Empirical Modelling of Private Savings:

An Application of Cross Markov Chain Method and General to Specific Approach.

by

Rabia Nisar

Registration No: PIDE2015FMPHILETS04

MPhil Econometrics

A Dissertation Submitted to the Pakistan Institute of Development Economics, Islamabad, in partial fulfilment of the requirements of the Degree of Master of Philosophy in Econometrics

Supervised by:

Dr. Saud Ahmed Khan

Assistant Professor

PIDE

Department of Econometrics and Statistics

Pakistan Institute of Development Economics, Islamabad Pakistan

2018

Pakistan Institute of Development Economics

CERTIFICATE

This is to certify that this thesis entitled: **"Empirical Modelling of Private Savings: An Application of Cross Markov Chain Methods and General to Specific Approach"** submitted by Ms. Rabia Nisar is accepted in its present form by the Department of Econometrics and Statistics, Pakistan Institute of Development Economics (PIDE), Islamabad as satisfying the requirements for partial fulfillment of the degree in **Master of Philosophy in Econometrics**.

Supervisor:

Dr. Saud Ahmad Khan
Assistant Professor
PIDE, Islamabad

External Examiner:

Dr. Arshad Ali Bhatti
Assistant Professor
International Islamic University
Islamabad

Head,
Department of Econometrics and Statistics:

Dr. Amena Urooj

ACKNOWLEDGEMENT

"And my Success is not but through Allah." (11:88)

All praises to Almighty Allah the most Merciful, Compassionate, the Righteous Teacher and the Possessor of all strength, who granted me the determination and strength to complete my thesis. I am indebted to my divine parents for their consistent support whether financial or moral, and for their prayers through which I was able to be at this stage. I am appreciative to my sister Asma Nisar, and my brother Hammad Nisar, for their care and support throughout the ups and downs during the process of attaining knowledge and completing my thesis, and to all of my friends, for lending a compassionate ear and their constant perspective.

It is pleasure to express my profound and cordial gratitude to my very respected and learned supervisor, Dr. Saud Ahmed Khan, for his unflinching encouragement, kind advice and treasured guidance from the early stage of this research throughout the completion process.

I am obliged a lot to Dr. Asad Zaman (Vice Chancellor, PIDE), for his valuable guidance and enlightenment, Dr. Amena Urooj (Head of Department, Econometrics and Statistics) and Ms. Uzma Zia, for their moral support and kind suggestions. I am also thankful to my teachers Dr, Atiq ur Rehman, Dr. Hafsa Hina, Dr. Abdul Qayyum, Dr, Zahid Asghar, Dr. Waseem Shahid, Dr, Abdul Jalil, and Dr. Ahsan ul Haque Satti for providing me the knowledge which has been very helpful for the completion of the study.

Finally, I am grateful to Allah for providing me the privilege to become part of the Pakistan Institute of Development Economics (PIDE) and to attain education through the hands of such honorable and inspirational Professors, Assistant Professors, Lecturers, and colleagues.

Rabia Nisar

This work is dedicated to my parents, who supported me throughout my life.

Contents

List of Abbreviations

MCM:	Markov Chain Method
DHSY:	Davidson, Hendry, Srba and yeo
PIH:	Permanent Income Hypothesis
AIH:	Absolute Income Hypothesis
LCH:	Life-Cycle Hypothesis
SBP:	State Bank of Pakistan
WDI:	World Development Indicators (World Bank)
BRIC:	Brazil, Russia, India, China
GDP:	Gross Domestic Product
MPS:	Marginal Propensity to Save
MPC:	Marginal Propensity to Consume
LCPIH:	Life-Cycle Permanent Income Hypothesis
GMM:	Generalized Method of Moments
OECD:	Organization for Economic Corporation and Development
OLS:	Ordinary Least Square
ARDL:	Autoregressive Distributed Lag
ECM:	Error Correction Mechanism
VECM:	Vector Error Correction Mechanism
EDA:	Exploratory Data Analysis
GUM:	General Unrestricted Model
AIC:	Akaike Information Criteria
SIC:	Schwarz Information Criteria
Y:	Income
IR:	Interest Rate
INF:	Inflation

FD:	Financial Development
REM:	Remittances
DP:	Dependency Ratio
PSAV:	Private Savings
TR:	Trade
SSE:	Sum of Squared Errors
LM:	Lagrange Multiplier
LR:	Likelihood Ratio
DGP:	Data Generating Process

List of Figures:

List of Tables

Abstract:

This study investigates the determinants of Private Savings of Pakistan by applying modern technique *Cross Markov Chain Method (Cross MCM)* first explored by a Russian mathematician Andrey Andreyevich Markov (1856-1922) on the cross country analysis. Keeping in mind that the data is incapable of giving us final results in the absence of the economic theory, but clues only. The data of the variables are retrieved from WDI. Using the variables from the theory, as the initial step the associations among the dependent variable i.e. Private Saving and the independent variables; Financial Development, Interest Rate, Dependency Ratio, GDP, Inflation, Remittances, Trade and Tax; are to be found out to look for clues from the data that whether they support the theory or not. This technique is applied on *all countries* altogether as well as for the separate category of the *low and middle income* countries. Finally, applying the *General to Specific Approach* from the theory of reduction by Davidson, Hendry, Srba and Yeo (1978) on the variables that are found to be significantly associated with the macroeconomic variable, using time-series data of Pakistan. In short-run, it is found out that Dependency Ratio, Interest rate and trade have their impact on the Private Savings. Whereas, there is 5% speed of adjustment towards the long-run calculated by Error Correction Mechanism.

Chapter 1 INTRODUCTION

It is the major purpose of the governments to make the country successful, economically stable and developed. Although, there is no specific and defined recipe to have flourishing and successful economy, but the economic societies in the world have been organized on the foundation of three measures[1] i.e. output[2], savings[3] and education[4], as the growth of a country is somehow linked with these factors. According to the capital fundamentalists, the savings has its influence on the growth. To obtain higher growth it is important to increase the saving rate. The policy makers have been endeavoring to boost private savings of Pakistan, which has been declining gradually. As per definition, the private savings are the household income that is not used for the consumption or taxes. It is the savings of household and businesses plus after-tax corporate profits minus dividends paid. The saving decisions of individuals have major impact on the overall economy of the country, as it has its role in investment, availability of jobs, economic growth and stability.

To proliferate the development and the welfare of the society, it is important to motivate the domestic savings. The savings enhance the mobilization and utilization of the domestic resources. For the case of Pakistan it is important to discern the determinants of the private savings as there is a progressive decline over the previous years. A vast study has been done on this issue and found out that various variables; such as income, persistence, dependency ratio, life expectancy, education, Financial Development, interest rate, inflation, remittances and/or Terms of Trade; are considered to influence the Private savings as proposed by the researchers (Husain, 1996; Loayza, Schmidt-Hebbel, and Servén, 2000; Faridi and Arif, 2012).

[1] McRai (1995)
[2] As it shows that to what extant the state is responsibly improving the growth and development of the economy.
[3] Saving that is necessary but nor sufficient condition of growth, is the main source of the future investment.
[4] The educated young individuals of a country show that there is capacity of investment within an economy.

In the literature, there are a number of studies that have contradicting results for the case of Pakistan, without any justification of such contrast. They have suggested various policies based on observations, study of historical data, and experiences of different country's behavior, but it can be observed that for the case of Pakistan the behavior of the economy is quite unique.

In the literature, various variables are used to study different countries on different time sets. Those variables are justified by Permanent Income Hypothesis (PIH) by Friedman (1956), Absolute Income hypothesis (AIH) by Keynesian (1936), Relative Income Hypothesis (RIH) of Duesenberry (1949), life-cycle hypothesis (LCH) of Modigliani (1959), Ricardian Equivalence Wilson and Good (1985). It is common that due to the dissimilarities in believes, tradition and culture, preferences, relationship among the people living in a society and their access to the technology of the specific region, there is peculiarity in the behavior of overall households upon manipulating the social, economic or demographic variables.

Many of the important variables according to the above mentioned theories are found to be having ambiguous results by using different techniques, as, the actual series of the real-world data do not fulfil most of the assumptions of the techniques used by the researchers such as First Normalized Equation, Toda Yamamoto Technique, Chocrane Orcutt Method, OLS, GMM, etc. The assumption of these techniques are too unrealistic to be used on the real data, and thus give misleading and vague results. There are a few concerns of the policymakers such as; *do the countries with similar level of independent variable have same behavior of the private savings? The variables which are widely used to promote the private savings whether have positive or negative effect? Why the renowned theories fail for the case of Pakistan? What is the apposite model of the private savings, using correct econometric methodology for the case of Pakistan?*

In this study, all the variables which are found by the previous researches as the factors effecting the private savings are taken account. These variables are included in the present

study to be verified by the data using a bivariate technique 'Markov Chain Method' named after Andrey Andreyevich Markov (1856-1922). The Cross Markov Chain Method is applied on the cross sectional countries in order to find out whether the variables have significant association with the Private Savings over the cross section of the countries and verify that if these can be considered as the determinants of Private Savings for all countries. This cross sectional analysis is important to measure the association among the potential determinants and the private savings. Afterwards, the significantly associated variables are used in the encompassing procedure to generate the general model for the time series analysis of Pakistan. The core purpose of this study is to find out the determinants of Private savings for the case of Pakistan using an appropriate econometric methodology. After the formation of the general model, the variety of restrictions are applied to narrow down the general model to an econometrically reliable model[5] for Pakistan, which is specific and un-surpassing for Pakistan in the real data analysis. This methodology is known as the General to Specific Approach, which proposed by Hendry and Richard (1982).

1.1. Objective of the study:

The objectives of the study are as follows:

- To measure the association of our dependent variable with the independent variables by applying Cross Markov Chain methodology, using the Transition Probabilities by Qubtia (2017).
- To apply encompassing technique proposed by Hendry and Richard (1982), Mizon (1984) and Mizon and Richard (1986), using all the vastly used variables in the given theories, after being approved by our data, to sort out the controversy.

[5] Using DHSY methodology proposed in 1978

1.2. Significance of the Study:

The contribution of this study is for the interest of the policy makers as well as for the scholars. To proliferate the development and the welfare of the society, it is important to motivate the domestic savings. The savings enhance the mobilization and utilization of the domestic resources. For the case of Pakistan, it is important to discern the determinants of the private savings as there is a progressive decline in the private savings.

"In God we trust, all others must bring data"

- W. Edwards Deming, Statistician

In the literature, there are several studies that have contradicting results for the case of Pakistan, without any justification of such controversy. Thus, in this study, the exploratory data analysis is used by using Cross Markov Chain process (Qubtia, 2017) to observe the association between the variables, analyze the results and make the data speak for the clues from the real world. Markov Chain process uses minimum assumptions and is a very simple and robust methodology. It suggests us the variables to be included for our reduction theory using a fool prove method in order to find an econometrically correct model of the saving function for Pakistan. This study provides the statistical evidence backed by the theory as well as by the data.

1.3. Proposed Sections of the Dissertation:

The thesis is subdivided into different sections for the purpose of the better understanding. Section 1 comprises of the introduction and background of the topic of our research with exposition of the basic purpose of the study. In this section the gap, objectives and the significance of the study are being discussed. In the section 2, the literature review related to the topic of interest is explained, with the aim to create the theoretical and empirical understanding of all the aspects of the previously done research on the Private savings. The

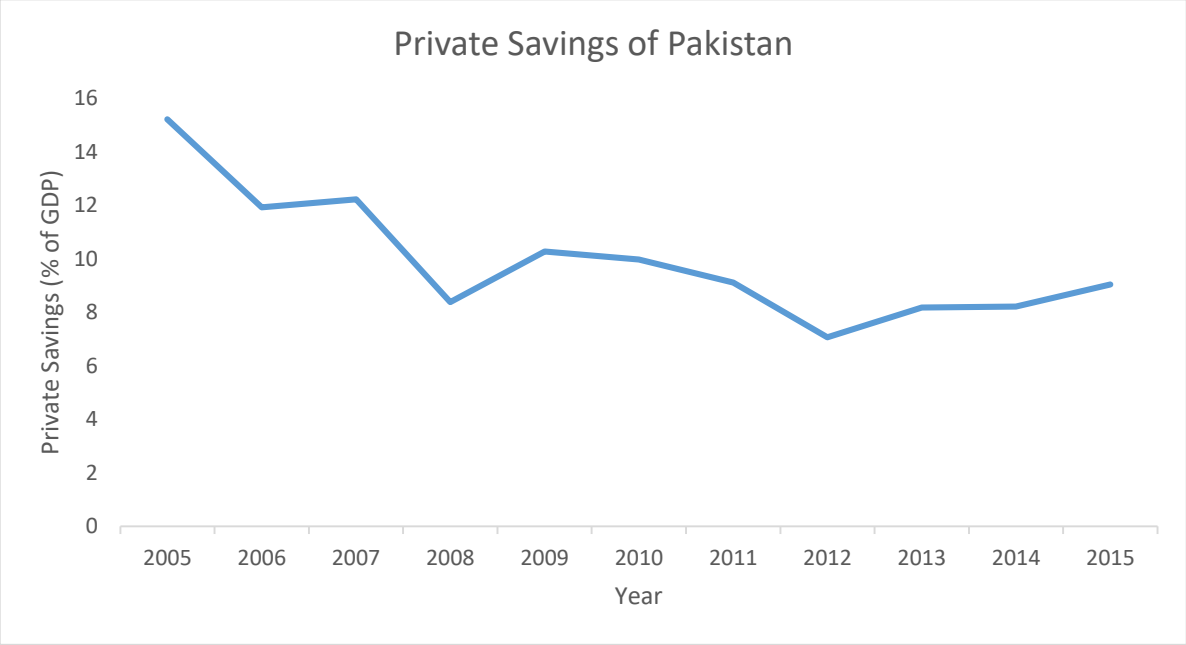
main purpose of this chapter is to mention the theories with reference to the literature and to highlight the real world issues causing the changes in the private savings. The section 3 is the most important section as it is related to the data and methodology. Here the techniques, econometric models, and the steps that are to be followed to resolve the controversy are explained. The variables and the source of data from which the data have taken for the research are also mentioned in this section. The section 4 comprises of the results and discussions. In this section the estimation results are included. Then the results are interpreted and model the saving function empirically and try to resolve the controversy of the enormous theories related to it. Finally, in section 7, the results are concluded and suggest the possible policy implications for Pakistan on the basis of the results and discussions done earlier.

