider Paracha, Bilal Maiken** and **Rabia Anwar** who always pray for my success. I apologize to the people whose company and moral support I enjoyed but their names I forgot to include in this document. I especially thank my father for always believing me and my mother for her non ending prayers for me. Writing the thesis without my parents support was really unthinkable for me.

*Rameez Malik*

# DECLARATION

I hereby declare that this thesis, neither as a whole nor a part of it, has been copied out from any source. It is further declared that I have prepared this dissertation entirely on the basis of my personal efforts made under the supervision of my supervisor **Dr. Muhammad Akbar**. No portion of the work, presented in this dissertation, has been submitted in the support of any application for any degree or qualification of this or any other learning institute.

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**List of Abbreviations**

| | |
|---|---|
| GDP | Gross Domestic Product |
| K | Capital Stock |
| TO | Trade Openness |
| FI | Financial index |
| POP | Population |
| ADF | Augmented Dickey-Fuller test |
| PP | Phillips Perron Unit Root Test |
| LM | Lagrange Multiplier test for Serial Correlation |
| ECM | Error Correction Model |
| VECM | Vector Error Correction Model |

## LIST OF TABLES

## Abstract

The aim of study is to assess the nexuses of financial development, trade openness and economic growth in Pakistan. To estimates the impact of financial development, trade openness and economic growth in Pakistan. The study utilised annual time series data from 1970 to 2014, a sample size of 44 observations taken from world development indicator (WDI). The financial development is defined as the enhancement in quality and efficiency of financial intermediary services. So for the purpose the study used financial development index constructed from different proxies of financial development which includes, domestic credit to private sector (% of GDP), domestic credit to financial sector (% of GDP), domestic credit by banks (% of GDP), broad money (% of GDP). To estimates the impact of financial development trade openness and economic growth in Pakistan. We firstly check the stationarity of the data by using Augmented Dickey-Fuller (ADF) and Phillips Perron (PP) unit root test as our variables are non stationary at level but becomes stationary at first difference. So we used Johansen cointegration test to check the cointegration equation by using trace and maximum eigen value test. As both trace and maximum eigen value shows one cointegrating equation. After conforming that there was one cointegrating relationship exists. We used Vector Error Correction (VECM) to estimate the shortrun and longrun relationships. The results indicate that in short-run physical capital per worker (K), trade openness and population are significant and have a positive impact on real GDP (per capita). However financial development index (FI) shows negative impact on real GDP (per capita).

While in longrun physical capital per worker (K), financial development index (FI) shows positive effect on real GDP (per capita).

# CHAPTER 1

## INTERODUCTION

Sustainable economic growth is considered a necessary condition for a nation to achieve human development. According to economists there are a number of factors that affect economic growth. Financial development and trade openness are considers as two of the most important factors that can be helpful for sustainable economic growth. Raymond W. Goldsmith (1969) explains three steps for financial structure and development. As economies grow, first step is to document changes in financial structure-the mixture of markets, intermediaries and financial instruments operating in an economy. Second step is to evaluate the overall impact of financial development-overall quality and quantity of financial markets, intermediaries and financial instruments on economic growth. Third step is to estimate whether financial structure influences by rate of economic growth. Particularly, he showed that as countries develop banks be apt to become larger relative to national output. The study argued that as countries develop there was more improvement seen in the national economic system as they become richer. The overall financial improvement tends to accelerate economic development, help new firm formation, boost up firm growth, and facilitates firm access to external financing. The literature suggests four primary functions of finance.

(1) By mobilizing savings

(2) Allocating capital

(3) By monitoring the use of financial resources

(4) By redistributing and transforming risks.

Mackinnon and Shaw (1973) showed financial development intermediaries causes economic growth. The study supports financial sector liberalisation as opposed to financial repression and argues that if government impose restriction on banking system, it result, in slowing down the development of financial process, and subsequently reduce growth of economic side. Thus, they're expecting a positive impact of financial development on economic growth through the roles it plays in the economy. Merton and Bodie (1995) argued that the main function of any financial system is to facilitate the allowance of assets, over space and time, in vague situation. Chimobi (2010) identified two distinctive complementary channels by which economic growth was promoted by financial development: the allocative and accumulative channel.

As Pakistan economy is a developing economy and low level of economic growth has been observed for last many years. Development of financial system and trade openness may play a significant role to achieve higher level of economic growth. In light of the above discussion, the following objectives of the study are specified.

1. Application of Vector error Correction Model to determine short-run and long-run relationship among financial development, trade openness and economic growth.
2. Analyzing the impact of financial development and trade openness upon economic growth in Pakistan economy.
3. To give policy implications.

Description about remaining chapters was as follow, chapter 2 contain review the literature relevant to Pakistan and the review relevant to other countries, and chapter 3 outlines the methodology and estimation techniques, and chapter 4 contain tables of result and detailed discussion about numerical results, finally chapter 5 presents summary, conclusion, and recommendations.

# CHAPTER 2

# REVIEW OF LITERATURE

## 2.1. Introduction:

Chapter two revolves around two major sections. The first section include basic concept of recent studies. Similarly in the second section we reviewed the recent studies this section is sub divided into two parts, studies related to Pakistan and the studies related to foreign countries.

## 2.2. Basic concepts of the topic.

Economic growth is the percentage increase in real gross domestic product (GDP) which is measured by inflation-adjusted market value of the goods and services produced by an economy over time. It conservatively measured as the percent rate of increase in real GDP, typically in per capita terms. Measurement of economic growth uses national income accounting while economic growth is measured as the annual percent change of gross domestic product (GDP).

Financial sector development plays a vital role in economic development. It promotes economic growth through capital accumulation and technological progress by increasing the savings rate, mobilizing and pooling savings, producing information about investment, facilitating and encouraging the inflows of foreign capital, as well as optimizing the allocation of capital. Countries with better-developed financial systems tend to grow faster over long periods of time, and a large body of evidence suggests that this effect is causal: financial development is not simply an outcome of economic growth; it contributes to this

growth. Additionally, it reduces poverty and inequality by broadening access to finance to the poor and vulnerable groups, facilitating risk management by reducing their vulnerability to shocks, and increasing investment and productivity that result in higher income generation. Goldsmith (1969) was the first to show empirically the existence of a positive relationship between financial development and GDP per capita. Finance-growth nexus can be traced back to Bagehot (1873) and Schumpeter (1911) who strongly believed that well organized financial systems could surely spur innovation and future real growth with respect to identification and funding of productive investment. Financial sector development is important element of economic growth, Schumpeter (1934), Goldsmith (1969), Mckinnon(1963) and Shaw(1963), King (1993), Levine (1993), Lucas (1998), and Robinson(1934). Schumpeter (1934) argued that through productive investment the banking sector become engine of economic growth. The impact of financial sector development overstressed Lucas (1988). Balassa (1985), Sala Martin (1991), Roubini (1991), Harrison (1995), Frankel (1996) empirically found Trade policies and growth of economic positively linked with each other. Atje (1993), King and Levine (1992, 1993, 1994), Jayaratne and Strahn (1996), Levine and Zervos (1996), Diaz-Alejandro (1985) examines a positive link has been obtained between economic growth financial sector development. Muhammad *et al.* (2005) point out financial depth and real interest exerted positive impact on economic growth. Abdul and Ying (2008) point out positive and significant relationship between financial development and economic growth exists in the case of Pakistan. Nabila

and Zakir (2014) point out low impact of financial development on economic growth. Beck*et al.* (2000) point out financial development has a large and positive impact on total factor productivity, which feeds through to overall GDP growth. Gemma *et al.* (2010) point out a positive influence of financial development on economic growth. George *et al.*(2013)for instance using either the private sector credit to GDP ratio or the private sector credit as a ratio to total credit, we found positive and statistically significant effect of financial development on growth.

Trade openness is considered as another important determinant of growth performance. It reflects the degree of flexibility in trading activities among different economies. In this era developing countries want the growth quick as wing, for this purpose they heavily dependent on international trade. Trade openness introduces export promotion policies to enhance and upgrade with new technology, which ultimately remove all the flaws from production and services side of less developed nations. Flexible trade policy promotes efficiency and productivity by creating domestic and foreign competition. Trade openness is a gateway for industrial development in poor nations because imports enhance the capacity to explain the culture and trend of your own country to the rest of the part of world in positive manner. Moreover, easy access to international market provides opportunities to the industry of small open economies. Grossman *et al.* point out the countries who want to accelerate their economic growth; they should import those things which will ultimately increase the production for export. Economic growth and financial sector development link was considered a notorious issue.

