Have Developing Countries been Seeking to Minimize Welfare Cost of Taxation? Evidence from Barro’s Tax Smoothing Hypothesis

A thesis for the partial fulfillment of the degree requirements of Doctor of Philosophy

By
IHTSHAM UL HAQ PADDA

July, 2009

Department of Economics
Federal Urdu University of Arts, Science and Technology (FUUAST), Islamabad
Acknowledgement

In the name of Allah, the Most Beneficent, the Most Merciful

First, I would like to thank my thesis worthy advisor, Distinguished National Professor of Economics Dr. Syed Nawab Haider Naqvi, of Federal Urdu University of Arts, Science and Technology (FUUAST) Islamabad, for his unflinching support and invaluable guidance in the PhD program. The door to his office was always open whenever I ran into a trouble spot or had a problem in the course of research work. He affectionately steered in the right direction whenever I was in hot water. Without his encouragement and guidance, I could not have accomplished this dissertation.

I am also greatly indebted to Dr Ather Maqsood Ahmed of NUST Islamabad, who taught me the nitty-gritty of writing academic papers and extended valuable cooperation throughout my study. His expert opinion and useful tips on my work were always insightful and worked as a beacon for carrying out the colossal task of research. I also want to thank Dr Waseem Shahid Malik of QAU Islamabad, who was always more than eager to solve the critical problems faced by me during the entire exercise of writing the research work. I am grateful to my teachers in PhD program: Dr Rehana Siddiqui, Dr Muhammad Iqbal and Dr Abdul Qayyum of PIDE, Dr Abdul Salam of FUUAST, Dr Aitzaz Ahmad of QAU, Dr Ather Akbari of Saint Mary’s University Canada, Dr Seemi Mallick and Dr Adiqa Kousar Kiani, Head of the Department of Economics at FUUAST, for their kind help and guidance. I will be failing in my duty if do not thank and mention laudable role of two institutions viz Higher Education Commission of Pakistan and Punjab Workers Welfare Board, which provided me an opportunity to avail the PhD scholarship.

I am highly thankful to thesis examiners Dr Saleh AmirKhalkhali of Saint Mary’s University Canada and Dr Cohen of the Netherlands, for their time, keen interest in thesis examination and invaluable comments and suggestions which proved a great help and enhanced the authenticity of this dissertation. Their recommendations will certainly open up new vistas for my future research plans.

Last, but not least, I am really grateful to my friends Javed, Saud and Tanweer who shared with me lodging facility in a true learning environment. I also thank my parents, for educating me, my wife, for her unconditional support to pursue my interests, my brothers and sisters, for their unwavering cooperation. Special thanks to my son, Nashit, who could not fully enjoy my affection in his babyhood.

IHTSHAM UL HAQ PADDAA
Abstract

The developing economies are characterized by severe fiscal deficit, sky-rocketing public debt and unstable economic growth. To finance fiscal activities governments’ resources are limited. The deficits can be corrected through fiscal adjustment and regulations in the shape of government spending cuts, tax increase and/or debt creation. One of the basic decisions the government has to make is to share out the burden of fiscal adjustment between spending, borrowing and taxing with a view to satisfying the dictates of efficiency and equity, including inter-temporal equity. This fine balancing of policy instruments to achieve well-known fiscal objectives involves, among other things, an evaluation of the level of taxes and spending to decide whether to adjust them at the economically realistic levels. Tax increases may be less problematic than reducing expenditure if the current level of tax revenue is comparatively low based. However, in the former case, considerations of the tax smoothing acquire significance. Another important issue, which this study tackles, is the problem of causality between taxes and spending. Particularly, in order to decide which variable should be given temporal priority, it should be known whether changes in spending lead, follow, occur simultaneously, or are independent of the changes in tax rates. The present study finds that the fiscal stances of Sri Lanka, India and Pakistan are not significantly different from other developing countries, so that our analysis of these countries can be safely generalized to other developing countries. It also aims to check whether these developing countries have in effect adopted a tax smoothing policy to overcome the fiscal deficit and what forms such policy has taken. The empirical analysis presented here reveals that Pakistan and Sri Lanka have tried to minimize the welfare cost of taxation but these have not been policies fully consistent with the best practice tax smoothing. On the contrary, India has not sought to smooth its tax rates to minimize the welfare cost at all. Moreover, fiscal policies in Pakistan, Sri Lanka and India have been consistent with the fiscal synchronization, the spend-and-tax, and the institutional independence hypotheses respectively. The present study makes quite a few non-trivial recommendations, which may or may not accord with so-called common sense approaches to such problems. For instances it shows at length that to minimize the welfare cost of taxation the governments should finance their permanent expenditure by increasing the tax rate while transitory shocks to the expenditures or output should be financed by creating public debt. Such debt should, however, be contingent and retired in good days. In the same vein, it recommends that, a countercyclical (debt falls in booms and rises in recessions) policy might also be adopted. On the other, a pro-cyclical policy may lead to volatility in tax rates and increase the welfare cost of taxation. It is asserted that if developing countries fiscal policies are reformed along the lines suggested in this study it would lead to major over-hauling of the fiscal stances of the developing countries—those which would lead to efficient and equitable policies based on robust theoretical and empirical foundations.
# Table of Contents