Chapter 2 SAVING PROFILE OF PAKISTAN

2.1. Background:

The State Bank of Pakistan (SBP) reported that the Savings of Pakistan has been declining since FY10. Ever since the savings were not been able to rise in such a way to be able to support the economic development. According to SBP (2013-14) total national savings of Pakistan comprise of about 58% of the Private savings of Pakistan, which is more than half of it.

Figure 2.1: Line Graph of the Private Savings of Pakistan.



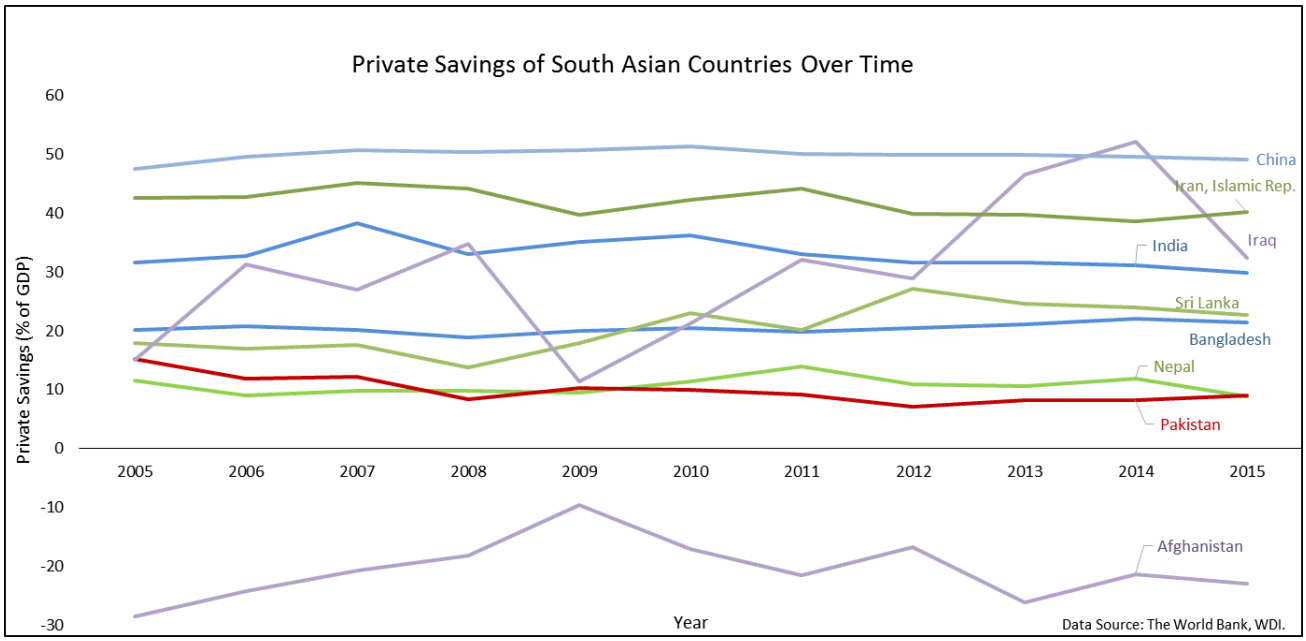
The private savings of Pakistan (Figure 2.1) over time there is a consistent downfall in the private savings being the percentage of GDP. In 2005 the private savings were at 15% approximately, which was itself very low. By 2008, it dropped further to as low as 8 percent of the total GDP of Pakistan. It rose a bit in 2009 but it went down in 2010, altogether only being able to reach around 9% in 2015, which is quite low.

Currently, the Private savings are not only lowest in the history but among the countries of the South Asian region as well, with the exception of Afghanistan. Even the economies which are

considered to be smaller are growing faster and better, let alone the countries which are part of BRIC like China and India. The comparison of the countries is shown in the Figure 2.2.

The performance of the South Asian countries can be observed in Figure 2.2, the gap between the Private Savings of Bangladesh and that of Pakistan is widening over the years. Bangladesh improving its domestic savings, while that of Pakistan is reducing. Iraq and Pakistan started off from same level in 2005 with the private Savings of 15% of their respective GDP,

Figure 2.2: The Comparison among the Private Savings of the South Asian countries with respect to their GDP



while Iraq managed to improve and was able to save approximately up to 35 percent of its income in 2008, whereas, Pakistan was unable to cope up with its previous level and left to save only 8% of her income at that time. For once in 2014, Iraq was able to reach as high as 52 percent of its GDP, despite all the fluctuations and rough pattern. Sri Lanka with its low pace and consistency was able to leave Bangladesh behind and reach at 23% of its GDP, which is better than its previous savings as well. On the other hand, Pakistan saved only 9% and failed to save as much as it was saving in 2005. Pakistan is at its bottom line and it has been there for almost a decade, which is a growing concern of the researchers.

Chapter 3 LITERATURE REVIEW

To find out the social or economic behavior of any country, the literature is studied to explore the determinants by cross-country analysis of the variables. To assess the private savings, the income is an important piece of information.

3.1. Empirical Review:

As the income is the ultimate source, through which one saves after daily life expenditure. Only some portion of the income is kept for saving after the consumption by the households. According to the Absolute Income Hypothesis (AIH), in 1939 Keynes proposed that the consumption is a function of the current income. Another model for consumption function is Life Cycle Hypothesis (LCH), which is proposed by Modigliani and Brumberg (1954). It argues that the income of the population changes in a pattern, and so their consumption over the life time. The accumulation of wealth continues until the retirement and then it starts to diminish until the life ends. The individual consumers optimally allocate their resources to consumption over their life depending on their life resources (Modigliani, 1986). Thus concludes that the age population is an important factor in determining the pattern of consumption and so its savings.

Permanent Income Hypothesis (PIH) is postulated by Friedman in 1957, according to whom the consumption and income had two components; transitory and permanent, whereas, the consumption is a function of the permanent component of the income. The PIH and LCH are closely related, thus gave rise to the theory of Life Cycle Permanent Income Hypothesis (LCPIH). In 1978 Hall proposed that the consumption cannot be determined by the current income as it is a random walk model, rather, it depends upon the decision made by them after considering the resources over the life time.

It is mentioned above that the private savings depend on the income, but the fact cannot ignored that it also depends on the size of the family[6]. As it is difficult to take the size of family data on the macro level, it can be substituted by dependency ratio (World Bank).a number of studies is done on the dependency ratio being the factor effecting the private savings (e.g. Masson, Bayoumi and Samiei, 1998; Hafizah, 2009; Agarwal, Sahoo, and Dash, 2009; Khan, Gill and Haneef, 2013; Niculescu-Aron and Mihaescu, 2014; Ahmed, 2015; Marcel and Kirori, 2016; and Akram and Akram, 2016) In most of the developing countries, there is an issue of high dependency ratio as only the head of the family earns and the rest if the family consumes. The main reason of this behavior is the family system where the young individuals (14 - 25 age) are not motivated to earn for their own living, until all the savings are consumed. Another reason for the high dependency ratio might be that only male family members join the labor force, and the females are not appreciated as much as their counterparts, as it is considering the responsibility of the male to support the family financially and that of the female to run the house.

The consumption also influences the private savings, but negatively. If there is general rise in the prices of goods and services, which may have adverse impression on the saving rate. As the consumption is increased with the hike in inflation, reducing the savings of the household used by many researchers, for example, Athukorala and Sen, (2004), Hafizah, (2009), Faridi and Arif, (2012) Niculescu-Aron and Mihaescu (2014) and Akram and Akram, (2016). The inflation may also reduce the wealth in general. It is common observation that in the long run the individuals save in the form of physical property[7] for the future or financial property[8]. But while considering the property of the people it should be considered that what they owns and

[6] For example, if disposable income of two families A and B are same but the size of family A is 7 and that of family B is 3. There will be difference in the saving pattern of these families.
[7] like real estate and gold etc.
[8] such as bonds and certificates, because of its liquidity for any in need consumption or for investment.

owes, as the asset less the liability of the household is said to be the wealth. The saving rate is an important information that determined by the wealth. It can be calculated by dividing the savings by the income. Wealth is directly related to the saving rate (Abel and Ben, 1998). There are a few studies which included the effect of wealth such as Husain (1996).

Remittances have always been doing a huge contribution to the current account of many economies like Pakistan. The remittances not only helped the low-income households to be able to meet their basic needs, it also helped the economy of Pakistan to decrease the deficit. Private savings has positive relation with the remittances. According to the State Bank of Pakistan, Pakistani workers sent the amount of $19 billion only for the year of 2015-16. Thus, including remittances in our study may help us see the clear picture of the variables improving the saving rate of our country. In literature many studies have been done using the remittances in their models, which includes Masson, Bayoumi and Samiei (1998), Athukorala and Sen (2004), Nasir and Khalid (2004) and Faridi and Arif (2012).

We know that due to the differences in believes, tradition and culture, preferences, relationship among the people living in a society and their access to the technology of the specific region, there is always differences in the behavior of overall households upon manipulating the social, economic or demographic variables. Pakistan is a developing country with more than 61% population living in the rural or underdeveloped areas (World Bank data, 2015). Most of the savings in the small households in the low income economies of Pakistan is done within the neighborhood, friends circle or colleagues in the form of group accumulation. This behavior is very common in Pakistan, due to the lack of access of the banking facilities, the social uncertainty in the small towns and villages, the tradition of trusting family members, relatives and friends rather than the stranger bankers, and to avoid the complication of the banking policies. Thus, there may be an impact of social uncertainty, crime rate and political unrest in the country.

According to a report issued by Standard Chartered Bank in 2017, 51% of the potential savings from the millennial in Pakistan are not being saved through financial institutes. They prefer to keep the cash at home, which has a disadvantage of not being available for investment. Storing money under the mattress has high risk of theft, also for the lack of interest.

Rest of the population living in the urban areas i.e. nearly 39% is utilizing the banking facilities just for the transactions and for their salary accounts. Although, with the advancement of the technology and Financial Development, the individuals are going towards commercial banks, but the use of saving accounts are not very common as the 96.4% population of Pakistan is followers of Islam (according to Pakistan Bureau of Statistics), which discourages giving or taking of the interest while borrowing or lending money. Thus, the policy of increase of the interest rate may not significantly encourage the saving rates (see Hafizah, 2009; Athukorala and Sen, 2004; Siraj and Bengali, 2007; Agarwal, Sahoo, and Dash, 2009; Faridi and Arif, 2012; Niculescu-Aron and Mihaescu, 2014; and Marcel and Kirori, 2016). But if financial deepening and development has positive impression in Pakistan, as with the increase of the access of banking facility to the people, the domestic savings may have positive influence. Numerous literature can be found on the Financial Development being an important factor of the private savings (e.g. Husain, 1996; Loayza, Schmidt-Hebbel, and Servén, 2000; Athukorala and Sen, 2004; Agarwal, Sahoo, and Dash, 2009; Khan, Gill and Haneef, 2013; Ahmed, 2015; Akram and Akram, 2016)

3.2. Methodological Review:

This section explores the various econometric techniques while studying the Private savings as the dynamic modelling.

3.2.1. Cross Correlation Techniques

The Markov Model is first studies by a Russian mathematician Andrey Andreyevich Markov (1856-1922). There has be different methods in the Markov Models adjusted according to the observations. Cross Markov Chain process is introduced by Qubtia (2017), the main purpose of the cross-correlation technique is to find association between two variables.. This is a non-conventional process which uses the median as a measure of the central tendency. It thus eliminates the problem caused by the outliers or other influential observations and nonlinearity. One of the major difference between the MCM and the other methods is that MCM treats data as a source to extract the clues, not the final results As this method only gives the clues for the association, one should make sure that the variables used are backed by the theory.

3.2.2. The Theory of Reduction

The theory of reduction is the origin of the 'good' econometric modelling. Davidson, Hendry, Srba and Yeo (1978) initially used this econometric methodology in order to find appropriate model for consumption function by generating the variable within the framework of generally accepted theory. The *general to specific approach* is a process in which a General Unrestricted Model (GUM) is formulated on the foundation of the theoretical and empirical literature, which is then tested transformed by performing various linear and non-linear tests of restrictions (Charemza and Deadman, 1997).

3.2.3. Panel Data / Disaggregated Panel Data Analysis

Masson, Bayoumi and Samiei (1998) studied the panel data of the OECD and developing countries. Loayza, Schmidt-Hebbel, and Servén, (2000) worked on the large panel data to find the policy and non-policy determinants of the saving disparity across the world. They used the generalized method of moments (GMM) proposed by Chamberlain (1984); Holtz-Eakin, Newey, and Rosen (1988); Arellano and Bond (1991); and Arellano and Bover (1995). They studied the OECD and developing countries separately.

Agarwal, Sahoo, and Dash (2009) studied the saving behavior of the South Asian countries over the time of 1960 – 2005. They applied various methodologies such as unit root tests, ECM, Dynamic OLS and ARDL to check the relationship between the various factors with the savings of individual countries – India, Pakistan, Bangladesh, Sri Lanka and Nepal.

3.2.4. Time Series Based Techniques

Hafizah (2009) conducted a study on the macroeconomic variables of Malaysia to find the determinants of the private and national savings of the country. The data of 30 years is used by applying Johansen and Juselius, multicointegration to find out the long-run relationship. While, to check the short run they used VECM to establish the impact of per capita income, rate of return and young age dependency on the private savings.

Nasir and Khalid (2004) took the percentage and the growth rate of the variables to remove the trend from the series of the data of Pakistan for the year 1990 – 2003. They applied Chocrane Orcutt method by using the autoregressive process AR (I) to remove autocorrelation from the series. Akram and Akram (2016) found out using the data for the year of 1973 – 2013 of Pakistan.