Saaed and Hussain (2015) empirically investigate the fundamental link among policies of trade, growth in economic side and development in financial (Kuwait). Annual time series data covering 1977-2012 had been used. On the way to examine causal relationship the Johansen test for cointegration relationship, Granger test for causality under VAR framework were employed. The results illustrate a unidirectional causality exist between development in the sector and growth in economic side; and between growth in economic side and degree of trade. Major finding of the study clearly indicates that financial deepening directly and indirectly play crucial task here in contributing development in financial sector, growth of economic side along with globalization.

Caporale *etal.* (2009) examine the link between development in financial sector and growth in economic side of new EU member countries from1994 - 2007.The overall result shows that the contribution of credit markets and stock are still underdeveloped in these economies. On the other hand a new proficient banking sector also accelerated growth rate. Moreover, Granger causality test results tell us the existence of causality from development in financial sector to growth of economic side, but in the same direction.

Bourdon *et al.* (2009) investigates the relationship between policies of trade and growth of economic system. Five year total averaged data from 1980-2004 of 158 different countries was used. Generalized Method of Moments and Dynamic Panel Estimation were used. The outcome of the study authenticates higher exporting countries grow more rapidly than low exporting countries. More significantly non-linear pattern exist between trade in quality and trade

dependency ratio, telling in low quality product specialized countries the trade have negative impact on growth in these countries. Moreover there was a non-linear relationship between trade ratio, growth and exports variety telling that the countries exporting a wider range of products will growing more rapidly.

Altee *et al.* (2014) investigates the contact of development sector and policies of trade openness on the growth of economic side in Oman form 1972-2012 by using annual data set obtained from World Development Indicator (WDI 2014. To investigate this casual relation Granger test for causality under VAR structure was used. The overall result clearly indicates that financial deepening directly and indirectly influences financial sector development, globalization and economic growth.

## 2.3 Review of recent studies:

### 2.3.1 Studies related to Pakistan:

Ali Sharafal *et al.* (2014) investigates development in financial sector and growth in economic side on the economy of Pakistan economy from 1972-2011. The annual facts and figures covering the period 1972-2011was used and the data were obtained from Statistical Handbook on Pakistan Economy (2010) of the SBP (2012). The ADF as well as PP unit root test were employed to check the stationary of the data. While Johansan cointegration test used to examine the longrun relationship between variables. To investigate this casual relation Granger causality test under Vector error correction model framework was employed. The overall result shows bidirectional causality exists between the variables of interest

and further witness that uni-directional existence of causality from development in financial sector towards growth in economic side.

Gokemenoglu *et al.*(2015) examines the link among development of financial sector, international trade as well as growth in economic side of Pakistan from 1967 to 2013. The annual facts and figures were obtained from World Bank Database (2014). ADF as well as PP test for unit root were employed headed for verifying stationarity property. To examine longrun relationship Johansan test were used while causality direction can be examine by Granger test for causality. The overall outcome indicates intercontinental trade, financial improvement spur economic growth of Pakistan.

Lal *et al.* (2009) investigates cause of financial structure, development of financial sector on growth of economic side in Pakistan from 1975 to 2008. The annual facts and figures were obtained from WDI and World Bank dataset. The ADF as well as PP test for unit root were employed headed for checking stationarity property. While Johansan cointegration was employed to check the longrun relationship among variables of interest. After conforming that a longrun relationship exists among variables ECM employed. The result shows that growth of economic side was positively related with financial structure and channel mechanism, financial development towards growth was capable in the direction of development in financial sector, but in the sense of volume investment. The major findings of the research highlights that fiscal development and fiscal structure were considered the main source of trade and industry enlargement.

### 2.3.2 Studies related to other countries:

Arouri *et al.* (2013) empirically investigates the relation among financial improvement, growth of economic side and policies of trade sincerity in Bangladesh. Annual facts and figures from 1975-2011 on Bangladesh economy obtained from the WDI available in World Bank (WB 2012) were used. The Autoregressive Distributive Lag (ARDL) bound testing approach for co-integration developed by Pasaran and Innovative Accounting Approach (IAA) for causality were used to examine the dynamic casual relation among financial improvement, economic growth, and policies of trade openness. Due to structural breaks in data unit root tests are not reliable and unit root had been covered by Zivot-Andrew test for unknown structural breaks in the data. The overall result shows financial improvement, economic growth, and policies of trade openness were linked our longrun.

Arabi (2014) empirically investigates financial development effect on economic growth in Sudan over 1970 to 2014. The ADF as well as PP test for unit was employed headed for checking stationarity property. Johanson cointegration approach and VECM was used to point out the shortrun and longrun effect of improvement in the financial sector on growth of economic side. The overall results indicating that the contribution of financial development was very small in accelerating the economic growth of Sudan

Altaee *et al.* (2014) investigates role of financial improvement, trade openness on trade and industry development in Oman. The annual facts and figures for the period 1972 to 2012 obtained from World Development Indicator

(WDI) online (2014) had been used. To investigate this casual relation Granger causality test under Vector Autoregression framework was employed. The ADF as well PP test headed for checking the staionarity property. Johansan co-integration in VAR framework was used in the sense of examining long-run relation amongst trade openness, financial improvement and economic development and VAR stability can be examined by CUSUM and CUSUMSQ test. VDC based on VAR result was computed to addresses the casuality. The overall result shows the policies of economic aimed that policies of trade openness had significantly impacting financial improvement and economic growth.

Akinlo and Egbetunde (2010) empirically investigate the long run and casual relation among financial improvement and economic development of ten Sub-Saharan African countries. The ten Sub-Saharan African countries were Chad, Congo Republic, Central African Republic, Kenya, Gabon, Sierra Leone, Nigeria, Swaziland, South Africa and Zambia. The facts and figures covering the period 1980 to 2005 obtained from WDI database in print by WB (CD-ROM 2007) were used. VECM was used to examine the longrun and casual relation among financial improvement and economic growth. The ADF and PP test for unit root employed headed to make sure stationarity property. Johansan cointegration test was used to test the cointegrating relation among variables. Finally Granger Causality test within the framework VECM was used. The overall results show that financial improvement granger causes economic growth within Nigeria, Gabon, Congo Republic and Central African Republic while economic development Granger causes financial improvement in Zambia and there were

also a bidirectional relation exists among development in financial sector and growth in economic side within Kenya; Chad; Swaziland; South Africa and Sierra leone.

Asghar and Hussain(2014) empirically examines the casual relation among financial improvement and economic development of 15 developing countries. The annual facts and figures from the period 1978 to 2012 obtained from World Development Indicator (WDI) were used. Panel cointegration technique was used to examine the casual relation among financial improvement and economic growth of developing countries. The stationarity of the facts and figures can be checked by IPS and ADF Fisher Panel Unit Root tests. Pedroni panel residual based and likelihood based panel cointegration test were used to analyzing cointegration relation among financial improvement and economic development in developing countries. The major findings showed that there were strong evidence of the longrun relation among financial improvement and economic development in developing countries.

Arac and Ozan (2014) empirically examine the casual relation financial improvement and economic development in Turkey. The quarterly facts and figures covering the period 1987 to 2012 obtained from Turkish Statistical Institute and Central Bank of Turkey were used. Granger test for causality base on ECM was use headed for examine the fundamental relation among financial improvement as well as in growth of economic side. Stationarity of variables can be checked by Augmented dickey Fuller (ADF) test. Johansan (1991) cointegration test and Pesaran's Bound testing approach was employ to test the

cointegrating relation among variables. Granger test for causality test base on ECM was employ headed for investigate the short-run and long-run causality direction. The overall results shows that long run relation exist among economic development and all financial indicators so both were supply leading and demand following.

Gallova empirically examines the casual relation among foreign direct investment, economic development and exports for Central and Eastern Europe. The quarterly facts and figures covering the period 1993-2010 obtained from Eurostat and Central Banks of individual countries. VECM was applied headed for finding casual relation among direct net foreign investment, economic development along with exports.ADF and PP test for unit root headed for checking stationarity property. After conforming integrated order of variables under observation was one. Johansan cointegration test used to find out the longrun relation among net foreign direct investment, economic growth and GDP. Out of eight countries long term relation among variables were proved in five countries. That means cointegration does not take into account short term deviations. For that reason Vector error correction model (VECM) was used to detect such deviations within the cointegration. The overall result shows that impact on foreign direct investment with region of Central and Eastern Europe was not clear, since there was positive as well as negative effect proven on exports.

Hussain and Chakraborty (2012) empirically examine the relation among financial improvement and economic development and their causality in Assam, a

state of India. The annual facts and figures covering the period 1985 to 2009 obtained from Reserve Bank of India database. Johansan and Jesulius coinegration, Granger Causality test were used to examine the relation among financial improvement and economic development. The ADF and PP test for unit root headed for checking stationarity property. After conforming that variables under study was integrated of order one Johansan and Jesulius cointegration test was employed to interrogate long-run relation among variable. After that Granger causality test employ to find out the causality direction. Finally IRF used to trace out the response of dependent variable in VAR system. The overall result indicates that financial improvement has an effect on economic growth in Assam.

Kenani and Fujio (2012) empirically investigate dynamic fundamental relation among financial improvement, policies of trade openness, and economic development in Malawi. Annual facts and figures covering the period 1970 to 2009 obtained from IFS, IMF, Annual Financial, Economic Review Reports and Reverse Bank of Malawi (RBM). The VECM was employ to determine direction of causality. The ADF and PP test for unit root headed for checking stationarity property. Johansen cointegration test was employed to find out the longrun relation amongst variables while Granger Causality test based on ECM was used causality relation. The causality result suggesting that financial improvement was considered important factor of growth in economic side, trade openness in shortrun and they have pointer fundamental effects within longrun.

Khan *et al.* (2005) empirically examine the relation among financial improvement and economic development in Pakistan. The annual facts and figures

covering the period 1971 to 2004 obtained from IFS CD-ROM and State Bank of Pakistan were used. The ARDL was use on the way to investigate empirical relation among financial improvement and economic development. While CUSUM and CUSUMSQ tests were applied to find the stable relation among economic growth and financial development. The overall result shows in the longrun real interest and financial depth positively impacting economic growth. While in the shortrun economic growth was significantly and positively exaggerated by changing the investment share.

Khan and Qayyum (2007) empirically examine the impact of trade liberalisation, financial improvement and economic development in Pakistan. The annual facts and figures covering the period 1961 to 2005 was used. The ARDL was used to determine the long run relation among real GDP, financial improvement, trade liberalisation and real deposit rate. The overall result showing trade openness and financial policies have positively impacting real GDP.

Le (2016) empirically examines the causality patterns among financial deeping, trade openness and economic improvement of 14 countries of Asia and Pacific. The annual facts and figures collected from International Financial Statistics (IFS) were used. The Gregory and Hansen (1996) test for cointegration and Toda-Yamamto non Granger causality test were used. The ADF and PP test for unit root headed for checking stationarity property. Gregory and Hansen test for cointegration was used to analyse the long run relation and dynamic interaction among variables and Toda-Yamamoto test was used for causality. The overall result illustrate depth of financial sector, growth in economic side as well as

policies of trade don't share long run relation and there was also a strong relation among financial depth and economic improvement and the connection among trade openness and financial depth was significant but somewhat weaker and finally there was doubtful linkage among trade openness and economic improvement for most of the countries.

Matadeen *et al.* (2011) empirically examine link between policies of trade and growth in economic side in Mauritus. Bi-annual facts and figures covering the period 1989 to 2009 obtained from Central Statistical Office of Mauritus was used. The Vector error correction model was employ to find out the casual links among trade liberalization and economic development. The ADF and PP test for unit root handed for checking stationarity property. After conformation of the order of variables was integrated of order one. Johansan Multivariate Cointegration Approach for cointegration used to test the longrun relationship between variables. Empricial findings shows that there was significant positive links among the longrun along with shortrun indicating that policies of trade was important engine of growth of economic side in Mauritus.

Nollovu (2013) examines the link between financial development as well as growth of economic side in Zimbabwe beginning 1980-2016. Facts and figures have been obtained from World Bank Database. The ADF and PP test for unit root handed for checking stationarity property. Johansan cointegration test used to check existence of longrun relationship in addition to Granger causality employ to discover existence of causality among variables. The overall results show in Zimbabwe the financial system does not promote economic growth.

Nayia and Satish (2011) empirically examine the long run casual relation among financial improvement and economic development in the case of India. The facts and figures covering the period 1981 to 2011 obtained from WDI database (2011), IFS (2011) by the IMF were used. Two variable Eangle Granger approach had been used to examine the longrun casual relationship among financial development and economic growth. The ADF and PP unit root test was employ to check the stationarity property. The Eangle Granger two variable approach had been used to find out the long run equilibrium relation between development of financial sector as well as growth in economic side. ADF and PP test for unit handed for checking stationarity property. Once the long run relation among two variables was established its does not means they have short run too. Error Correction Model (ECM) has been used to overcome this model. The overall results shows that there was a longrun causality exit from financial improvement towards economic development but for the short periods there were no relation conducted from error correction model.

Nickolas *et al.* (2004) examines the relationship among growth in economic side, development of financial sector along with trade liberization, within Turkey. The annual facts and figures covering the period 1960-2012 obtained from UNSESCO, National Accounts of OECD, Turkish State Institute Statistics and International Monetary Fund (IMF) were used. Johansen and Juselious cointegration test and VAR model was employ headed forexamine the link amonggrowth in economic side, development of financial sector along with trade liberization. The ADF and PP test for unit root handed for checking stationarity

property. Johansen and Juleious test used to investigate the longrun equilibrium relation among examined variables. As result shows that there was positive relation between economic improvement, degree of openness, investments and human degree. Therefore Error correction model (ECM) was employ for examine the shortrun and longrun relation of variables. Overall result suggests degree of openness, human capital and investment growth had positive effect on Turkish economy growth.

Nelson and Chadra (2009) examine the casual relation among financial improvement and economic development in Srilanka. The annual facts and figures covering the period 1995-2005 obtained from Annual Report of Central Bank of Srilanka 2003-2005 and International Financial Statistics (IFS). Johansen coinegration test and error correction model (ECM) employ to examine casual relation between developments of financial sector along with growth in economic side. The ADF as well as PP test for unit root handed for unit root test checking stationarity property. Johansen cointegration employs to check the cointegration relation among financial development and economic growth. As the majority variables were cointegrated so Granger tests for causality in ECM process use inspect casual relation between fiscal improvements along with trade and industry development. Major result suggested that broad money cause trade and industry development with two way causality while the major findings not powerfully sustain that fiscal enlargement boost trade and industry intensification.

Pradhan (2009) empirically investigates the fundamental nexus of economic development and financial improvement in a multivariate Vector Autoregressive

(VAR) model in India. The monthly facts and figures of India covering the period from 1993 to 2008 obtain from statistical handbook lying on Indian financial system Mumbai and Bank of India were used. Johansen cointegration as well as VECM was use on the way towards check up fundamental nexus in the middle of growth in economic side along with development of financial sector. The ADF as well as PP test unit root test handed for checking stationarity property. Johansen maximum likelihood test was applied to test the cointegation between variables. The VECM had been formed to determine the causality direction among financial improvement. The results represented that Vector Error Correction Mechanism pattern forces longrun performance of microeconomic variables meeting their cointegrating relations, and accommodate shortrun dynamic.

Rehman*et al.* (2015) examines the relation amongst financial improvement, trade openness along with economic development within Saudi Arabia. The yearly facts and figures covering the period 1971-2012 obtained from World Bank database was used. Vector error correction model used to examining relationship among financial improvement, policies of trade along with growth in economic side. The ADF as well as PP test for unit root handed for checking stationarity property. Johansen multivariate test employ to obtain the longrun relation among variables. To find out the direction of causality Granger Causality test was used. Finally Vector Error Correction Model was employed. The results of Granger Causality test shows that there was bidirectional relation between growth in economic side and policies of trade. However results of VECM show that longrun relationship exist in the middle of the variables under study. The empirical result

shows that development of financial sector and trade openness was the basic ingredients to raise the speed of economic development in Saudi Arabia.

Shaheen *et al.* (2011) empirically investigates the casual relation among financial improvement, international trade and economic development in Pakistan. The annual facts and figures covering the period 1973 to 2009 obtained from IFS CD-ROM 2009 was used. The ARDL bound testing approach for cointegrating relations and Granger test for causality were used to examine longrun relation and the possible track of causality in the midst of development in financial sector, policies of trade along with growth in economic side. The ADF and PP test for unit root handed for checking stationarity property. As the variables are stationary at different levels so ARDL bound testing approach was use on the way to inspect longrun relation between them. Granger causality was used to find out causality direction. Finally CUSUM and CUSUMSQ test were used to check the structural stability. The end results show that there was uni-directional causality pragmatic from policies of trade towards economic enlargement and from financial enhancement towards trade.

## 2.4 Summary:

From the above studies we concluded that the existence of causality and its direction differ by trade openness policies, and the indicators which we use to made financial index. Outcomes from economic, trade policies, level of financial development and different economic sizes may lead to further differences. To examine this relationship no of studies overtaken. Ali *et al.* (2014) investigates development of financial sector with growth in economic side on the economy of

Pakistan from 1972-2011. They founded that bidirectional causality exists between the variables of interest and further witness that uni-directional causality exists from development in financial sector towards growth of economic side. Gokemenoglu *et al.*(2015) empirically investigates the link amongst development in financial sector, international trade, in addition to economic growth within Pakistan 1967-2013. They founded that intercontinental trade, financial improvement spur economic growth of Pakistan. Lal *et al.* (2009) investigates cause of fiscal structure, development of financial sector on growth in economic side in side Pakistan from 1975 to 2008. They founded that financial development and financial structure were considered the main source of trade and industry enlargement. The main aim of our studies are to investigate that the relationship in the middle of growth in economic side along with financial development, in addition to in middle of economic growth along with international trade and checking that whether there exists a casual relationship among them.