Athukorala and Sen (2004) estimated the determinants of the private saving using the case study of India. Husain (1996), Sajid and Sarfraz (2008) and Khan, Gill and Haneef (2013)

employed cointegration to empirically estimate the long run determinants of the private savings for the time series data of Pakistan. Siraj and Bengali (2007) analyzed Harrod Domar model for the case of Pakistan using the fiscal year data from year FY78 to FY03. They used the OLS methodology to extract the results

Ahmed (2015) investigated the short run as well as the long run relationship of the different variables with the private saving of Pakistan over the period of 1972 - 2012 by using long run cointegration test, first normalized equation for long run association, vector error correction model for short run association, Toda Yamamoto technique for long run causality and Granger causality test for short run causality.

Chapter 4 METHODOLOGY AND DATA

This chapter is very important in order to understand the procedure in detailed manner. We discussed the process of obtaining our results, techniques, methods and tests that are conducted in this study. The main purpose of this chapter is to explain the methodological framework of the study through which the objectives of the study are fulfilled.

4.1. Methodology:

In this study, first the Cross Markov Chain process IS applied to the dependent variable against the independent variables one by one. This detailed analysis is required to understand the data, thus following exploratory data analysis (EDA). Exploratory data analysis or "EDA" is an initial step in analyzing the data.

Figure 4.1: Difference between the Classical and EDA Approach

The main reasons[9] to look into the data before applying any statistical tests or econometric technique are for the checking of assumptions, to detection the mistakes/errors, to preliminary selection of appropriate models, for determining relationships among the explanatory variables, and for assessing the direction and rough size of relationships between explanatory and outcome variables.

[9] Seltman (2012)

Loosely speaking, any method of looking at the data that does not include formal statistical modeling and inference falls under the term of exploratory data analysis. Exploratory data analysis is generally cross-classified in two ways. First, each method is either non-graphical or graphical. And second, each method is either univariate or multivariate (usually just bivariate). In this study the non-graphical, bivariate analysis is used, under EDA.

Initially the Cross Markov Chain Method (Cross MCM) is applied to understand the behavior of various variables affecting private savings of all countries as well as after categorizing the countries in the groups of *high and low income countries*. Afterwards, only the variables significantly influencing the dependent variable are passed through the different tests to see if there is any econometric data problems. This is a vital step to understand the model selection in further stages. Then, the variables are included to construct a general model so that by using the General to Specific Approach an appropriate model can be specified. This specific model is generated after a number of diagnostic testing and checking statistical significance. The steps that are followed to find out the determinants of the Private Savings are given below:

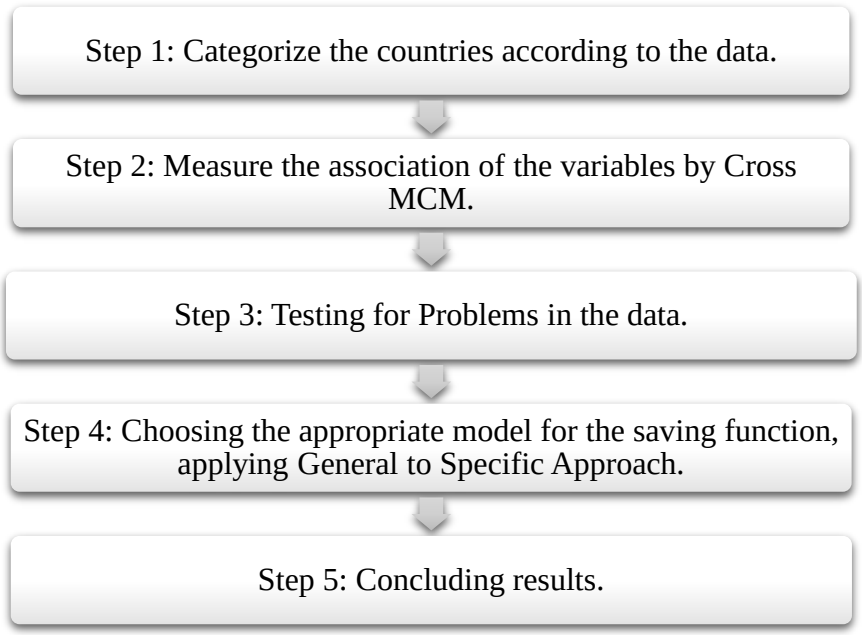


Figure 4.2: Steps followed in the study to determine the variables having impact on the Private Savings

4.1.1. Step 1: Categorize the countries according to the data.

The annual data of the numerous countries is collected and cleaned[10] for the under study variables[11]. To have the clear picture for understanding the behavior of the macroeconomic variable, the data of the countries are classified into the "*High Income Countries"* and the "*Low/Middle Income Countries"* based on the variable GDP per capita 2015[12]. All the countries above the third quartile of the GDP per capita 2015 is categorized an the *High-Income Countries* where as rest of the countries are considered an the *Low and Middle Income Countries.* As Pakistan falls in the category of the low/middle income country, only the low/middle income countries and all countries is included[13] in the analysis. The main purpose of the apportioning was to bring out the information in order to make make the data speak for the clues. It reduces any heterogeneity within the data caused due to the income inequality with respect to the population of the various countries. The categorization of the countries is helpful for the cross sectional study of the data using the Cross Markov Chain Method.

4.1.2. Step 2: Measure the association of the variables by Cross MCM.

Next the cross-tabulation technique is used among the variables, using the Transition Probabilities. In this procedure the *median* of the series is used to check that whether the independent variable is influencing the dependent variables or not as explained by the theory. The aim of Cross MCM is to create a detailed understanding of the association among the variable individually.

[10]Due to some missing values a few countries are excluded for all variables, except from taxes as very few data was available for taxes. So that the loss of data must not be faced. If the countries for which the data of taxes is missing are excluded from all variables, will have to narrow down to a few countries, creating uncertainty in results for Cross Markov Chain analysis.

[11] Private savings, financial development, dependency ratio, GDP, inflation, interest rate, remittances, trade and taxes

[12] The reason to take 2015 as a base year is because it is a recent year, where countries are approximately in current stage.

[13] High income countries in not included in this study as it was not our target study.

This is a cross-sectional analysis, which highlights if the variables included by most of the studies is actually backed by the data or not. in this paper, those variables are included that are frequently used by the researchers and various policies are designed according to these findings. Those complex and complicated techniques deceive the observers by a number of unrealistic assumptions. These assumptions are mostly ignored while applying and do not followed by most of the real data. Those techniques are tricky and the problems are hidden under the complicated mathematics which is hard to justify. On contrary to which, the method being used for cross sectional analysis is simple and fool proof. This procedure is unique in a way that it uses *median* as a measure of central tendency, contrary to most of the techniques which has *mean* as its central representative. The reason this particular technique is preferred is that it excludes the impact of outliers, clusters and non-linearity from the analysis, and the results become unbiased. Through this step it clarifies whether there is the relationship as per other studies (i.e. positive or negative) mentioned in the literature.

The variables found to be significantly influencing the Private savings are brought forward to next step. The variables which are insignificantly affecting savings are excluded and treated as the irrelevant variables. The analysis is done on all countries as well as the low/middle income countries and the results are compared and then concluded.

4.1.3. Step 3: Testing for problems in the Data.

The recent studies suggests that to improve the model specification and empirical modelling, it is important for the data to be checked by extensive range of tests. The variables which were found to be significantly associated with the dependent variable in the cross sectional analysis are brought forward to this step. The tests for problems is applied on the Time Series data of Pakistan on these variables. By the detailed testing of the data an understanding can be created about the information that our data carry.

It is important to check the basic properties of the Time Series Data. The purpose of these tests is to look for the problems within the data. The results become biased and misleading due to the issues such as autocorrelation, conditional heteroskedasticity, structural breaks etc. if the data do not fulfil its required properties, then it is to be transformed so that the required estimation techniques can be applicable.

4.1.4. Step 4: Choosing the appropriate model for the saving function, applying General to Specific Approach.

The aim of this step is to find out the best model for the Private Savings of Pakistan using time series data. The checking of data for problems guides us to appropriate approach, the saving function is modelled accordingly. Using the particular approach, our econometric model for Pakistan is generated based on the variables which has its significant impact on the dependent variable in our cross-sectional analysis. It should be made certain that the data fulfils the assumptions of the technique that is used. In this study, Hendry methodology is used by generating the general model and then use zero restriction to find out the appropriate model. The general to specific method proposed by Hendry (1994), is used. After various diagnostic testing an un-surpassing model for this case study can be found out.

4.1.5. Step 5: Concluding Results.

Finally this study is concluded by suggesting the policy implications to improve the domestic savings, based on the findings of present study. The main purpose of this study is to follow the exploratory data analysis approach and resolve the controversies using data as the ultimate judge and suggest the policy recommendations for Pakistan to improve its saving rate.

4.2. Cross Markov Chain Process

The Markov Chain Model is stochastic modelling to capture changing phenomena. It is assumed that the future state depends only on the present state with the property of "*memorylessness*". It is the simplest Markov Method which explains the dependence of the present state on the previous period only (chain-like structure; each link of a chain is connected with the previous link only).

Cross Markov Chain Method, proposed by Qubtia (2017) is bivariate analysis. This methodology is used to check the causation between the dependent and independent variable where the null hypothesis is that *there is no association between the Private savings and the Independent variable*. The median is used as a measure of central tendency to split the countries into two equal groups to check the transition[14] over time. These groups represent whether the country is in the low saving/low independent variable category or high saving/ high independent variable category, for each variable using all countries as well as after excluding the *high income* countries to check the transition over time If the number of countries in the low saving/low exogenous variable category and the high saving/high exogenous variable category is not significantly different from the number of countries in the low saving/high exogenous variable category and the high saving/low exogenous variable category we fail to reject[15] the hypothesis.

We observe that the transition matrix and the transition probabilities to see if there exist no association between the two variables or not. Whereas, if the diagonal cells contain significantly more number of observations than the other diagonal, then it is interpreted as there

[14] Low-Low (LL), Low-High (LH), High Low (HL) and High-High (HH)
[15] Qubtia (2017)

is association between the variables. The null hypothesis states that the transition probabilities are same for all countries and for all time periods.

4.3. Model Specification Method

There are several traditional and new model specification methods such as Data Mining Technique, Simple to General Approach and General to Specific Approach. In our study, General to Specific Approach is used as it is the most recent and technically suitable for assessing econometric modelling.

4.3.1. Data mining

For the forecasting and prediction of the variables, it is necessary to understand the relationship of the various variables. The process of data mining incorporated different analysis tools to learn pattern and behaviour of the variables. The data mining became famous when the computing of the algorithms grown easier and accessible to the researchers. This model specification method turned out to be common as previously the results were inefficient as being based only on the economic theory.

On the other hand, the data mining approach to model selection criteria has the drawbacks itself. There was the controversy of having the biased results using the data mining approach for the model specification (Gilbert, 1986, Sargan, 2001, and Hendry, 1995). The coefficients and the standard error are underestimated (Compos, Ericssion and Hendry, 1999 and Lovell, 1983). This phenomena created the problems of the suggestions of the inefficient forecasting and hence, unreliable policies.

The data mining approach is preferred due to the reasons such as; it is less time consuming, it does not have the assumption of the data to be normally distributed, and it is more flexible in selecting the predictors.

4.3.2. Simple to General approach

Simple to general approach (S2G) is another model selection methodology used in econometrics to find out the appropriate model. The procedure includes initially generating a simple model and testing frequently by including additional variables unless a proper model is found.

A few drawbacks of S2G modelling were discussed by Hendry and Krolzig (2001) as there are various alternate paths to follow, the selection of the path to choose may be difficult and time consuming, there is a possibility of rejection of tests even after inclusion of different variables, the reason of the multiple rejection of the tests may be unidentified. This procedure does not have clear signal for the discontinuation of adding variables and how many tests are applicable for the model specification. If the final model contain the problem of misspecification, then there is no use of imposing restrictions on the model. This procedure has numerous loopholes, which suggests us to General to specific approach which is more reliable and overcomes most of the drawbacks mentioned above.

4.3.3. The General to Specific Approach

As we know that the data generation process is unknown for the data. We entail to fit an appropriate model for the data for the representation. The selection of appropriate modeling requires to understand a few things first. After observing the data, its distribution, problems and its behavior through the graphical analysis, we include the suitable variables in the model and formulate a general model. As, we need to look for the statistically accurate modeling, it is important to understand probability structure for data. The theory of reduction proposed by Hendry provides the data generating process to econometric model. For this reason this methodology is also known as Hendry Methodology. The key objective of theory of reduction

is to eliminate the insignificant variables from the model and to remove the specification bias using the probability concept for the simplification process of empirical model.

The general to specific modeling is a practical example of the reduction theory. The general unrestricted model (GUM) is formulated on the basis of the theoretical, exploration and previous empirical background. The model is simplified by testing the sensible economic restrictions for the parsimonious and congruent representation. Each simplification steps are checked by diagnostic testing. This method is preferred over the other techniques of the model specification such as *Data mining* and *Simple to General*. The general to specific approach is less time consuming. The problem with the other technique i.e. *Simple to General Approach* is that it starts from the minimum variables, thus causing the under-specification within the model. The consequences of the under-specification is a very severe issue in econometrics. Due to a missing variable in a model, there is a high risk that the effect of the missing variable may be apprehended by any such variable which is irrelevant, thus *Simple to General Approach* is not favored. On the other hand, including as much variables as given in the literature does not harm the model. The model becomes over-specified, which can easily be handled. The irrelevant variables are thus removed eventually.

The General Unrestricted Model GUM is simplified by testing the sensible economic restrictions for the parsimonious and congruent representation. There are various criteria through which we test to see which of the model is preferred. The model is tested and the variables which are found to be insignificant are removed from the model and then checked for the any other insignificant variables. The method is to first remove the variables with highest *p-value* and then check if there are still any other variables to be removed. This step wise methodology is adopted by various researchers recently. It helps find out the most reliable model using General to Specific Approach, as it eliminates the problem of multicollinearily.

To confirm whether the restrictions we are applying are valid or not, we implement the statistical test: The joint linear restrictions can be performed by F test (Harvey, 1990).

$$F = \frac{(SSE_0 - SSE)/m}{SSE/(T-k)}$$

Where, SSE_0 and SSE denotes the residual sum of square for restricted model and unrestricted model respectively, and the statistic has the F distribution with (*m, T - k*) degree of freedom. Its null hypothesis is 'the restriction applied on the general model is true'. There are other tests like *Likelihood Ratio, Wald* and *Langrange Multiplier* for both linear and non-linear restrictions (Charemza and Deadman, 1997). All the simplification steps are further checked by diagnostic testing.

4.4. Model Selection Criteria

In this chapter we mentioned about a few model selection methods, although, there is a vast range of such criteria in the literature of econometrics. In order to select appropriate model from the competing models, we may use R-squared, Adjusted R-squared, Akaike's Information Criterion (AIC), Schwarz's Information Criterion (SIC), Mallow's C_p Criterion, Forecast *chi-squared* only few of which are discussed in this section.

4.4.1. R^2 and Adjusted R^2

The R-squared is a statistical measure of the data being close to the fitted line. It is the measure of the goodness of fit, also known as the coefficient of determination. The R-squared is defined by:

$$R^2 = 1 - \frac{\sum \hat{u}^2}{\sum (y_i - \bar{y})^2}$$

R^2 lies between 0 and 1, the value being close to 1 is preferred. It is only valid for the comparison while having the same number of regressand. Also if we include more variables

in the regression the R^2 automatically rises, which makes it not good model selection criteria. To overcome this problem, Henry Theil developed adjusted R^2.

$$\bar{R}^2 = 1 - (R^2)\frac{n-1}{n-k}$$

Similar to the R^2, the adjusted R^2 also determines the goodness of fit of estimated regression model. It also lies between 0 and 1. While comparison the regressand must be same. Unlike R^2, the adjusted R^2 increases when *t* stat of the added variable is greater than 1.

4.4.2. AIC

Akaike's Information Criterion (AIC) is one of the most commonly used criteria. It also imposes penalty for adding regressors to the model.

$$AIC = e^{2k/n}\frac{\sum \hat{u}^2}{n}$$

Here $\frac{2k}{n}$ is the penalty for adding regressors. AIC is useful for both nested and non-nested models. Is is also used in determining the lag length in AR (q) models. According to the interpretation of R^2 and adjusted R^2, a model is preferred when the value is close to 1 than the model close to zero.

4.4.3. SIC

Similarly, Schwarz's Information Criterion (SIC) is also vastly used method as model selection criteria. The SIC is also takes account of the adding regressors, while SIC is slightly different from AIC. SIC imposes more strict forfeit and thus the criterion is estimated. SIC is defines as follows.

$$SIC = n^{k/n}\frac{\sum \hat{u}^2}{n}$$

Here $\frac{k}{n}$ is the penalty factor. Lower the value of SIC, the better the model.

4.5. Model

The Econometric Model to be presented in current study includes various variables from the literature. This model encompasses the restricted model, and this newly generated model is a general model or the *General Unrestricted Model*. The General Unrestricted Model (GUM) to be estimated in this study is shown as follows:

$$Psav_t = \alpha_0 + \alpha_1 Y_t + \alpha_2 Ir_t + \alpha_3 Inf_t + \alpha_4 Fd_t + \alpha_5 Rem_t + \alpha_6 Dp_t + \alpha_7 Tr_t + \alpha_8 Tax_t + \varepsilon_t$$

$Psav_t$= private savings for the year *t*,

Y_t = GDP per Capita for the year *t*,

Ir_t = Deposit Interest rate for the year *t*,

Inf_t = Inflation rate for the year *t*,

Fd_t = Financial Development for year *t*,

Rem_t= Remittances for the year *t*,

DP_t = Dependency Ratio for the year *t*,

Tr_t= Terms of Trade,

Tax_t= Taxes,

$\alpha_0, \alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5, \alpha_6, \alpha_7 and\ \alpha_8$ are the parameters of their respective variable, whereas the error term is represented by ε_t.

4.6. Data:

The annual data of 30 *High Income Countries* and 89 *Low Income Countries* are used in this study for the time span of 2005 – 2015. The intersection variables from various studies are being used as the determinant of the private saving has been used for the present study.

4.7. Variables Construction and the Data Sources:

WDI World Bank is used as the source of the data. Cleaning of the data has been done by excluding the countries with missing values. The World Bank has taken the data from different sources such as, International Monetary Fund, International Financial Statistics, Financial

Access Survey, World Bank National Accounts Data, World Bank staff estimates based on IMF balance of payments data, World Bank and OECD GDP estimates, World Bank staff estimates based on age distributions of United Nations Population Division's World Population Prospects, OECD National Accounts Data files, Government Finance Statistics Yearbook and data files. The variables that are taken for the study are private savings (percentage of GDP), financial development, dependency ratio, GDP per capita (current US $), inflation, consumer prices (annual percentage), deposit interest rate (%), personal remittances received (percentage of GDP), terms of trade and taxes. The construction and the definitions are according to the WDI the World Bank.

Chapter 5 RESULTS AND FINDINGS

The *theory of reduction* proposed by Hendry provides the data generating process to econometric model. As we know that the data generation process is unknown for the real data. We entail to fit an appropriate model for the representation of the data. The selection of appropriate modeling requires to understand a few things first. After observing the distribution of the data, problems and its behavior through the graphical analysis, we include models backed by both the theory and the data.

Athukorala and Sen (2004) estimated the determinants of the private saving. The level of Per Capita Income, Interest Rate, the Rate of Inflation Financial Development, and Remittances being involved as the function of the private savings, hence the model is as follows.

$$Psav_t = \alpha_0 + \alpha_1 Y_t + \alpha_2 Ir_t + \alpha_3 Inf_t + \alpha_4 Fd_t - \alpha_5 Rem_t - \alpha_8 Tr_t + u_t \quad \text{... (eq. 5.1)}$$

$Psav_t$ is the dependent variable, which shows the Private Savings for the year *t*. whereas the independent variables are $Y_t,\ Ir_t, Inf_t, Fd_t, Rem_t, and\ Tr_t$ are the GDP per Capita, Deposit Interest rate, Inflation rate, Financial Development, Remittances, and Trade for the year *t*. In the above equation, $\alpha_0, \alpha_1, \alpha_2, \alpha_3, \alpha_4, and\ \alpha_5,$ are the parameters of their respective variable, whereas the error term is represented by u_t.

Another model suggested by Agarwal, Sahoo, and Dash (2009) shows the relationship between the Private Savings and the Income Per Capita, Financial Development and Dependency Ratio has its impact on the Private Savings. The model is as follows.

$$Psav_t = \alpha_0 + \alpha_1 Y_t + \alpha_4 Fd_t - \alpha_6 Dp_t + u_t \ . \quad \text{..... (eq. 5.2)}$$

$Psav_t$ is the dependent variable, whereas the independent variables are $Y_t, Fd_t\ , and\ dp_t$ are the GDP per Capita, Financial Development, and Dependency Ratio for the year *t*. In the above equation, $\alpha_0, \alpha_1, \alpha_4, and\ \alpha_6$ are the parameters of their respective variable, whereas the error term is represented by u_t.

Loayza, Schmidt-Hebbel, and Servén, (2000) and Ahmed, (2015) found that the Private Saving is concluded to be dependent upon its Income, the Financial Development and the Persistent Value of the dependent variable.

$$Psav_t = \alpha_0 + \alpha_1 Y_t + +\alpha_4 Fd_t + \alpha_7 Psav_{t-1} + \alpha_9 Tax_t + u_t \quad \ldots \quad \text{(eq. 5.3)}$$

$Psav_t$ is the dependent variable, which shows the private savings for the year *t*, whereas the independent variables; Y_t, Fd_t, Tax_t *and* $Psav_{t-1}$, are the GDP per Capita, Financial Development, Taxes and Private Savings of the previous year. In the above equation, $\alpha_0, \alpha_1, \alpha_4, and\ \alpha_7$ are the parameters of their respective variable, whereas the error term is represented by u_t.

These models are the restricted models of a General Unrestricted Model (GUM):

$$Psav = \alpha_0 + \alpha_1 Y_t + \alpha_2 Ir_t + \alpha_3 Inf_t + \alpha_4 Fd_t + \alpha_5 Rem_t + \alpha_6 Dp_t + \alpha_7 Psav_{t-1} + \alpha_8 Tr_t + \alpha_9 Tax_t + \varepsilon_t \quad \ldots \quad \text{(eq. 5.4)}$$

$Psav_t$ is the dependent variable, which shows the private savings for the year *t*. whereas the independent variables are $Y_t, Ir_t, Inf_t, Fd_t, Rem_t, Dp_t, Tr_t, Tax_t$ *and* $Psav_{t-1}$. $Psav_t$ = Private Savings for the year *t*, Y_t = GDP per Capita for the year *t*, Ir_t = Deposit Interest rate for the year *t*, Inf_t = Inflation rate for the year *t*, Fd_t = Financial Development for the year *t*, Rem_t= Remittances for the year *t*, Dp_t = Dependency Ratio for the year *t*, Tr_t= Terms of Trade, Tax_t= Taxes and $Psav_{t-1}$= Private Savings for the year *t -1*. While the parameters of their respective variables are $\alpha_0, \alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5, \alpha_6, \alpha_7, \alpha_8\ and\ \alpha_9$, and the error term is represented by ε_t.

The above mentioned restricted models (eq. 5.1, 5.2 and 5.3) are the specific cases of the General Unrestricted Model (eq. 5.4) i.e. they are nested in the equation 4. All the restricted models (eq. 5.1, 5.2 and 5.3) are non-nested in each other. Thus the general model is *encompassing* the three specific restricted models.

5.1. Cross Sectional Analysis:

This chapter deals with exploring the association of all the independent variables; Financial Development, Interest Rate, Dependency Ratio, GDP, Inflation, Remittances and Tax; included in the general model with Private savings of all countries. Then, after eliminating the high income countries from the data to remove heterogeneity and compare the difference of association. This clarifies the relationship between the dependent and independent variables. To find the empirical evidence that if the variables we are including are associated as told by the theory, we take cross sectional data and apply the Cross Markov Chain Method to check the association.

5.1.1. Cross Markov Chain Method among FD_{t-1} and $PSAV_t$:

We are using the Cross Markov Chain Method (Cross MCM) to see whether the transition probabilities remain the same for all the countries during the time period of 2006 till 2015. This technique is used to extract the clues from the data.

Here by using MCM based on the *median,* we classify the data on the basis of the financially developed countries into low/high categories and then observe their Private savings using all countries. Private savings data is taken for t = 2006, 2007… 2015 for the dependent variable and the previous time period i.e. t-1 for the Financial Development.

Table 5.1: Average PSAV Transitions in t on the basis of FD in t-1 during 2006-2015 for all countries

FD_{t-1} / $PSAV_t$	L	H
L	37	22
H	23	37

The table above shows the Transition Matrix of the Cross MCM of the Financial Development and the Private Savings of 119 countries after taking the average of the transition matrices during the year 2006 till 2015. The result shows that on average there are 37 out of 59 countries with low Financial Development in the year t-1 are also having low Private Savings in the year t, whereas, the remaining 23 countries with low financial development in t-1 are having high Private savings in the year t. Using the BINOMDIST function in excel for cumulative and then subtracting it from 1(i.e. the total probability), to find out the probability of 37 countries being randomly in the *low-low* category, is 0.018, to test the null hypothesis given as:

$$H_0: \text{There is no association among the } FD_{t-1} \text{ and } PSAV_t$$

According to the rule of thumb, as the p value for the number of countries in the low-low category is less than 0.025 i.e. for 5% (two-tail test), thus rejecting the null hypothesis and concluding that there is significant association between the two variables. Similarly, it concludes the same results for the countries with the high Financial Development in year t-1 and observing that whether these countries have Low or High Private Savings in the time period t. The *high-high* and *low-low* (or *low-high* and *high-low*) categories for the study variables have approximately same counts, as the median is used as the central tendency, thus the distribution of the countries for the categories is symmetric.

Table 5.2: Average PSAV Transitions in t on the basis of FD in t-1 during 2006-2015 for low income countries

FD_{t-1} / $PSAV_t$	L	H
L	25	19
H	19	25

The table above shows the Transition Matrix of the Cross MCM of the Financial Development and the Private Savings of 89 countries after taking the average of the transition matrices during the year 2006 till 2015. The result shows that if we exclude the High Income countries from

the data to study the behavior of only low and middle income countries we found out that there is no significance difference in the distribution of the countries in the *low-low* category and those in the *low-high* category. If we calculate the *p-value* of 25 i.e. the number of countries in the *low-low* category with the BINOMDIST function in excel and then taking the difference from 1, we get 0.186, which is greater than 0.025 thus we fail to reject the null hypothesis at 5% concluding that there is no significant association between the Financial Development and the Private Savings if we take the data for low income countries only.

5.1.2. Cross Markov Chain Method among IR_{t-1} and $PSAV_t$:

To check the association between the Interest Rate of the previous period and the Private Savings for the current values of all countries, while using the Cross MCM, we get the results which are shown in the Table 3 below:

Table 5.3: Average PSAV Transitions in t on the basis of IR in t-1 during 2006-2015 for all countries

IR_{t-1} / $PSAV_t$	L	H
L	25	34
H	35	24

The above table shows that on average there are 25 such countries which have low Interest Rate in the time period *t-1* and low Private savings in the time period *t*. The *p-value* for 35 is 0.0775, thus it falls in the acceptance region. It fails to accept the null hypothesis that there is no association between the Interest Rate and Private Savings, which is contrary to most the economic theories. We should keep in mind that as per theory the interest rate has two way effect on the private savings, i.e. substitution effect and the income effect. For the deeper study, we looked into the individual Transition Matrices of the Interest Rates and Private Savings for

the periods 2006 till 2015 and found out that for years 2006 to 2008 the Transition matrix of Cross MCM results seem to show no significant association.