# CHAPTER 3

# MATERIAL AND METHODOLOGY

## 3.1 Introduction:

Chapter three revolves around some major sections. First section contains model and data description. Similarly second section contains financial development index and principal component. However last section contains methodology of analysis will be explained: which insights the estimation technique that is used in the model. Each section will be discussed briefly under a separately.

## 3.2 Model and Data Description

In this section we explain our econometric model, overview of data and the sources for collection of data.

In ascertain the nexus of financial development, trade openness, and economic growth in Pakistan; the following model is specified.

$$GDP_t(\text{per capita}) = f(FD_t, K_t, TO_t, POP_t)$$

Which indicate that economic growth is a function of financial development (FD), physical capital per capita (K), trade openness (TO) and population (POP). Moreover equation 3.1 can be expressed in a natural log-linear form as follows

$$\ln GDP_t = \alpha_0 + \alpha_1 \ln FD_t + \alpha_2 \ln k_t + \alpha_3 \ln TO_t + \alpha_4 \ln POP_t + \varepsilon_t$$

Where

GDP is the growth of real GDP per capita, a proxy for economic growth FD is financial development TO is trade openness proxied by the natural log of

exports plus imports as percentage of real GDP. $\varepsilon_t$ is the random error term and $\alpha_0$ is the constant, while $\alpha_1, \alpha_2, \alpha_3, \alpha_4$ are the coefficients of respective variables.

We collect Pakistan data over the period of 1970 to 2014. We will also explain principal component (PC): that is used for constructing financial development index. We will describe variables included in our study as well as source of our data. This study utilized annual time series data from 1970-2014, a sample size of 44observations. The main sources of data collection are 2012 WDI (online) and Pakistan economic survey (online).

### 3.3. Financial development index:

In the literature, financial sector development is defined as enhancement in quality, size, and effectiveness of financial mediator services. So for this purpose we construct financial development index from different proxies of financial development which includes, domestic credit to financial sector, by banks, by private sector (% of GDP), and broard money (% of GDP) consistent with Calderon and Liu(2002) and Soukhakian (2007). The data of these indicators are obtained from WDI (online) of the World Bank. We construct financial development index (FD) using principal component analysis (PCA), which is discussed in the following section.

### 3.4. Principal Component:

Principal component analysis (PCA) is originated by Karl Pearson around the turn of the century and was further developed by Haralled and Hotelling in 1930's. PCA refers to a technique which we used to reduce the dimensionality of data set by orthogonal transformation. In PCA we applied orthogonal

transformation to a set of variables that are correlated and by applying orthogonal transformation to these set of variables we find a new set of variables that are uncorrelated. However the number of PC is less than or equals to original variables. The key idea of Principal Component Analysis was that the first principal component tackles as much variation of the data as possible and has largest variance. The second principal component tackles the most variation than the first principal component and so on. The process continues under the assumption that the second principal component is uncorrelated with the first principal component.

Following steps overtaken in performing PCA these steps are as follow

**Step1: Satisfactory size of the sample**

In performing principal component analysis the first step is minimum sample size. In seek of getting reliable results the number of observations be hundred or larger than hundred.

**Step2: Correlation in the middle of Variables**

In performing principal component the second step is checking the correlation in the variables. There should be a significant amount of correlation exists in the variables to justifying application of principal component. If significant amount of correlation not exist in the variables our results are not reliable and we have not need to apply principal component.

**Step3: Initial Extraction of the Components**

In principal component analysis only first few component can tackle the maximum amount of variation, so in our analysis we use only components. The

important point about principal component was that the first principal component contains maximum variance and last contains minimum amount of variance. That why in our analysis we use first few because most of the variation are tackles by first few principal components.

**Step4: Retained Components**

In this step we decide how many principal component we use in our analysis. On the basis of some rules

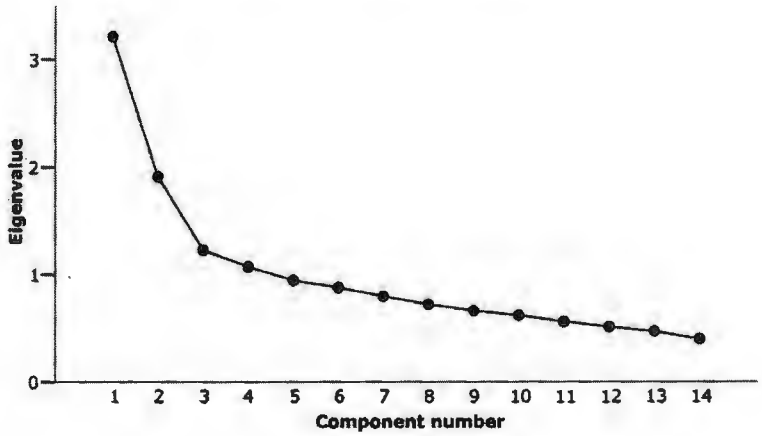
(i) **The Eigenvalue Criterion**:

An Eigenvalue criterion is the most appropriate criteria which we used to decide which component we include in our analysis. On the base of this criterion we include a component whose eigenvalue greater than one. However eigenvalue represents the amount of variance of the component.

**(ii) Scree Test Criterion:**

In scree plot the eigenvalue linked with the components that are plotted and we are looking for a breakdown among the larger eigenvalues component and the lowest eigenvalue in the scree plot. We use the components which are retained before the break and neglected the components which are not retained after the breakup. The hypothetical scree plot is designed to get a clear idea.

Hypothetical Scree Plot:




(iii) Variance Explained Criteria:

Rule of thumb to retain a component that account in total for about 60% of the variance and 5-10% at least for individual component.

These are the some steps which have to be considered into analysis while performing PCA for conducting a composite index.