Table 5.4: Average PSAV Transitions in t on the basis of IR in t-1 during 2006-2008 for all countries

IR_{t-1} / $PSAV_t$	L	H
L	27	32
H	33	26

Whereas, if we observe the results of the Transition matrices of Cross MCM for the year 2009 till 2015 we found that there exists the association at 10% significance level. The table for the year 2009 to 2015 is given as follows:

Table 5.5: Average PSAV Transitions in t on the basis of IR in t-1 during 2009-2015 for all countries

IR_{t-1} / $PSAV_t$	L	H
L	24	35
H	36	23

Here out of 60 countries with low Interest Rates in *t-1* period, 24 have low Private Savings in t period, and 36 (*p-value* = 0.046) have high Private Savings, thus concluding that there is a significant association among the variables. But we can observe that there is inverse association between the Interest Rate and Private Savings, as the Transition Matrix is showing higher number of counts in *High-low* and *low-high* categories. The sign of relationship is opposite as compared to the direction of relationship proposed by the theory.

To remove the heterogeneity, we eliminated the high-income countries from the data and observed if there were any difference in direction afterwards. The table below shows the average Transition Matrix for the Cross MCM. Here the *low-low* (or *high-high*) category has

more counts as compared to the *low-high* (or *high-low*) category which shows that the direction of association is positive which is similar to the theory but opposite to the results while having the high-income countries in the data.

Table 5.6: Average PSAV Transitions in t on the basis of IR in t-1 during 2006-2015 for low income countries

IR_{t-1} / $PSAV_t$	L	H
L	23	21
H	22	23

If we calculate the *p-value* to check the significance, the result shows that it fails to reject the null hypothesis that there is no association among the Interest Rate and the Private savings. To further explore our data we took average of the Transition Matrices of the Cross MCM of the low income countries for the year 2006-2008 and 2009-2015, to see if there is change in behavior as we move across time.

Table 5.7: Average PSAV Transitions in t on the basis of IR in t-1 during 2006-2008 for low income countries

IR_{t-1} / $PSAV_t$	L	H
L	25	19
H	19	25

The two tables (Table 7 and 8) shows that there is some association among the Interest Rate and the Private Savings for low-income countries in the years 2006-2008 but no association at all for the countries 2009-2015. The countries in 2006-2008 show the similar behavior as told by the theory, but the results are not significant enough to reject the null hypothesis.

Table 5.8: Average PSAV Transitions in t on the basis of IR in t-1 during 2009-2015 for low income countries

IR_{t-1} / $PSAV_t$	L	H
L	22	22
H	23	22

5.1.3. Cross Markov Chain Method among DP_{t-1} and $PSAV_t$:

Age of the population is an important factor in determining the Private Savings of the countries. The countries with higher under 14 and above 65 age population, the higher consumption there is, as they are depending on the earning population's income. The average Transition Matrix for Cross MCM of all countries during the year 2006- 2015 among the variables the Dependency Ratio for the period *t-1* and the Private savings in period *t* is given below:

Table 5.9: Average PSAV Transitions in t on the basis of DP in t-1 during 2006-2015 for all countries

DP_{t-1} / $PSAV_t$	L	H
L	16	44
H	43	16

As the Number of counts of the Transition Matrix is higher in the *high-low* and *low-high* category as compared to the other diagonal, we conclude that there is inverse relationship among these two variables. To find out that if this relationship is significant, we check the *p-value* i.e. 0.000197. The null hypothesis is rejected at 1 % thus there is strong inverse relationship between the Dependency Ratio and Private Savings.

To observe if there still exists any relationship among the Dependency Ratio and Private Savings if we only take the low-income countries.

Table 5.10: Average PSAV Transitions in t on the basis of DP in t-1 during 2006-2015 for low income countries

$PSAV_t$ \ DP_{t-1}	L	H
L	13	32
H	32	13

The results in the above table also shows that there exists significant association among the Dependency Ratio in the previous period and the Private Savings in the current period for the low income countries as well.

5.1.4. Cross Markov Chain Method among GDP_{t-1} and $PSAV_t$:

Income is a very important variable in determining the Private Savings. The results of the Cross MCM are given in the Table below:

Table 5.11: Average PSAV Transitions in t on the basis of GDP in t-1 during 2006-2015 for all countries

$PSAV_t$ \ GDP_{t-1}	L	H
L	44	16
H	16	44

The results shows that there is positive significant relationship among the GDP and the Private Savings, as the number of counts are higher in the *low-low* (or *high-high*) category as compared to the *low-high* (or *high-low*) category and the *p-value* of 44 is 6.73E-05 which is quite low when compared with 1% significance level. The null hypothesis is rejected.

Table 5.12: Average PSAV Transitions in t on the basis of GDP in t-1 during 2006-2015 for low income countries

GDP_{t-1} / $PSAV_t$	L	H
L	34	11
H	11	34

The *p-value* of 34 is 0.000124 which is less than 0.025 thus rejecting the null hypothesis at 5%. It concludes that there is significant association among the GDP for previous time period and the Private Savings for the current time period. The result verifies the relationship given by the theory.

5.1.5. Cross Markov Chain Method among INF_{t-1} and $PSAV_t$:

Inflation is one of the factors which causes the Private Savings to increase or decrease, as when inflation rises, it increases consumption and thus have inverse effect on Private Savings. The average Transition Matrix of the Inflation and Private Savings for t = 2006-2015 is given below:

Table 5.13: Average PSAV Transitions in t on the basis of INF in t-1 during 2006-2015 for all countries

INF_{t-1} / $PSAV_t$	L	H
L	25	35
H	35	25

The above table of average Transition Matrix of the Cross MCM of the Inflation and the Private Savings shows that there are 25 such countries which have low Inflation and low Private Savings, whereas, 35 countries which has low inflation and high Private Savings. The relationship has same sign as proposed by the theory, but to check whether the association is

significant or not we calculate the *p-value* by using the BINOMDIST function. The *p-value* for 35 is 0.775 which fails to reject the null hypothesis.

We check whether the association changes if we remove the high income countries from the data. The average Transition Matrix below shows the Cross Markov Chain of the Inflation and Private Savings among the low income countries.

Table 5.14: Average PSAV Transitions in t of INF in t-1 during 2006-2015 for low income countries

INF_{t-1} / $PSAV_t$	L	H
L	20	24
H	24	20

24 out of the 44 countries which have low inflation in *t-1* period, have high Private Savings in period *t* whereas, 20 have low Private Savings, which is not significantly different from 24. The *p-value* of 24 is 0.276 thus fails to reject the null hypothesis. It concludes that the Inflation is not significantly associated with the Private Savings.

5.1.6. Cross Markov Chain Method among REM_{t-1} and $PSAV_t$:

Remittances is the source of income for most of the developing countries thus play an important role in upbringing the savings. It is important to verify the association of the Remittances with the Private savings with our data according to the theory. The table below shows the average Transition Matrix of the Cross MCM of the Remittances in the period *t-1* and Private Savings in period *t*.

The number of counts are higher in the *low-high* and *high-low* category as compared to the other diagonal, which shows that there is inverse relationship among the Remittances and the Private Savings. The *p-value* of 43 is 0.00053, which rejects the null hypothesis at 1% as well.

Table 5.15: Average PSAV Transitions in t on the basis of REM in t-1 during 2006-2015 for all countries

REM_{t-1} / $PSAV_t$	L	H
L	17	43
H	43	17

To check the relationship of these two variables for the low income countries, the Transition Matrix for Cross MCM of the variables is given in the Table 5.16:

The low income countries' average Transition Matrix shows the same result as the one with all countries combined. 31 countries have the low Remittances in the previous and high Private Savings in the current period. Thus have contrary results as compared to the theory.

Table 5.16: Average PSAV Transitions in t of REM in t-1 during 2006-2015 for low income countries

REM_{t-1} / $PSAV_t$	L	H
L	14	31
H	30	14

5.1.7. Cross Markov Chain Method among Trade $_{t-1}$ and PSAV $_t$:

Trade in the previous period may have an influence on the Private Savings of the current period. To check the significance of the impact we applied the Markov Chain on our variables. The results of the Cross MCM are given in the Table 5.17.

The results shows that there is no relationship among the Trade and the Private Savings, as the number of counts are almost the same in the *low-low* (or *high-high*) category as compared to the *low-high* (or *high-low*) category and the *p-value* of 31 is 0.3494 which is quite low when compared with 1% significance level. The null hypothesis is rejected.

Table 5.17: Average PSAV Transitions in t on the basis of TR in t-1 during 2006-2015 for all countries

TR_{t-1} / $PSAV_t$	L	H
L	31	29
H	29	31

Table 5.18: Average PSAV Transitions in t on the basis of TR in t-1 during 2006-2015 for low income countries

TR_{t-1} / $PSAV_t$	L	H
L	19	25
H	25	20

The *p-value* of 25 is 0.185 which is not less than 0.025 thus cannot reject the null hypothesis at 5%. It concludes that there is no significant association among the Trade for previous time period and the Private Savings for the current time period. But if we make grouping of the Transition according to the time with similar behavior and then average to get the results, we get different outcome. The results are given as follows.

Table 5.19: Average PSAV Transitions in t on the basis of TR in t-1 during 2013-2015 for low income countries

TR_{t-1} / $PSAV_t$	L	H
L	17	27
H	27	18

The *p-value* of 27 is 0.06 which rejects the null at 12% which is not very high but plausible. Thus there is a slightly significant relationship among the variables.

5.1.8. Cross Markov Chain Method among TAX $_{t-1}$ and PSAV $_{t}$:

As the taxes increase the consumption of the individuals also increases thus the savings decreases. It is important to verify the association of the tax with the Private savings with our data according to the theory. The table below shows the average Transition Matrix of the Cross MCM of the taxes in the period *t-1* and Private Savings in period *t*.

Table 5.20: Average PSAV Transitions in t on the basis of TAX in t-1 during 2006-2015 for all countries

TAX_{t-1} / $PSAV_t$	L	H
L	13	9
H	9	13

The number of counts are higher in the *low-high* and *high-low* category as compared to the other diagonal, which shows that there is inverse relationship among the taxes and the Private Savings. The *p-value* of 13 is 0.1431394, which fails to reject the null hypothesis. To check the relationship of these two variables for the low income countries, the Transition Matrix for Cross MCM of the variables is given in the table below:

Table 5.21: Average PSAV Transitions in t on the basis of TAX in t-1 during 2006-2015 for low income countries

TAX_{t-1} / $PSAV_t$	L	H
L	6	6
H	7	7

The low income countries' average Transition Matrix shows the same result as the one with all countries combined. 6 countries have the low taxes in the previous and high Private Savings in the current period. Thus does not show any relationship among the variables.

Summary:

The summary of the results of the association between the independent variables; Interest Rate, Dependency Ratio, GDP, Inflation, Remittances, Trade and Taxes; of the previous period and the Private Savings for the current values of all countries, by applying the Cross MCM, are shown in the Table 22 and 23 for all countries and developing countries respectively.

Table 5.22: Results of the Cross Markov Chain Method for all countries

Independent Variable	Category	Transition Matrix Value	Positive/ negative	P-value	H_0: There is no association between the Independent variable and Private Saving
FD_{t-1}	LL	37/119	+	0.0259	Rejects H_0
IR_{t-1}	HL	35/119	-	0.0775	Accepts H_0
DP_{t-1}	HL	43/119	-	0.000197	Rejects H_0
GDP_{t-1}	LL	44/119	+	6.73E-05	Rejects H_0
INF_{t-1}	HL	35/119	-	0.0775	Accepts H_0
REM_{t-1}	HL	43/119	-	0.000197	Rejects H_0
TR_{t-1}	LL	31/119	+	0.3494	Accepts H_0
TAX_{t-1}	LL	13/44	+	0.1431	Accepts H_0

Table 5.23: Results of the Cross Markov Chain Method for low-income countries

Independent Variable	Category	Transition Matrix Value	Positive /negative	P-value	H_0: There is no association between the Independent variable and Private Saving
FD_{t-1}	LL	25 /89	+	0.1856	Accepts H_0
IR_{t-1}	LL	23 /89	+	0.3830	Accepts H_0
DP_{t-1}	HL	32 /89	-	0.0012	Rejects H_0
GDP_{t-1}	LL	34 /89	+	0.000124	Rejects H_0
INF_{t-1}	HL	24 /89	-	0.2757	Accepts H_0
REM_{t-1}	HL	30 /89	-	0.0080	Rejects H_0
TR_{t-1}	HL	25 /89	-	0.1856	Accepts H_0
TAX_{t-1}	HL	7 /26	Nil	0.2905	Accepts H_0

The results in the Table 22 show the relationship of the independent variables and dependent variable for all countries, i.e. there is a significant association among the Private Savings of the current period and the Financial Development, Dependency ratio, GDP, and Remittances of the previous period. Whereas, insignificant association with Interest Rate, Inflation, Trade and tax. The sign of influence on the Private Savings are also mentioned. Private Saving has positive relationship with Financial Development and GDP, while, Dependency Ratio and Remittances have negative association with the private savings. The findings are similar to that of Agarwal, Sahoo, and Dash (2009) for Financial Development, Income and dependency. However the effect of remittances matches with Athukorala and Sen (2004).

To remove the uncertainty and verify the results we removed the High Income Countries from the data and the repeat the analysis. The results are shown in the Table 23. For the Low and Middle Income countries we got fairly similar results as for all countries included, except for the Financial Development, which became insignificant after removing the High Income countries from the data. The sign of influence for Interest Rate and Trade reversed for the low and middle income countries. For the year of 2006-2015 on average Dependency Ratio, Income, and Remittances has significant effect on the Private Savings. There is a slightly significant impact for Trade in the years 2013-2015 (see Table 19) and Interest Rate for the years 2006-2008 (Table 7), Also found to be important variables. Using these variables as well in the analysis, and create a General identity for the Time Series Analysis given as follows:

$$Psav_t = \alpha_0 + \alpha_1 GDP_t + \alpha_2 Ir_t + \alpha_6 Dp_t + \alpha_5 Rem_t + \alpha_8 Tr_t + u_t \qquad \text{(eq A)}$$

We move towards the next step of assuming that the other variables which got excluded in this step are not supported by the data, only the variables in the general equation are shortlisted from the cross-sectional analysis. In the next step we get the most reliable model of Private Savings of Pakistan for the long-run as well as short run, using General to Specific Approach.

5.2. Time Series Analysis:

This chapter contains the results and findings of the Time Series Analysis by applying the General to Specific approach to find out the long-run effect as well as the short-run determinants of the Private Savings for the case of Pakistan. After applying Cross Markov Chain, we found out that in cross section Dependency Ratio, GDP per capita and Remittances have significant impact on the Private Savings. For the time series analysis Interest Rate and Trade are also included although in the cross sectional analysis these variables have shown insignificant impact on Private Savings but are important variables according to the theory. These variables may cause the Private Savings to boost or hinder. Thus the general model for Pakistan as mentioned in the equation A is:

$$Psav_t = \alpha_0 + \alpha_1 Ir_t + \alpha_2 Dpr_t + \alpha_6 GDP_t + \alpha_5 Rem_t + \alpha_8 Tr_t + u_t \quad \ldots \quad \text{(eq 5.6)}$$

The equation 5.6 shows that the current value of Private Savings depends upon a current value of GDP per capita, current Interest rate, current change of Dependency Ratio, current value of Remittances, and the current value of Trade. Before analyzing the determinants of Private Savings, it is important to carry out univariate analysis on the variables included in the model. Initially the stationarity of the variables are checked. There are various method and tests to check the stationarity of a series. First, a line Graph is plotted to check if there is a trend, shift, break or any unpredictability, which may cause the unauthenticity of the statistical tests for stationarity such as Augmented Dickey Fuller (ADF) test. After the visualization, the findings can be verified by the tests. Using Augmented Dickey Fuller Test with the intercept and no trend, the series is tested. If the series is not stationary, it is important to see the order of integration. On checking the integration order of all of the variables, it is found that all of the variables in the above equation are I(1).

The series with huge spread are compressed by taking log of the series except for the series which are expressed in rate. Taking the log shrinks the gap and the scale is adjusted for the analysis. This transformation is important especially when the variables are of different scales.

$$psav_t = \alpha_0 + \alpha_1 Ir_t + \alpha_2 Dpr_t + \alpha_6 gdp_t + \alpha_5 rem_t + \alpha_8 tr_t + u_t \quad \dots \quad \text{(eq 5.7)}$$

Here, Ir_t is the Call money rate for Pakistan, Dpr_t is the change in the Dependency Ratio for current time period, gdp_t is the log of the GDP per capita (in Local Currency Unit) for the time period t, rem_t is the log of Remittances (current US$), tr_t is the log Terms of Trade adjustment (in Local Currency Unit), $psav_t$ is the log of Private Savings (in Local Currency Unit) and u_t is the error term.

To find out the relationship among the variables an OLS regression is ran in the Autoregressive Distributed lag form. Using the independent variables at level and two lags of the dependent and independent variables as the regressor, as the optimal lag is found to up to 2 lags. If the error term is stationary, there is a relationship exist among the variables and the regression is not spurious. The model is as follows:

$$psav_t = \beta_0 + \beta_1 psav_{t-1} + \beta_2 psav_{t-2} + \beta_3 Ir_t + \beta_4 Ir_{t-1} + \beta_5 Ir_{t-2} + \beta_6 Dpr_t + \beta_7 Dpr_{t-1} + \beta_8 Dpr_{t-2} + \beta_9 gdp_t + \beta_{10} gdp_{t-1} + \beta_{11} gdp_{t-2} + \beta_{12} rem_t + \beta_{13} rem_{t-1} + \beta_{14} rem_{t-2} + \beta_{15} tr_t + \beta_{16} tr_{t-1} + \beta_{17} tr_{t-2} + \varepsilon_t \quad \dots \quad \text{(eq 5.8)}$$

Here ε_t is the error term. The result (Appendix B) shows that there are a few variables which are insignificant, now the variables with highest p-value is removed sequentially after applying the coefficient-test. This General to specific Approach helps us find a specific model which is appropriate for the case of Pakistan. On applying zero restrictions as suggested by the t-test and F-test we came along a very specific model which contains all of the variables significant at 15% shown in the following Model:

$$psav_t = -\beta_0 + \beta_1 psav_{t-1} - \beta_3 Ir_t + Ir_{t-2} + \beta_6 Dpr_t - \beta_7 Dpr_{t-1} - \beta_9 gdp_t +$$

$$\beta_{10} gdp_{t-1} - \beta_{15} tr_t + \beta_{16} tr_{t-1} + \varepsilon_t \quad \ldots \text{(eq 5.4)}$$

The results shows (Table 5.24) that there is positive and significant effect of the first lag of Private savings, level and second lag of the Interest Rate, level and first lag of the rate of Dependency Ratio, GDP per capita and trade has significant impacts. The lags and the current coefficients have opposite signs. The remittances has been removed through the process as the remittances brought to the country are not usually saved in the banks by the families of the remitters. Most of the inflow is either invested or used in the purchase of property of gold.

Table 5.24: Results of the ARDL Model for the Specific Model for Pakistan

Dependent Variable: LPSAV				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	-0.991006	1.460574	-0.678505	0.5023
LPSAV(-1)	0.926640	0.112203	8.258630	0.0000
IR	-0.040528	0.013716	-2.954795	0.0058
IR(-2)	0.023930	0.015544	1.539495	0.1335
DPR	25.50826	14.76970	1.727067	0.0938
DPR(-1)	-24.94559	13.74233	-1.815237	0.0789
LGDP	-0.597941	0.380694	-1.570658	0.1261
LGDP(-1)	0.527538	0.364009	1.449245	0.1570
LTR	-1.035219	0.416436	-2.485904	0.0183
LTR(-1)	1.543485	0.405880	3.802814	0.0006

The impact of the interest rate is negative, which means that the substitution effect of interest rate is more as compared to the income effect in the case of Pakistan. The results shows that 83% of the variance of our macroeconomic variables is explained by this model. The value of AIC and SC are -0.529532 and -0.115801 respectively, which are desirable. The residuals are stationary, normally distributed, and statistically, do not seem to have heteroskedasticity (results are shown in Appendix B).

Equation 7, shows the Specific model for the private savings which included the significant variables with the lags of the dependent and the independent variables undergone the general to specific process. During the process the Remittances is found to have insignificant effect in the case of Pakistan. The coefficients of the independent variables in the model with the lag value and the current value has opposite signs. To remove the unit root effect the variables are combined assuming the lag and current values equal. To see the short run effect, along with the speed of adjustment to the long run, the difference equation is formed by rearranging the equation as follows:

$$\Delta psav_t = -\gamma_0 + \gamma_1 \Delta Ir_t + \gamma_2 Ir_{t-2} + \gamma_3 \Delta Dpr_t + \gamma_4 \Delta gdp_t + \gamma_5 \Delta tr_t - \varphi\, ECM + u_t \quad \text{(eq 5.5)}$$

The first difference of all current variables along with the second lag of the Interest Rate and the Error Correction Mechanism (ECM) are the components of this model. The dependent variable is the first difference of the Private savings for time *t,* shows the short run impact, which is determined by the independent variables. On the right hand side the first difference of the significant independent variables is taken by combining the lag and current values, the lag value of interest is also in the model as the coefficient did not become insignificant in the previous step. The ECM is calculated from equation 7 by moving all the variables to one side and generating the series keeping the error term on the other (Appendix D). As ECM is found to be negative and significant on including in the equation, the model seem to be correct and showing the convergence of the short run into the long run model. The Error correction term

contains the effect of Interest Rate, Change in Dependency Ratio, GDP per capita and Trade, interprets that these dependent variables have long run impact on the Private savings and shows the speed of adjustment. The results are shown in the Appendix C. Now the insignificant variables are to be removed to find the short-run determinants of Private Savings. On applying zero restrictions as suggested by the t-test and F-test we came along a very specific model which contains all of the variables significant at 10% shown in the following Model:

$$\Delta psav_t = -\gamma_0 + \gamma_3 \Delta Dpr_t - \gamma_4 \Delta gdp_t - \gamma_5 \Delta tr_t - \varphi\ ECM + \ u_t \ \ldots \qquad \text{(eq 5.6)}$$

Table 5.25: Short-run regression for Private savings as shown in Equation 5.6

Dependent Variable: DLPSAV				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	-0.727340	0.413506	-1.758959	0.0869
DDPR	22.78689	12.13126	1.878362	0.0682
DGDP	-0.770573	0.339293	-2.271111	0.0291
DLTR	-1.612546	0.402919	-4.002160	0.0003
ECM	-0.055386	0.029585	-1.872099	0.0691

Now in the process the second lag of the interest rate will be removed after the inclusion of the ECM as it became insignificant. After the elimination of the second lag of the interest rate the coefficient of first difference is still slightly insignificant at 20%, we could have kept it in the model as the variable is not highly insignificant, but eliminating the first difference of the interest rate will make all the variables including GDP significant at 10%. The resultant model will become surpassing to the others. Thus the first difference of interest rate as well as the second lag of interest rate are removed during the process of reduction and attaining the parsimonious model. The results are given in the table 5.25.

The results shows that there is a significant short-run impact of change of Dependency Ratio, the GDP per capita, log of terms of trade adjustment. The Error Correction Term is negative and significant at 10% which implies that our model is stable and it converges towards the long-run mean. Furthermore, the value of coefficient represents the speed of adjustment, which means that there is 5% adjustment of the change annually towards the long run mean.

The difference in the change in the dependency ratio has positive impact on the difference of private savings, but it is unclear from the model that whether the change is positive or negative. It implies that the change in the dependency increases the savings for Pakistan. According to the theory the increase in dependency ratio decreases the savings and vice versa.

The first lag difference of GDP per Capita and the first difference of Trade has negative impact on the difference of the private savings. Although the result shows the opposite impact as compared to the theory but it is true for the case of Pakistan. The main reason for this reverses behavior is the money value impact on the local currency. The devaluation of the currency gives the illusion of the development in the economy and the output and trade seem to be enhanced, which is just due to the perspective. The money value not have its direct impact on the Private savings but, it reduces the purchasing power and the savings thus decreases.

The results of the time series analysis show that in the long run there is an impact of the interest rate, change in dependency ratio, GDP per capita, and the trade on the private savings but no significant impact of Remittances. On the other hand, in short run there is no significant impact of interest rate, but the significant impact of change in the Dependency ratio, GDP per capita and trade, with 5% speed of adjustment.

Concluding Remarks:

The Data Generating Process (DGP) of the real world data is not known, thus, if we include the variables without knowing the DGP, it may cause the occurrence of the spurious regression.

To avoid this problem, it may be helpful to include the variables suggested by the literature after verifying the association by the real data. For this purpose the Cross Markov Chain is applied and then moved towards General to Specific Approach.

The results of the Cross Markov Chain Method showed that interest rate has negative impact on the Private Savings but as we exclude the High Income countries from the data the impact is seen to be opposite. Although the impact is found to be insignificant but to verify the relationship we included the variable in the time series analysis, we found out that the parameter is significantly different from zero. The impact of interest rate is negative on the private savings, which shows that the income effect is greater than the substitution effect.

From the cross MCM we found out that the sign of trade also becomes opposite for both the cases[16], whereas in the Time Series analysis the results shows that in the short-run overall change in trade has negative impact on the change in the Private Savings, while in the long-run the trade also have positive relationship.

Inflation and taxes were excluded for being insignificantly associated with our dependent variable. Financial development was slightly associated with the Private savings in the cross sectional analysis of all countries but as we removed the High Income economies for the analysis, the association became insignificant. Even if we include the financial development variable in the time series analysis, it will have to be removed due to the problem of Multicollinearity.

According to the Cross MCM remittances have significant negative relationship with the Private Savings mainly because most of the earned money from remittances are consumed by the families of the remitters either in the form of property or been invested in small businesses,

[16] While including High Income Countries and after excluding the High Income countries from the sample

thus not being part of the Private Savings. For the case of Pakistan Time Series analysis the Remittances has no influence in the short-run or long-run.

GDP has positive association with Private Savings in Cross Sectional whereas for the time series analysis in the case of Pakistan the impact has been reversed.

Our findings contrasts with Ahmed's (2015) study, as they implied inflation rate, financial development, dependency ratio as the determinants of Private Savings. We included these variables in our study but inflation and financial development were removed in Cross MCM. Then after General to Specific application we reached to a parsimonious and unique model.

Chapter 6 CONCLUSION AND RECOMMENDATIONS

6.1. Conclusion

The present study is able to respond to various concerns related to the macroeconomic variables and their impact on the Private savings individually as well as altogether. The results and findings of the current study of the step-wise analysis is presented in the previous section. First, the Cross Sectional Analysis is assessed in which we have applied Cross Markov Chain Method on the variables to see the association between the Private Savings and the independent variables. These variables are taken after the vast study of literature, so that the economic foundation can be kept intact. Secondly, the variables which were found to be related by the cross sectional analysis are then to be included in the time series analysis in which we have applied DHSY methodology for the case of Pakistan, only using the variables that are significantly associated with private Savings in the Cross Sectional Analysis

We demonstrated essential findings from our analysis just by adopting Cross Markov Chain Method. It helped us analyse the data without use of any complex hidden mathematical based methodology that depends upon set of unrealistic assumptions to be followed. We found out that the association of the variables differ with the socio-economic background of the country, as the empirical results of Cross MCM are different for the data before and after removing the High Income countries. We were also able to find out the sign by which the variables are influencing the macroeconomic variable.

The main purpose of the present study is to find an econometrically correct model for Private Savings using variables from the previous studies after detailed Cross Markov Chain Analysis (Qubtia, 2017) and General to Specific approach (Hendry, 1978). We found out that in the long-run the change of Dependency Ratio, Interest Rate, log of GDP per capita and the log of terms of trade have significant impact on the Private Savings. In the short-run there is

significant impact of change of Dependency Ratio, log of GDP per capita and the log difference of terms of trade adjustment. We have also found out the speed of adjustment of our model.