| Years | DCPS | DCFS | DCPSB | BM | FI | K | LGDP | TO | LPOP |
|---|---|---|---|---|---|---|---|---|---|
| **1970** | 25.4495 | 47.1957 | 25.0221 | 43.4608 | 91.98 | 12.59759 | 11.18707 | 0.376015 | 4.092677 |
| **1971** | 25.2635 | 51.1256 | 24.8216 | 46.7643 | 95.19 | 12.59952 | 11.16795 | 0.387673 | 4.118875 |
| **1972** | 29.1002 | 55.9676 | 28.3690 | 51.3045 | 106.75 | 12.6159 | 11.17667 | 0.317277 | 4.148517 |
| **1973** | 26.5334 | 48.8119 | 26.1524 | 47.1972 | 96.29 | 12.60286 | 11.20897 | 0.322949 | 4.187987 |
| **1974** | 20.5779 | 36.8513 | 20.2792 | 35.9024 | 73.80 | 12.58934 | 11.25176 | 0.329132 | 4.218036 |
| **1975** | 19.1559 | 36.9227 | 18.6251 | 33.6679 | 70.24 | 12.57133 | 11.25758 | 0.334319 | 4.248209 |
| **1976** | 21.9316 | 40.9151 | 20.9484 | 37.8394 | 78.96 | 12.54123 | 11.23978 | 0.354132 | 4.278331 |
| **1977** | 23.4067 | 44.5320 | 22.0942 | 39.3563 | 84.27 | 12.54099 | 11.22689 | 0.341992 | 4.308515 |
| **1978** | 22.2597 | 46.4672 | 20.8703 | 40.0350 | 83.48 | 12.5377 | 11.26091 | 0.354855 | 4.338597 |
| **1979** | 24.8132 | 50.6561 | 23.1506 | 43.1131 | 91.74 | 12.53244 | 11.27478 | 0.404901 | 4.368688 |
| **1980** | 23.4071 | 48.7736 | 21.5666 | 41.4968 | 87.18 | 12.53988 | 11.3143 | 0.414541 | 4.398884 |
| **1981** | 24.0395 | 46.5919 | 21.6631 | 39.0148 | 85.69 | 12.54338 | 11.35011 | 0.383897 | 4.42891 |
| **1982** | 24.7028 | 49.4639 | 22.1404 | 40.7925 | 89.18 | 12.55632 | 11.40029 | 0.349741 | 4.459451 |
| **1983** | 26.3763 | 50.2398 | 23.9079 | 43.8769 | 93.91 | 12.57173 | 11.44402 | 0.373982 | 4.489984 |
| **1984** | 24.2181 | 49.9554 | 24.2181 | 39.8551 | 90.74 | 12.60086 | 11.47039 | 0.372423 | 4.520483 |
| **1985** | 27.7822 | 52.0567 | 27.7822 | 40.6613 | 99.12 | 12.63258 | 11.53345 | 0.365465 | 4.551031 |
| **1986** | 29.7861 | 55.5017 | 29.7861 | 43.3097 | 105.98 | 12.68964 | 11.59466 | 0.362788 | 4.581594 |
| **1987** | 27.6435 | 57.7861 | 27.6435 | 45.3111 | 104.01 | 12.6898 | 11.59772 | 0.3599 | 4.612146 |
| **1988** | 26.3686 | 53.1169 | 26.3686 | 41.3654 | 97.34 | 12.72907 | 11.6499 | 0.325067 | 4.642659 |
| **1989** | 24.9129 | 51.3420 | 24.9129 | 38.9810 | 92.69 | 12.74133 | 11.66082 | 0.342945 | 4.673203 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **1990** | 24.1573 | 50.8712 | 24.1573 | 39.1371 | 91.00 | 12.76738 | 11.68252 | 0.320902 | 4.697841 |
| **1991** | 22.3218 | 51.1761 | 22.3218 | 39.1899 | 87.72 | 12.84256 | 11.75675 | 0.32261 | 4.723931 |
| **1992** | 23.6173 | 55.9195 | 23.6173 | 42.7481 | 94.36 | 12.85991 | 11.79527 | 0.372797 | 4.749617 |
| **1993** | 24.5522 | 54.8956 | 24.5522 | 45.6570 | 96.37 | 12.89963 | 11.8045 | 0.398761 | 4.774913 |
| **1994** | 24.0060 | 51.6455 | 24.0060 | 45.7592 | 93.25 | 12.927 | 11.82259 | 0.359258 | 4.79975 |
| **1995** | 24.2071 | 51.0232 | 24.2071 | 43.5708 | 92.55 | 12.96454 | 11.85884 | 0.347554 | 4.824225 |
| **1996** | 24.6940 | 54.3557 | 24.6940 | 46.0413 | 96.41 | 12.97784 | 11.90173 | 0.355164 | 4.848195 |
| **1997** | 24.6462 | 52.1164 | 24.6462 | 48.2032 | 95.53 | 12.94602 | 11.85481 | 0.331404 | 4.871833 |
| **1998** | 25.1139 | 51.4505 | 25.1139 | 47.1502 | 95.66 | 12.92342 | 11.83132 | 0.305174 | 4.893952 |
| **1999** | 25.4743 | 49.1276 | 25.4743 | 44.8203 | 94.11 | 12.91809 | 11.84865 | 0.279943 | 4.917716 |
| **2000** | 22.3361 | 41.6012 | 22.3361 | 38.5947 | 81.34 | 12.91262 | 11.86472 | 0.280507 | 4.939927 |
| **2001** | 21.7755 | 38.0855 | 21.7755 | 39.1966 | 78.18 | 12.9136 | 11.86799 | 0.29028 | 4.961865 |
| **2002** | 21.6739 | 37.2155 | 21.6739 | 43.2999 | 78.69 | 12.89332 | 11.85336 | 0.298898 | 4.983333 |
| **2003** | 24.5973 | 37.8841 | 24.5973 | 46.4792 | 85.65 | 12.88883 | 11.87983 | 0.337998 | 4.989071 |
| **2004** | 28.7361 | 43.0186 | 28.7361 | 48.4179 | 97.44 | 12.86048 | 11.89925 | 0.299607 | 5.008633 |
| **2005** | 28.6456 | 46.4829 | 28.6456 | 48.9634 | 99.69 | 12.85516 | 11.96152 | 0.347546 | 5.027165 |
| **2006** | 26.8500 | 42.1963 | 26.7601 | 56.3716 | 95.69 | 12.79162 | 11.92774 | 0.379958 | 5.046002 |
| **2007** | 27.8432 | 45.4646 | 27.7368 | 58.8677 | 100.46 | 12.82432 | 11.98516 | 0.353328 | 5.06386 |
| **2008** | 28.7338 | 51.2344 | 28.6022 | 54.4676 | 104.52 | 12.8249 | 12.00569 | 0.34191 | 5.081404 |
| **2009** | 22.7228 | 46.6967 | 22.6208 | 51.6261 | 89.31 | 12.78949 | 11.94389 | 0.302943 | 5.098646 |
| **2010** | 21.4129 | 46.1867 | 21.2886 | 52.5128 | 86.74 | 12.78755 | 11.94352 | 0.322195 | 5.156178 |
| **2011** | 18.1263 | 42.7080 | 18.0323 | 48.1001 | 76.91 | 12.78395 | 11.95853 | 0.313994 | 5.176715 |
| **2012** | 16.9373 | 45.8642 | 16.8390 | 51.4135 | 77.72 | 12.77918 | 11.98055 | 0.27684 | 5.196838 |
| **2013** | 16.1182 | 49.2163 | 16.0188 | 52.1764 | 78.57 | 12.77379 | 11.9998 | 0.284676 | 5.217107 |
| **2014** | 15.6448 | 47.4725 | 15.5442 | 51.9712 | 76.48 | 12.78915 | 12.04467 | 0.277308 | 5.236442 |

## 3.5 Methodology of Analysis

The first step in time series analysis is to check stationarity of data which are under investigation. The main aim of checking the stationarity was that whether the data are stationary or non stationary. For this purpose number of unit root test was proposed but in our study we use ADF and PP test.

### 3.5.1 Unit Root:

The importance of the stationarity of variables in a model cannot be over emphasized. Granger and Newbold (1974) warn that inthe presence of non-stationary variables are searcher was risk of producing spurious regression. Furthermore, we restricted towards the use of conventional causality based Granger causality test on VAR model if variables under study are stationary.

Hence, if series are nonstationary, then the stability condition of VAR was not met, so in this situation we cannot use Granger causality test. So in these cases, cointegration test and VECM was only suggested to examine the link between nonstationary variables. In this regard, the ADF and PP unit root test employed to ascertain stationarity of variables.

**3.5.1.1 Augmented Dickey-Fuller Test:**

An extension of DF was ADF which was developed by Dickey and Fuller in 1979 which only relies on the assumption that the disturbance in the model was white noise. But in practice it was difficult to make such type of assumption hence for this purpose the ADF test was usually used.

The ADF test is based on following model:

$$\Delta y_t = \alpha + \beta t + \pi y_{t-1} + \sum_{i=1}^{p} \psi_i \Delta y_{t-i} + u_t$$

Where

$y_t$= variable in the equation

α= constant term (or a drift)

t= time trend

p= lag order

$u_t$= disturbance term which is assumed to be white noise

Generally unit root can be conceded by testing$H_0$: $\beta = \pi = 0$ (null hypothesis). But in most cases, it is expedient to focus on testing $H_0: \beta = 0$ as a null hypothesis and $H_A: \beta < 0$ as alternative hypothesis by ignoring the time trend t and arguing that it was only a part of appropriate formulation (Greene, 2003). Now if our null

hypothesis was rejected, then we concluded that our model under study has a unit root and the series under study was non-stationary.

The critical value of ADF is same as the critical values of DF.

**3.5.1.2 Phillips-Perron Unit Root Test:**

Another widely used test which we used to check the stationarity properties of data was Phillip&Perron test developed by Phillip and Perron in 1988. The main advantage of PP test over ADF is it non parametric. As ADF test is parametric so require selecting the level of serial correlation but PP doesn't require selecting the level of serial correlation. The main difference between ADF and PP test is that the PP test continues by ignoring any type of serial correlation in test regression and it also deal with heteroskedasticity in errors. Other advantages of ADF test were it doesn't require the specification of lag length for test regression from the user. It is robust and the PP test regression was as follow

$$\Delta y_t = \beta' D_t + \pi y_{t-1} + u_t$$



While we use AIC and BIC for the lag selection

**(i) Akaike Information Criteria (AIC) test:**

Hirotsuga Akaike was developed this criterion test in 1974. It is one of the most generally used fit statistics, which was shown in statistical model output. It is computing by the following formula, which is given bellow,

$$AIC = \frac{-2\mathcal{L} + 2k}{n} = \frac{-2(\mathcal{L} - k)}{n}$$

And,

$$AIC = -2\mathcal{L} + 2k = -2(\mathcal{L} - k)$$

Where,

$\mathcal{L} = The\ likelihood\ function\ of\ the\ model.$

$k = total\ number\ of\ predictors\ including\ the\ intercept.$

$n = total\ numbers\ of\ model\ observation.$

**(ii) Bayesian Information Criterion (BIC):**

The 2nd leading present-day relative fit statistic for likelihood base statistical models is the Bayesian Information Criterion (BIC). The original formula was given by the University of Washington's Adrian Raftery (1986). It was based on the deviance statistic, it is given as

$$BIC_R = \mathrm{D} - (d.f)\ln(n)$$

Where,

$D = deviance\ statistic.$

$d.f =$ The degrees of freedom of the model residual.

$Residuald.f = numberofobservation - number(predictors + intercept)$

And second formula is,

$$BIC_L = -2L + k\ln(n)$$

Where,

$\mathcal{L} = The\ model\ likelihood\ function.$

$k = The\ number\ of\ predictors\ countig\ also\ intercept.$

It is clear that $BIC_R$ and $BIC_L$ have very different values. In Bayesian criterion information (BIC) that model considered to be better fit whose value becomes less of BIC.

**Table 3.2 Augmented DickeyFuller Test**

| Variable | Level | | | First Difference | | | result |
|---|---|---|---|---|---|---|---|
| | intercept | Intercept & Trend | none | Intercept | intercept & trend | None | |
| **LGDP** | 0.7592 | 0.9370 | 1.0000 | 0.0000 | 0.0001 | 0.0001 | I(1) |
| **K** | 0.6155 | 0.9892 | 0.8019 | 0.1348 | 0.0048 | 0.0161 | I(1) |
| **FI** | 0.0098 | 0.3504 | 0.4684 | 0.0001 | 0.0006 | 0.0000 | I(1) |
| **LPOP** | 0.0592 | 0.9991 | 0.8878 | 0.7806 | 0.0299 | 0.4041 | I(1) |
| **TO** | 0.1384 | 0.1307 | 0.3688 | 0.0000 | 0.0000 | 0.0000 | I(1) |

**Table 3.3 Phillips Perron test**

| Variable | Level | | | First Difference | | | result |
|---|---|---|---|---|---|---|---|
| | intercept | Intercept & Trend | none | Intercept | intercept & trend | None | |
| **LGDP** | 0.7623 | 0.9215 | 1.0000 | 0.0000 | 0.0001 | 0.0000 | I(1) |
| **K** | 0.6645 | 0.9237 | 0.8545 | 0.0004 | 0.0023 | 0.0000 | I(1) |
| **FI** | 0.0858 | 0.2478 | 0.4391 | 0.0000 | 0.0004 | 0.0000 | I(1) |
| **LPOP** | 0.0070 | 0.9171 | 1.0000 | 0.0000 | 0.0002 | 0.0007 | I(1) |
| **TO** | 0.1312 | 0.1070 | 0.3395 | 0.0000 | 0.0000 | 0.0000 | I(1) |

Table 3.2 and 3.3 show the test results of ADF and PP test for unit root. The above result from ADF plus PP test indicates all variable were nonstationary on their level but stationary after the first difference at 1 percent level of significance. This implies that all the variables were integrated of order one. After conforming that all our variables were integrated of the same order, now we employ Johansen's test for cointegration to ascertain whether the variables were co-integrate.

### 3.5.2 Cointegration

The basic idea behind the cointegration was that if, two or more series move closely together in the long-run and even the series were themselves trended hence the difference between them was constant (Chimobi, 2010). Moreover, the cointegration test was used as a key to ascertain the long – run equilibrium relationships among the variables; since there was constant difference existed between them. A lack of cointegration suggested that was no long-run relationship existed between such types of variables (Greene, 2003).

Cointegration was introduced by Granger (1981) as a key tool for existence and finding the long run relationship among nonstationary variables. The first test for cointegration were proposed by Eangle and Granger (1987), while Johansen and Juselius (1990) have developed a procedure to test the number of cointegration relations i.e; long run relationships among the variables for finding cointegrating relations. Cointegration was a technique for testing the correlation among nonstationaey time series variables. If two or more series were themselves nonstationary but the linear combination of them was stationary then the series was said to be cointegrated.

#### 3.5.2.1The Johansen cointegration Test

The Johansen method is a necessary instrument for researchers who wish to investigate the time series models. If there was at least one cointegrating vector present the influence of nonstationary variables can go ahead to spurious regression so in this sense the cointegration testing is approximately compulsory.

The basic concept behind the Johansen test is Augmented Dickey test because it was the multivariate generalization of Augmented Dickey Fuller test. However the generalization refers to examine the linear combinations of variables for unit roots. The Johansen test is applied in the situation when we are dealing with more than two variables in this sense with restricted to apply the Johansen test to estimate all possible cointegrating vectors. Consequently we cannot apply Johansen test to estimate conitegrating vectors if we have fewer than two variables. On contrary if we are dealing with three variables each of them have unit root in these types of cases we have two possible cointegrating vectors. However generally we say that if we have n possible variables so the possible number of cointegrating vectors will be n-1.

Estimated model of Johansen test is as follow

$$\Delta X_t = \mu + \sum_{i=1}^{p} \Gamma_i \Delta X_{t-i} + \Pi X_{t-i} + u_t$$

Where $\Gamma_i = -(I - A_1 - A_2 - \cdots - A_i)$

i=1,…,p

And

$\Pi = -(I - A_1 - A_2 - \cdots - A_i)$And$\Pi = \alpha\beta'$.

$X_t = (m\,x\,1) vector\ of\ non-stationary$

$\Gamma_i = (m\,x\,m)\ matrix\ of\ coefficients$

$\alpha = (m\,x\,r)\ link\ in\ variables$, such that$0 < r < m$.

This estimates the speed of variable matrix of error correction coefficients.

Where,

$r =$ *Number of cointegrating adjust to their equilibrium.*

$\beta =$ $(m\,x\,r)$ *matrix of r cointegrating vectors*, so that$0 < r < m$. This is whatrepresents the long-run cointegrating relationship between the variables.

Now we can check the cointegration throughout the rank of $\Pi$ matrix.

1. Variables are not cointegrated if the rank of matrix$\Pi = 0$.
2. Variables are cointegrated if the rank of matrix$\Pi \neq 0$.
3. Determinant becomes zero if the rank of matrix$\Pi < m$, for solving this problem the eigen-values are useful.

Assume that for the johansen test we computed the eigenvalues, and then the numbers of cointegrated vectors can be determined by

1. If $\lambda_m = 0$, then we have $m - 1$ cointegrating vectors. Because in that type of cases the rank of $\Pi$ matrix is atmost $m - 1$ not $m$.
2. If$\lambda_{m-1} = 0$, then we have $m - 2$ cointegrating vectors. Because in that type of cases the rank of $\Pi$ matrix is atmost $m - 2$ not $m - 1$.
3. If$\lambda_{m-2} = 0$, then we have $m - 3$ cointegrating vectors. Because in that type of cases the rank of $\Pi$ matrix is atmost $m - 3$ not $m - 2$. And the process continues

**Likelihood ratio:**

Likelihood ratio tests are Johansen tests.

In likelihood ratio test we use two tests

1. Maximum Eigen-value test
2. Trace test

Both the test initially starts with the null and alternative hypothesis of Johansen test. For both test statistics, the initial Johansen test is a test of the null hypothesis of no cointegration against the alternative of cointegration. The tests differ in terms of the alternative hypothesis

As we using five variables log (GDP per capita), financial development (FD), capital stock (K) as endogenous and trade openness (TO) and population total (POP) as exogenous variables. So the error correction can be exerted as

$$\Delta lnGDP_t = \alpha_0 + \alpha_1 \Delta lnGDP_{t-1} + \alpha_2 \Delta lnFD_{t-1} + \alpha_3 \Delta lnK_{t-1} + \alpha_4 \Delta lnTO_{t-1} + \alpha_5 \Delta lnPOP_{t-1} - \varphi \mu_{t-1} + \varepsilon_t$$

$$\Delta \ln FD_t = \beta_0 + \beta_1 \Delta \ln GDP_{t-1} + \beta_2 \Delta \ln FD_{t-1} + \beta_3 \Delta \ln K_{t-1} + \beta_4 \Delta \ln TO_{t-1} + \beta_5 \Delta \ln POP_{t-1} - \varphi \mu_{t-1} + \varepsilon_t$$

$$\Delta \ln K_t = \gamma_0 + \gamma_1 \Delta \ln GDP_{t-1} + \gamma_2 \Delta \ln FD_{t-1} + \gamma_3 \Delta \ln K_{t-1} + \gamma_4 \Delta \ln TO_{t-1} + \gamma_5 \Delta \ln POP_{t-1} - \varphi \mu_{t-1} + \varepsilon_t$$

Where $\varphi$ is adjustment factor and $\alpha$, $\beta$ and $\gamma$ shows multiplier impact that will reveal one unit change in dependent causes how much change in independent variable. $\mu_{t-1}$ is error correction term that represent long-run relationship where $\mu_{t-1} = lnGDP_{t-1} - \beta_0 - \beta_1 lnFD_{t-1} - \beta_2 lnK_{t-1} - \beta_3 lnTO_{t-1}$

## 3.6. Diagnostic tests:

### 3.6.1 Autocorrelation tests:

A general test used to test the autocorrelation was developing by Breusch and Godfrey based on Lagrange Multiplier Principal. The autocorrelation test is similar to Durbin Watson test. The advantage of LM statistic is that it is useful in

identifying autocorrelation of any significance level. Let $e_t$ represent the residual of linear regression of the form

$$y_t = \sum_{l=1}^{k} \mathbf{x_{lt}\beta_t} + \mathbf{e_t}$$

And the errors are assumed as

$$e_t = \rho_1 e_{t-1} + \rho_2 e_{t-2} + \rho_3 e_{t-3} + \ \ldots + \rho_p e_{t-k} + \mu_t$$

Where $\mu_t$ is error term and assumed to be normal.