We estimated the relevant variables backed by the data and found the signs of the coefficients of the independent variables. Contrary to many of the studies we found out that Interest Rate has negative Impact on the Private Savings of Pakistan. It is due to believes and cultural background of majority of the people that mostly people especially from the religious family background, despite the benefits of the high interest rate evade savings. The change of Dependency ratio has a positive effect on the Private Savings. Trade has the similar results as many researchers, however, the effect of the change of dependency ratio is positive as shown by the results of the estimation. This may seem unusual but as we interpret the construction of the variable, we understand that the impact of the rate by which the dependency ratio is changing the private savings are being influenced. More the change in the dependency ratio the higher will be the savings. From the results it is not clear that the change is whether positive or negative.

The log of remittances has no impact on the private savings for Pakistan. It is the common observation that there is a huge contribution of the remittances in the Balance of Payment, but most of the inflow as the remittances is used in the purchase of property, family expenditure, or the purchase of expensive metal (such as gold) etc. The remittances has insignificant impact as it is not being saved rather consumed on large scale.

The Error Correction term is negative and significant, which implies that the model is stable and there exists the convergence in long-run.

6.2. Recommendations:

Well the results shows that there is positive effect of the interest rate only in the short-run on the private savings, which suggests that there is no use of manipulating interest rate in order to enhance savings. Although the increase in the Interest rate may have negative impact on the savings in the long-run. The key to improve the Private savings is to provide trade incentives so that the trade can be improved. It may seem that in the short run the trade is having negative impact on savings but it can be considered as the cost of establishing business or enhancing quality of the product. By instituting the trade ties with other countries the negative impact can be reduced.

The Dependency ratio may be decreased as it eludes the load off the Private Savings. The change in the dependency ratio happens to increase the Savings according to the results of the estimation. Another way to improve the savings is to keep the focus on the improvement of the output while keeping the money value in consideration. Although this paper shows the negative impact of GDP per capita on the private savings which is absurd. The problem of over-estimated GDP can be solved by selection of well-constructed variable for the proxy of output of the country.

Further Research:

There is always further dimensions that opens up with a new research, in the present study we applied cross sectional analysis using Cross Markov Chain process using Median as the centre of representation and split the data in to two categories i.e. low and High. Researchers can extend the research by applying same techniques splitting the data into more categories for deep study of the variables for example low medium and high. Furthermore the same technique can be applied on other data with using different frequencies. In order to have correct modelling one may apply the correct modelling including the seasonal and monthly impact.

References:

Abbas, S. (2016). Empirical Modelling and Model Selection: An Application of Encompassing Principle on Consumption Function of Pakistan. *Unpublished thesis*.

Abel, A. B., & Bernanke, B. S. (1998). Macroeconomics. Addison-Wesley, New York.

Agrawal, P., Sahoo, P., & Dash, R. K. (2009). Savings behavior in South Asia. *Journal of Policy Modeling*, 31(2), 208-224.

Ahmed, F. (2015). Determinants of Savings Behavior in Pakistan: Long Run-Short Run Association and Causality. *Timisoara Journal of Economics and Business*, 8(1), 103-136.

Akram, N., & Akram, M. I. (2016). Macro and Socioeconomic Determinants of Savings in Pakistan. *Pakistan Business Review*, 18(2), 325-342.

Ali, A. (2016). Saving and Investment in Pakistan. *SBP Staff Notes 01/16.*

Arellano, M., & Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *The review of economic studies*, 58(2), 277-297.

Arellano, M., & Bover, O. (1995). Another look at the instrumental variable estimation of error-components models. *Journal of econometrics*, 68(1), 29-51.

Athukorala, P. C., & Sen, K. (2004). The determinants of private saving in India. *World Development*, 32(3), 491-503.

Campos, J., & Ericsson, N. R. (1999). Constructive data mining: modeling consumers' expenditurein Venezuela. *The econometrics journal*, *2*(2), 226-240.

Chamberlain, G. (1984). Panel data. *Handbook of econometrics*, 2, 1247-1318. Elsevier

Charemza, W. W., & Deadman, D. F. (1997). *New directions in econometric practice*. Books.

Davidson, J. E., Hendry, D. F., Srba, F., & Yeo, S. (1978). Econometric modelling of the aggregate time-series relationship between consumers' expenditure and income in the United Kingdom. The Economic Journal, 661-692

Duesenberry, J. S. (1949). Income, saving, and the theory of consumer behavior. *Cambridge, Mass*: Harvard University Press.

Faridi, M. Z., & Arif, M. A. (2012). Globalization and saving behavior of Pakistan: an empirical analysis. *Pakistan Journal of Social Sciences*, 32(1), 77-91.

Friedman, M. (1956). A Theory of the Consumption Function. *Princeton NJ*. Princeton University Press.

Gilbert, C. L. (1986). *The development of British econometrics 1945-85*. University of Oxford Institute of Economics and Statistics.

Hafizah, H. A. K. (2009). An Empirical Analysis of Savings Determinants in Malaysia. *Doctoral dissertation*, Universiti Utara Malaysia.

Hendry, D. F. (1974). Stochastic specification in an aggregate demand model of the United Kingdom. *Econometrica: Journal of the Econometric Society*, 559-578.

Hendry, D. F. (1983). Econometric Modelling: The "Consumption Function" In Retrospect. *Scottish Journal of Political Economy*, 30(3), 193-220.

Hendry, D. F. (1984). Monte Carlo experimentation in econometrics. Handbook of econometrics, 2, 937-976.

Hendry, D. F. (1988). The encompassing implications of feedback versus feed forward mechanisms in econometrics. Oxford Economic Papers, 132-149.

Hendry, D. F. (1995). Dynamic econometrics. Oxford University Press.

Hendry, D. F., & Richard, J. F. (1982). On the formulation of empirical models in dynamic econometrics. *Journal of Econometrics*, 20(1), 3-33.

Holtz-Eakin, D., Newey, W., & Rosen, H. S. (1988). Estimating vector autoregressions with panel data. Econometrica: *Journal of the Econometric Society*, 1371-1395.

Husain, A. M. (1996). Private saving and its determinants: the case of Pakistan. *The Pakistan Development Review*, 49-70.

Kazmi, A. A. (2001). Study on Saving Functions for Pakistan: The Use and Limitations of Econometric Methods. *The Lahore Journal of Economics,* 6(2), 57-101.

Keynes, J. M. (1936). The general theory of employment, money and interest. *The Collected Writings*, 7.

Khan, T., Gill, A. R., & Haneef, S. (2013). Determinants of Private Saving: A Case of Pakistan. *Asian Journal of Economic Modelling*, 1(1), 1-7.

Loayza, N., Schmidt-Hebbel, K., & Servén, L. (2000). What drives private saving across the world?. *Review of Economics and Statistics*, 82(2), 165-181.

Lovell, M.C. (1983): "Data Mining", Review of Economics and Statistics 65, 1 – 12.

Low Saving And Investment Trap, (2016). Retrieved: July 11, 2017 from https://www.dawn.com/news/1236649

Marcel, I. O., & Kirori, G. N. (2016). Analyzing the Determinants of Private Savings in Kenya over the Period 1993-2013. *European Journal of Business, Economics and Accountancy*, 4(2), 67-80.

Masson, P. R., Bayoumi, T., & Samiei, H. (1998). International evidence on the determinants of private saving. *The World Bank Economic Review*, 12(3), 483-501.

McRae, H. (1995). *The world in 2020: power, culture and prosperity: a vision of the future*. HarperCollins.

Modigliani, F. (1949). Fluctuations in the saving-income ratio: a problem in economic forecasting. In *Studies in income and wealth* (pp. 369-444). NBER.

Modigliani, F., & Sterling, A. (1983). Determinants of private saving with special reference to the role of social security- cross-country tests. In *The Determinants of National Saving and Wealth* (pp. 24-55). Palgrave Macmillan UK.

Nasir, S., Khalid, M., & Mahmood, A. (2004). Saving-investment Behaviour in Pakistan: An Empirical Investigation. *The Pakistan Development Review*, 665-682.

Niculescu-Aron, I., & Mihaescu, C. (2014). Modelling the impact of economic, demographic and social determinants on household saving rate in the former socialist countries (Central and Eastern Europe). *Procedia Economics and Finance*, 10, 104-113.

Pearson, K. (1904). On the theory of contingency and its relation to association and normal correlationthe analysis of contingency tables. *Foreword to Drapers Company research memoirs:* Biometric series I.

Qubtia, M. (2017). A Re-Examination of the Empirical Evidence of Export Led Growth Hypothesis. *Unpublished thesis.*

Saving Rates Hit Bottom in FY14, (2014). Retrieved: July 11, 2017 from https://www.dawn.com/news/1151110

Saving Money, (2017). Retrieved: July 11, 2017 from https://www.dawn.com/news/1329195

Sajid, G. M., & Sarfraz, M. (2008). Savings and Economic Growth in Pakistan: An issue of causality. *Pakistan Economic and Social Review*, 17-36.

Sargan, J. D. (2001). Model building and data mining. *Econometric Reviews*, *20*(2), 159-170.

Seltman, H. J. (2012). Experimental design and analysis. *Pittsburgh*: Carnegie Mellon University, 428.

Siraj, S., & Bengali, K. (2007). Estimation of the Harrod-Domar Growth Equation: Pakistan's Case. *Journal of Independent Studies and Research (JISR),* 5(2), 45-51.

Standard Chartered Bank, (2017). The Race to Save: How the emerging affluent are preparing for tomorrow. Retrieved: July 10, 2017 from https://www.sc.com/en/resources/global-en/pdf/Research/2017-emerging-affluent-research.pdf

Wilson, J., & Good, O. P. (1985). Ph. D. and Master Program in Economics. *Statistics*, 36, 387-389.

APPENDIX A:

Table 0.1: List of 119 Countries taken for Cross Sectional Analysis

Afghanistan	Dominican Republic	Kyrgyz Republic	Saudi Arabia
Albania	Ecuador	Liberia	Senegal
Algeria	Egypt, Arab Rep.	Macao SAR, China	Serbia
Angola	Fiji	Macedonia, FYR	Seychelles
Antigua and Barbuda	Gabon	Madagascar	Sierra Leone
Argentina	Gambia, The	Malawi	South Africa
Armenia	Georgia	Malaysia	Sri Lanka
Australia	Ghana	Mali	St. Lucia
Azerbaijan	Grenada	Mauritius	Sudan
Bangladesh	Guatemala	Mexico	Suriname
Belarus	Guinea	Moldova	Swaziland
Belize	Guinea-Bissau	Mongolia	Sweden
Benin	Guyana	Morocco	Switzerland
Bhutan	Haiti	Mozambique	Tajikistan
Bolivia	Honduras	Namibia	Tanzania
Botswana	Hong Kong SAR, China	Nepal	Thailand
Brazil	Hungary	Nicaragua	Timor-Leste
Bulgaria	Iceland	Niger	Togo
Burkina Faso	India	Nigeria	Trinidad and Tobago
Cambodia	Indonesia	Norway	Tunisia
Cameroon	Iran, Islamic Rep.	Oman	Turkey
Chile	Iraq	Pakistan	Uganda
China	Israel	Paraguay	Ukraine
Colombia	Jamaica	Peru	Uruguay
Comoros	Japan	Philippines	Vanuatu
Congo, Dem. Rep.	Jordan	Poland	Venezuela, RB
Cote d'Ivoire	Kazakhstan	Qatar	Vietnam
Croatia	Kenya	Romania	West Bank and Gaza
Czech Republic	Korea, Rep.	Russian Federation	Yemen, Rep.
Denmark	Kuwait	Rwanda	

Table 0.2: List of 89 Low and Middle Countries taken for Cross Sectional Analysis

Niger	Cote d'Ivoire	Algeria
Malawi	Yemen, Rep.	Namibia
Madagascar	Pakistan	Macedonia, FYR
Liberia	India	Belize
Congo, Dem. Rep.	Moldova	Jordan
Gambia, The	Nicaragua	Iraq
Mozambique	Vietnam	Fiji
Guinea	Ukraine	Jamaica
Togo	Sudan	Serbia
Guinea-Bissau	Honduras	Azerbaijan
Burkina Faso	Nigeria	South Africa
Afghanistan	Bhutan	Belarus
Sierra Leone	Vanuatu	Thailand
Rwanda	West Bank and Gaza	Iran, Islamic Rep.
Uganda	Morocco	Peru
Comoros	Philippines	Colombia
Mali	Bolivia	Ecuador
Nepal	Swaziland	Botswana
Benin	Indonesia	Dominican Republic
Haiti	Armenia	Bulgaria
Tanzania	Egypt, Arab Rep.	St. Lucia
Senegal	Georgia	China
Tajikistan	Tunisia	Gabon
Kyrgyz Republic	Guatemala	Brazil
Timor-Leste	Sri Lanka	Romania
Cambodia	Albania	Mexico
Bangladesh	Mongolia	Russian Federation
Cameroon	Paraguay	Turkey
Ghana	Angola	Grenada
Kenya	Guyana	

Appendix B:

Table 0.3: Results of the ARDL with 2 lags of the General Model for Pakistan (Equation 5.8)

Dependent Variable: LPSAV				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	-1.153780	2.349708	-0.491031	0.6281
LPSAV(-1)	0.774319	0.213529	3.626291	0.0014
LPSAV(-2)	0.132125	0.238548	0.553875	0.5850
IR	-0.036941	0.025553	-1.445665	0.1618
IR(-1)	-0.015774	0.033373	-0.472650	0.6409
IR(-2)	0.033572	0.029904	1.122653	0.2732
DPR	21.77615	19.07757	1.141453	0.2654
DPR(-1)	-21.05062	21.88316	-0.961955	0.3461
DPR(-2)	-0.634473	16.50887	-0.038432	0.9697
LGDP	-0.346405	0.576367	-0.601013	0.5537
LGDP(-1)	0.316034	0.893436	0.353729	0.7268
LGDP(-2)	0.061525	0.545885	0.112708	0.9112
LREM	-0.042777	0.068054	-0.628568	0.5358
LREM(-1)	0.002984	0.062066	0.048071	0.9621
LREM(-2)	-0.016225	0.059282	-0.273689	0.7868
LTR	-1.038719	0.550275	-1.887635	0.0718
LTR(-1)	1.130338	0.649196	1.741136	0.0950
LTR(-2)	0.533421	0.633708	0.841746	0.4086