And $\rho = \frac{\sum_{t=2}^{T} e_t e_{t-1}}{\sum_{t=1}^{T} e_t^2}$the null hypothesis of the Breusch-Godfrey Test is $H_0: \rho_1 = \rho_2 = \rho_3 = \cdots = \rho_p = 0$against the alternative$H_A: \rho_1 \neq \rho_2 \neq \rho_3 \neq \cdots \neq \rho_p \neq 0$.

**Steps to carry out:**

1. Estimating regression model by ordinary least square method and computing the residuals$e_t$.
2. Regressing$e_t$against $x_{1t}, x_{2t}, \ldots, x_{tk}$,constants and$e_{t-1}$, by using $T - 1$ original observation 2 through $T$.
3. The test statistics of LM test

$$LM = (T - 1)R_e^2,$$

Where

$R_e^2 = R - squared\ from\ the\ auxiliary\ regression.$

4. We reject the null hypothesis

   $H_o: Zero\ autocorrelation$

   Against

$$H_A: \rho_1 \neq \rho_2 \neq \rho_3 \neq \cdots \neq \rho_p \neq 0$$

If $(T-1)R_e^2 > \chi^2_{1,1-\alpha}$,

5. If $e_t$related to$e_{t-1}$ we will expect that there were serial correlation in the residuals.

### 3.6.2 Test for normality:

The basic concept behind the hypothesis testing based on p-values calculation was that the distribution of population was assumed to be normal. So in this sense it is useful to inspect the normality assumption. There were many tests which we can use to check the normality assumption among these tests one of them was Jerqua Buera normality test described below.

The Jerqua Beura test is a well known normality test and it is often used to test the normality of residuals.

The null hypothesis of Jerqua-Beura is:

$\boldsymbol{H_0}$: Normal Distributed

Against

$\boldsymbol{H_1}$: Not normally Distributed

Test statistic of Jerqua Beura is:

$$\text{JB} = \text{n} \cdot \left(\frac{(\text{SK})^2}{6} + \frac{(\text{EK})^2}{24}\right)$$

Where

$SK = Skewness$

$EK = Excess\ kurtosis = K - 3$

Now

$$S = \frac{m_3}{m_2^{3/2}} = \frac{1/n \sum_{i=1}^{n}(x-\bar{x})^3}{[1/n \sum_{i=1}^{n}(x-\bar{x})^2]^{3/2}}$$

$$K = \frac{m_4}{m_2^2} = \frac{1/n \sum_{i=1}^{n}(x-\bar{x})^4}{[1/n \sum_{i=1}^{n}(x-\bar{x})^2]^2}$$

The test statistic of Jerqua Beura test can be compared with $\chi^2_{(2)}$(chi-square distribution with two degree of freedom). However we will reject the null hypothesis if our calculated values exceed with the critical values from$\chi^2_{(2)}$.

In other words we accept$H_0$: S=0 and K=3 if and only if JB<$\chi^2_{(2)}$.

# CHAPTER 4

# RESULT AND DISCUSSIONS

## 4.1 Introduction

This chapter presents empirical results along with discussion of the estimated Vector error Correction model in order to analyze the relationship among financial development, trade openness, and economic growth in Pakistan. Sections 4.2 to 4.4 present the econometric results while section discusses the results

## 4.2 Unit root test:

Before any analysis done especially which is based on time series data there is need to make sure whether variable understudy be stationary or else nonstationary. As discussed in the methodology section that the analysis of nonstationary variable lead towards spurious regression. If the variables understudy are found to be non stationary so we differenced them to ensure the stationarity. The number of times we differenced a variable to make it stationary it is refers as its integrating order. On the way to test stationarity property of variables we employ commonly used unit roots test so called ADF plus PP test for unit root. As the variables of interest be LGDP, K, FI, LPOP and TO. Table 3.2 and 3.3 show the test results of ADF and PP test for unit root indicates all variable were nonstationary on their level but stationary after the first difference at 1percent level of significance. After conforming that all our variables were

integrated of the same order, now we employ Johansen's test for cointegration to ascertain whether the variables were co-integrate

## 4.3 Johansan cointegration results

As noted above in the methodology section, the cointegration test use on the way to investigate existence of longrun equilibrium relationship in the middle of variables that were integrated of same order. Since all our variables were integrated of order one, then Johansen test for cointegration was employ to investigate longrun stability association among variables. The results of test are presented in tables 4.1 and 4.2 below

As all our variables understudy was integrated of order one, so we employ Johansen's cointegration test to investigate the longrun equilibrium connection in the midst of variables. Because cointegration test was use on the way to investigate existence of longrun equilibrium relationship amongst variable in situation were variables understudy are integrated of the same order. The test results are presented in tables 4.1 and 4.2 below

**Table 4.1(Unrestricted Cointegration Rank Test (Trace))**

| Hypothesized No. of CE(s) | Eigenvalue | Trace Statistic | 0.01 Critical Value | Prob.** |
|---|---|---|---|---|
| None * | 0.553663 | 53.61958 | 35.45817 | 0.0000 |
| At most1 | 0.303965 | 18.93225 | 19.93711 | 0.0146 |
| At most2 | 0.074970 | 3.350968 | 6.634897 | 0.0672 |

**Note:*** denotes rejection of the hypothesis at the 0.01 level, **MacKinnon-Haug-Michelis (1999) p-values

Table 4.1show result of the Johansen's cointegration performed on LGDP, K, FI, TO and LPOP. The trace statistic indicates there was one cointegration equation at 1% level of significance.

**Table 4.2Unrestricted Cointegration Rank Test (Maximum Eigenvalue)**

| Hypothesized No. of CE(s) | Eigen value | TraceStatistic | 0.01 Critical Value | Prob.** |
|---|---|---|---|---|
| None * | 0.553663 | 34.68733 | 25.86121 | 0.0004 |
| At most1 | 0.303965 | 15.58128 | 18.52001 | 0.0308 |
| At most2 | 0.074970 | 3.350968 | 6.634897 | 0.0672 |

**Note:*** denotes rejection of the hypothesis at the 0.01 level, **MacKinnon-Haug-Michelis (1999) p-values

Table 4.2show test result of the Johansen's cointegration test performed on LGDP, K, FI, TO and LPOP. The maximum eigenvalue statistics indicate there was one cointegration equation at 1% level of significance.

The results based on trace and maximum eigenvalue statistic, we concluded that there was one co-integrating relationship among LGDP, K, FI, TO and LPOP.

## 4.4 Estimation Results.

To establishing the long-run link between variables the VECM was now estimated. Basically VECM used to analyze adjustment mechanism, shortrun relations among the variables that take place to refurbish longrun stability of variables when they are digress from it. Before estimating the Vector Error Correction Model (VECM) the critical aspect that should be kept in mind is finest number of lag included in model. AIC and SBC information Criterion used to determining the finest amount of lag that should be included in model. Three equations are estimated in Vector Error Correction Model (VECM). Significance of adjustment factor of each equation is tested. Adjustment factor of only the equation of economic growth is significant while adjustment factors of other two equations are insignificant. Hence, we present and discuss the estimation results of

only the equation of economic growth. Before presenting these results, diagnostic tests are discussed here in order to establish validity of VECM.

The diagnostic tests included checking the stability of the Vector Error Correction Model (VECM), we apply the Lagrange-Multiplier (LM) test for autocorrelation, JB normality test, Heteroscedasticity test. The LM has a null hypothesis of no autocorrelation in the residuals while Jarqua-Bera has a null hypothesis of normality of residuals. Table 4.3 below shows the results of LM test for residual autocorrelation. The test results show that we accepting null hypothesis of no autocorrelation among residuals on 5% level of significance at first, second and up to twelfth lags. Thus, on the basis of below results we concluded that there was no autocorrelation among the residuals in our model.

**Table 4.3 LM Test for Serial Correlation**

| Lags | LM-Stat | P-value |
|---|---|---|
| 1 | 10.64558 | 0.3008 |
| 2 | 13.04137 | 0.1607 |
| 3 | 3.448621 | 0.9438 |
| 4 | 3.270723 | 0.9526 |
| 5 | 8.878951 | 0.4485 |
| 6 | 13.01509 | 0.1619 |
| 7 | 5.523593 | 0.7865 |
| 8 | 9.534868 | 0.3894 |
| 9 | 10.14648 | 0.3388 |
| 10 | 3.816917 | 0.9230 |
| 11 | 3.272050 | 0.9525 |
| 12 | 6.102423 | 0.7296 |

**Note: Test was done at 5 percent level of significance. LM – Stat stands for the LM test statistic. P – value stands forprobability value.**

Table 4.4 below shows the test results of JB normality test, heteroskedasticity test. The results mentioned below showed that we accepting null hypothesis of normality of residuals of combined equations on 5% level of significance and we also accept the null hypothesis of heteroscedasticity at 5% significance level.

**Table 4.4 Diagnostic test**

| Jarqua-Bera | | Heteroskedasticity test | |
|---|---|---|---|
| **Jarque-Bera** | 2.135871 | **Chi-Sq** | 60.19189 |
| **Df** | 6 | **DF** | 72 |
| **P-value** | 0.9068 | **P-value** | 0.8382 |

**Note: Df stands for degree of freedom and P-value is the probability values.**

After establishing validity of the estimated model, results are presented and discussed here. Table 4.5 shows short run estimates of the equation of economic growth. In short run, physical capitals per worker, trade openness and population significantly affect economic growth where as financial development is insignificant in the short-run. Moreover, physical capitals per worker, trade openness and population positively affect economic growth in Pakistan as signs of the estimates are positive. Error correction term is negative, significant and less than 1. Estimate of adjustment factor show that 33% short-run disequilibrium comes back to the equilibrium point in one year. It implies that there exists long-run stable relationship between economic growth and the regressors in Pakistan.

Table 4.6 contains the long run estimates of the equation of RGDP Per Capita. Results show that Physical capital per worker, financial development as well as trade openness has significant impact upon economic growth in the long-run. Moreover, the three variables positively affect economic growth as signs of the three estimates are positive. The results show that all the variables have positive

effect on economic growth. Consequently we say that in longrun all our variables are significant and they positively affected economic growth at one lag length.

**Table 4.5 short run error correction estimates**

| Variables | Coefficient | standard error | t-statistics |
|---|---|---|---|
| Cointeq1 | -0.333558 | 0.18065 | -1.84644 |
| D(LGDP(-1)) | 0.044544 | 0.23162 | 0.19232 |
| D(K(-1)) | 0.235449 | 0.25283 | 2.93124 |
| D(FI(-1)) | -0.000634 | 0.00075 | -0.84150 |
| C | -1.152044 | 0.64274 | -1.79238 |
| LPOP | 0.234599 | 0.13203 | 1.77689 |
| TO | 0.174418 | 0.16732 | 2.04240 |

**Table 4.6 long run error correction estimates**

| Regressor | Coefficient | standard error | t-statistics |
|---|---|---|---|
| LGDP(-1) | 1.000000 | | |
| K(-1) | 0.449348 | 0.04474 | 10.0432 |
| FI(-1) | 0.003118 | 0.00050 | 6.24983 |
| TO(-1) | 0.0215 | 0.0048 | 4.23154 |
| C | -5.648029 | | |

# CHAPTER 5

# SUMMARY CONCLUSION AND RECOMMENDATIONS

## 5.1. Summary and conclusion

This study contains five chapters. In chapter 1 we started our work by stating the problem. After stating the problem we move forward to our main objectives of the research and the questions which is relevant to our research work on the basis of which we overtaken this work. Chapter two contains review of literature. In this chapter we take a start by focusing on a review which is relevant to the basic concept of the study after that we reviewed some recent studies which was related to Pakistan and other countries. In this chapter we conclude that the existence of causality and its direction differ by trade frankness and indicators of financial index. Outcomes from economic, trade policies, financial development level, and different fiscal sizes may lead to further differences.

Chapter 3 starts with data description and model specification. In data description we discuss the main sources of data and in model specification we specify our model in a broad general way. After description of data and model specification we move forward to financial indicator index which we use as a proxy of financial development. After that we describe the techniques which we used to in our analysis and the diagnostic tests.

Chapter 4 contain tables of estimation results and discussion about the numerical results. Table 3.2 and 3.3 shows ADF and PP unit test results which clearly show

the non stationarity of variables at level and stationarity after differencing it once. Table 4.1 and 4.2 shows trace and maximum eigen value test results. Both the test shows there was one cointegrating equation at 1% level of significance. After conforming that there was one cointegrating existed we use Vector Error Correction Model (VECM) to estimate short-run and long-run links between variables. Before using VECM we firstly use some diagnostic test like LM test for autocorrelation, JB normality test, and Heteroscedasticity test. The diagnostic test results were given in table 4.3 and 4.4.While table 4.5 and 4.6 contain shortrun and longrun estimate. In short-run, we found a positive and significant impact of Capital shock per worker, trade openness and population upon economic growth. However financial development influences negatively but insiginificant. However, in long-run, Capital Stock per Worker, financial development and trade openness positively and significantly affect economic growth in Pakistan.

It may be concluded on the basis of estimated model in the study that financial development and trade openness can be considered as the important factors to achieve targets of economic growth in Pakistan.

## 5.2 Recommendations for researcher

There are number of other variable which affects trade openness financial development, and economic growth. Furthermore there were so many other indicators which we can use in making financial development index. As we focused on using one cointegrating equations so one can use two cointegrationg equations. As we can use VECM to estimate the short-run and long-run relationship in our analysis because we are sensitive in terms of stationarity

property of variables so the other can use ARDL technique without the sensitivity of staionarity property.

## REFERENCES


Akinlo, A. E.,& Egbetunde, T. (2010). Financial development and economic growth: The experience of 10 sub-Saharan African countries revisited. *The Review of Finance and Banking*, *2*(1).

Altaee, H. H. A., Saied, S. M., Esmaeel, E. S., & Adam, M. H. M. (2014). Financial Development, Trade Openness and Economic Growth: Evidence from Sultanate of Oman (1972-2012). *Journal of Economics and Sustainable Development*, *5*(23), 64-75.

Araç, A., & Özcan, S. K. (2014). The causality between financial development and economic growth: The Case of Turkey. *Journal of Economic Cooperation & Development*, *35*(3), 171.

Arouri, M., Uddin, G. S., Nawaz, K., Shahbaz, M., & Teulon, F. (2014). Causal linkages between financial development, trade openness and economic growth: fresh evidence from innovative accounting approach in case of Bangladesh. *Working papers 2014-037*, Department of Research, Ipag Business School.

Asghar, N., & Hussain, Z. (2014). Financial development, trade openness and economic growth in developing countries: Recent Evidence from Panel Data. *Pakistan Economic and Social Review,52*(2), 99.

Dritsakis, N., & Adamopoulos, A. (2004). Financial development and economic growth in Greece: An empirical investigation with Granger causality analysis. *International Economic Journal, 18(4), 547-559.*

Gallová, Z. *A causal relationship between foreign direct investment, economic growth and export for Central and Eastern Europe.*

Hussain, F., & Chakraborty, D. K. (2012). Causality between financial development and economic growth: Evidence from an Indian State. *The Romanian Economic Journal*, *15*(45), 27-48.

Kenani, J. M., & Fujio, M. (2012). A dynamic causal linkage between financial development, trade openness and economic growth: Evidence from Malawi. *Interdisciplinary Journal of Contemporary Research in Business,4(5), 569.*

Khan, M. A., Qayyum, A., Sheikh, S. A., & Siddique, O. (2005). *Financial Development and Economic Growth: The Case of Pakistan* [with Comments]. *The Pakistan Development Review, 819-837.*

Le, T. H., Kim, J., & Lee, M. (2016). Institutional quality, trade openness, and financial sector development in Asia*: An empirical investigation.Emerging Markets Finance and Trade, 52*(5), 1047-1059.

MAHAJAN, N., & VERMA, S. (2015). International Financial Integration and Economic Growth in India: An Empirical Investigation.

Matadeen, J., Matadeen, S., & Seetanah, B. (2011). Trade openness and economic growth: evidence from Mauritius.

Perera, N., & Paudel, R. C. (2009). Financial development and economic growth in Sri Lanka.

Pradhan, R. P. (2009). The Nexus between Financial Development and Economic Growth in India: Evidence from Multivariate VAR Modell.*International Journal of Research and Reviews in Applied Sciences*, *1*(2).

Qayyum, A. (2007). *Trade liberalisation, financial development and economic growth.*

Rehman, M. Z., Ali, N., & Nasir, N. M. (2015). Linkage between financial development, trade openness and economic growth: Evidence from Saudi Arabia. *Journal of Applied Finance & Banking*, *5*(6).

Shaheen, S., Awan, M. S., Waqas, M., & Aslam, M. A. (2011). Financial development, international trade and economic growth: empirical evidence from Pakistan.