R-squared	0.841368	Mean dependent var	2.365931
Adjusted R-squared	0.724119	S.D. dependent var	0.361557
S.E. of regression	0.189906	Akaike info criterion	-0.184607
Sum squared resid	0.829476	Schwarz criterion	0.567693
Log likelihood	21.78444	Hannan-Quinn criter.	0.089339
F-statistic	7.175879	Durbin-Watson stat	2.146535
Prob(F-statistic)	0.000012		

Table 0.4: Results of the Long-run regression of the Specific Model for Pakistan (Equation 5.9)

R-squared	0.836529	Mean dependent var	2.353328
Adjusted R-squared	0.790553	S.D. dependent var	0.366341
S.E. of regression	0.167657	Akaike info criterion	-0.529532
Sum squared resid	0.899488	Schwarz criterion	-0.115801
Log likelihood	21.12016	Hannan-Quinn criter.	-0.377883
F-statistic	18.19488	Durbin-Watson stat	2.238192
Prob(F-statistic)	0.000000		

Figure 0.1: Line Graph of the error term of specific model (Equation 5.9)

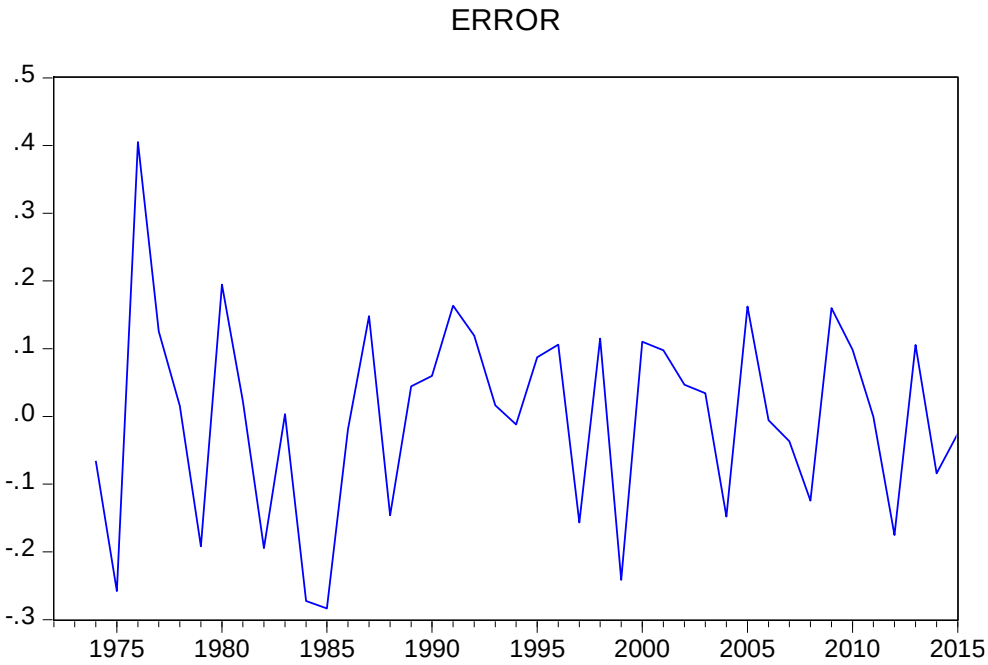


Table 0.5: ADF test of error term at level for no intercept no trend

Null Hypothesis: ERROR has a unit root		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.164049	0.0000
Test critical values:	1% level	-2.622585	
	5% level	-1.949097	
	10% level	-1.611824	
*MacKinnon (1996) one-sided p-values.			

Figure 0.2: Histogram - Normality test

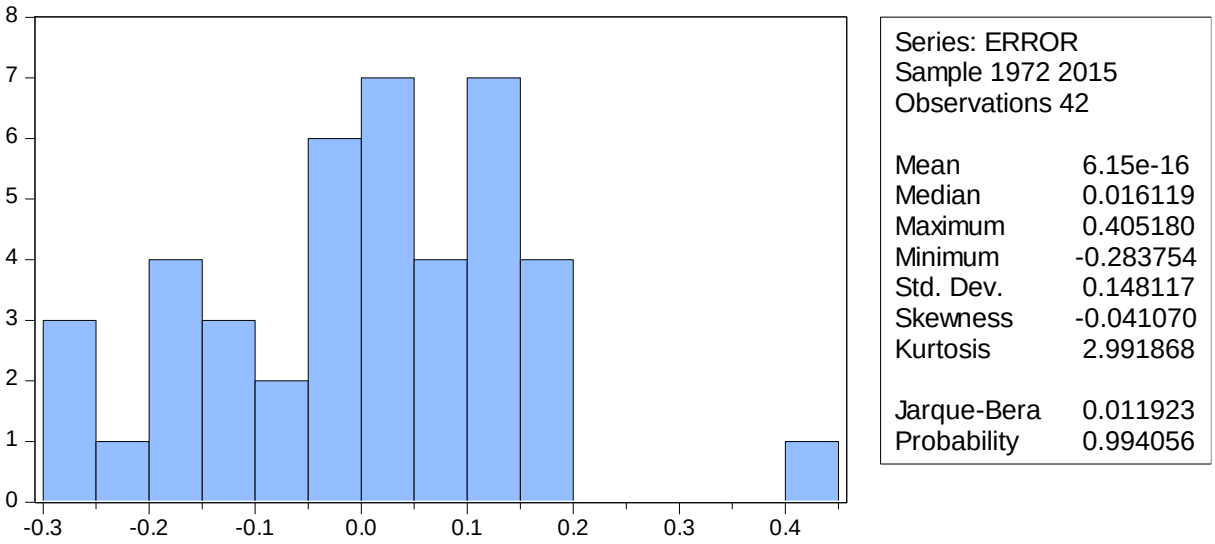


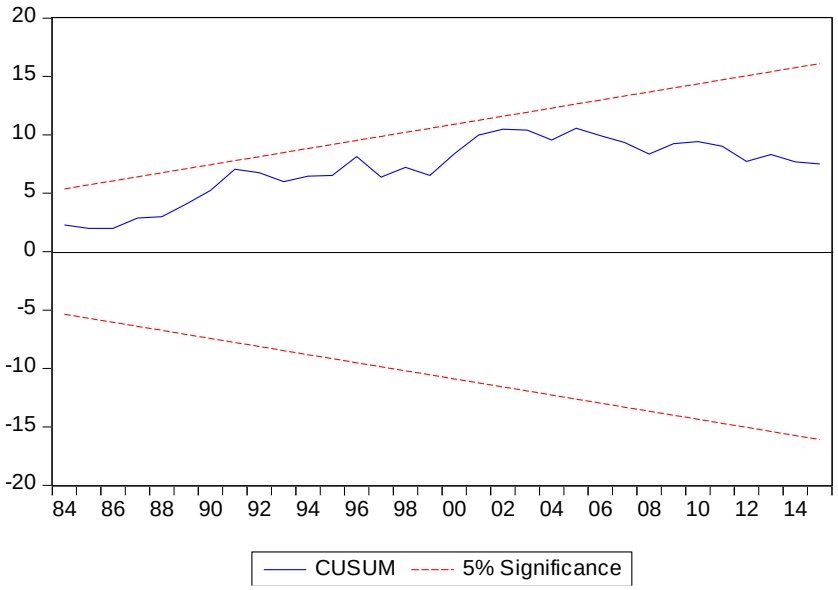
Table 0.6: Test results for Serial correlation.

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	0.796517	Prob. F(2,29)	0.4602
Obs*R-squared	2.117790	Prob. Chi-Square(2)	0.3468

Table 0.7: Test results for Heteroskedasticity

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	2.181200	Prob. F(9,31)	0.0507
Obs*R-squared	15.96903	Prob. Chi-Square(9)	0.0675
Scaled explained SS	9.232309	Prob. Chi-Square(9)	0.4161

Figure 0.3: CUSUM stability check



Appendix C:

Table 0.8: Results of the Short-run regression with lags of the General Model for Pakistan (Equation 5.10)

Dependent Variable: LPSAV				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	-0.823050	0.523148	-1.573263	0.1247
DIR	-0.018968	0.019571	-0.969172	0.3391
IR(-2)	0.006458	0.014402	0.448417	0.6566
DDPR	25.49702	12.42018	2.052871	0.0476
DGDP	-0.569943	0.375771	-1.516729	0.1383
DLTR	-1.481221	0.423974	-3.493661	0.0013
ECM	-0.057363	0.032775	-1.750234	0.0888

R-squared	0.420349	Mean dependent var	-0.002753
Adjusted R-squared	0.320981	S.D. dependent var	0.217752
S.E. of regression	0.179433	Akaike info criterion	-0.447017
Sum squared resid	1.126868	Schwarz criterion	-0.157406
Log likelihood	16.38736	Hannan-Quinn criter.	-0.340863
F-statistic	4.230198	Durbin-Watson stat	2.217736
Prob(F-statistic)	0.002649		

Table 0.9: Results of the Short-run regression of the Specific Model for Pakistan (Equation 5.11)

R-squared	0.393478	Mean dependent var	-0.002753
Adjusted R-squared	0.327908	S.D. dependent var	0.217752
S.E. of regression	0.178515	Akaike info criterion	-0.496940
Sum squared resid	1.179107	Schwarz criterion	-0.290074
Log likelihood	15.43574	Hannan-Quinn criter.	-0.421115
F-statistic	6.000884	Durbin-Watson stat	2.206040
Prob(F-statistic)	0.000796		

Table 0.10: ADF test of error term of Short-run at level for no intercept no trend

Null Hypothesis: U has a unit root		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.106226	0.0000
Test critical values:	1% level	-2.622585	
	5% level	-1.949097	
	10% level	-1.611824	
*MacKinnon (1996) one-sided p-values.			

Figure 0.4: Line Graph of the error term of specific model (Equation 5.11):

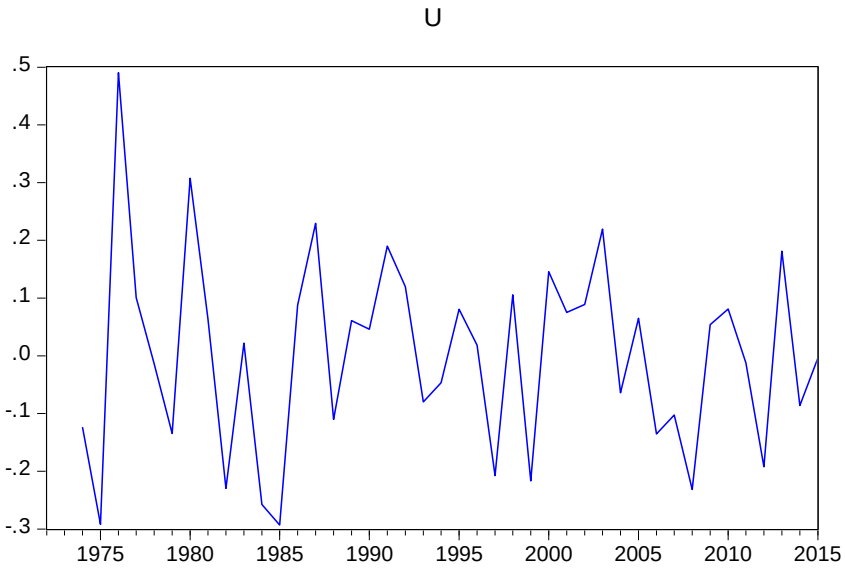


Figure 0.5: Histogram - Normality test

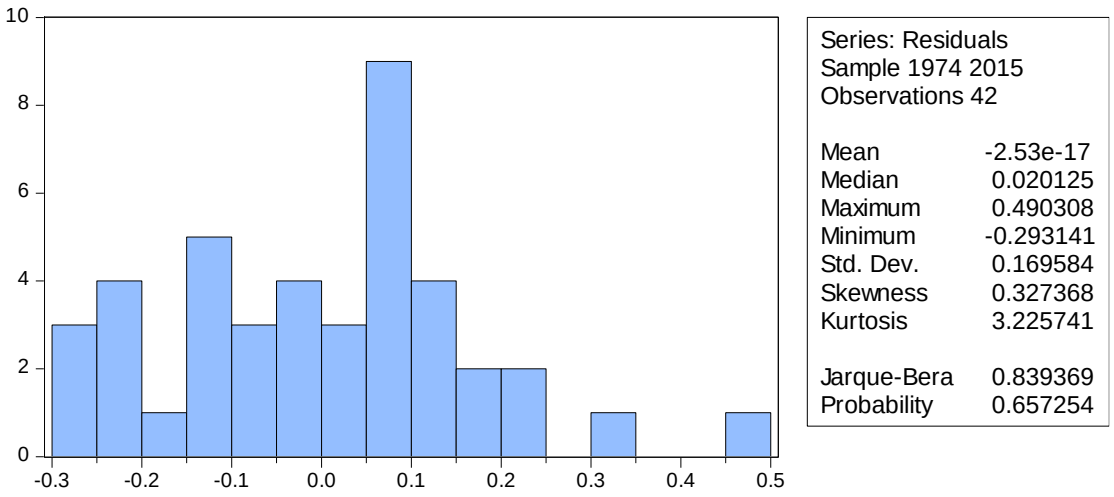


Table 0.11: Test results for Serial correlation.

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	0.782353	Prob. F(2,29)	0.4652
Obs*R-squared	1.797296	Prob. Chi-Square(2)	0.4071

Table 0.12: Test results for Heteroskedasticity

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	2.065565	Prob. F(9,31)	0.1051
Obs*R-squared	7.666761	Prob. Chi-Square(9)	0.1046
Scaled explained SS	6.621576	Prob. Chi-Square(9)	0.1573

Figure 0.6: CUSUM stability check