## CHAPTER 1

**Introduction**

1.1- Tax smoothing: ..................................................... 1

1.2- Recent Literature and Identification of Research Gaps: ........... 2

1.3- Motivation and Significance of the Study: ........................ 4

1.4- Research Strategy of the Study: ................................. 6

1.5- The Main Hypotheses of the Study: ........................... 7

1.6- Justification for the Study: ..................................... 9

1.7- Structure of the Dissertation: .................................. 9

1.8- Concluding Remarks: .......................................... 10

## CHAPTER 2

**Literature Review** ..................................................... 13

2.1- Fiscal Policies: .................................................... 13

2.1.1- Ricardian Equivalence: .................................... 14

2.2- Tax Smoothing: .................................................... 16

2.2.1- Literature on Tax Smoothing: ................................ 16

2.2.1.1- Empirical Estimation of the Tax Smoothing Hypothesis: ... 17

2.2.1.2- Tax Smoothing and Optimal Debt Management: .......... 20

2.2.1.3- Tax Smoothing and Fiscal Policy Rules: .................. 23
2.2.1.4- Tax Smoothing and Smooth Tax Rates: 26
2.2.1.5- Tax Smoothing and Seigniorage: 27
2.2.1.6- Tax Smoothing and Disaggregated Taxation: 29
2.2.1.7- Tax Smoothing and Private Sector: 30
2.2.1.8- Tax Smoothing and Budget Deficit: 31
2.2.1.9- Growth and Tax Smoothing: 34
2.2.1.10- Tax Smoothing in Developing Countries: 35

2.3- Conclusion: 37

2.4- Appendix to Chapter 2:

Review of Empirical Studies for Tax Smoothing: 40

CHAPTER 3

An Overview of Public Finances of Developing Countries with a Focus on Pakistan 45

3.1- An overview of the Economies of Pakistan, Sri Lanka and India: 46

3.1.1- Pakistan: 46

3.1.2- Sri Lanka: 46

3.1.3- India: 47

3.2- Public Finances in Pakistan, Sri Lanka and India: 48

3.2.1- Public Revenue: 48

3.2.2- Direct and Indirect Taxes: 51
3.2.2.1- Temporal Shifts in Direct and Indirect Taxes in the Region:  

3.2.2- Public Expenditures:  

3.2.3- Fiscal deficit and Public Debt:  

3.2.3.1- Public Debt:  

3.3- Conclusion:  

Chapter 4  

Theoretical Model  

4.1- Theoretical Derivation of the Model:  

4.2- Conclusion:  

Chapter 5  

Data and Methodology  

5.1- The Data:  

5.2- Decomposition:  

5.2.1- Beveridge-Nelson Decomposition:  

5.2.1.1- Beveridge-Nelson Decomposition Procedure:  

5.2.2- Wavelet Decomposition:  

5.2.2.1- Wavelet Transformation Procedure:  

5.3- Integration:  

5.3.1- Testing for Unit Root:  

5.4- Conclusion:
Chapter 6

Estimation and Results--- 1

6.1- A Comparison of Average Tax Rate and Average Expenditure Rate in Pakistan Sri Lanka and India:

   6.1.1- Pakistan: 97
   6.1.2- Sri Lanka: 98
   6.1.3- India: 98

6.2- The Analysis of Tax Smoothing for Pakistan:

   6.2.1- Decomposition of Total Expenditure Rate Series: 100
   6.2.2- Graphical Analysis: 103
   6.2.3- Co-integration Analysis: 104
   6.2.4- Error Correction Analysis: 105
   6.2.5- Error Correction Analysis with Additional Transitory Variables: 108
   6.2.6- Tax-Spend Nexus: 109

6.3- Concluding Remarks:
Chapter 7

Estimation and Results--- 2

7.1- The Analysis of Tax Smoothing for Sri Lanka:
   7.1.1- Decomposition of Total Expenditure Rate Series: 114
   7.1.2- Graphical Analysis: 115
   7.1.3- Co-integration Analysis: 116
   7.1.4- Error Correction Analysis: 117
   7.1.5- Error Correction Analysis with Additional Transitory Variables: 119
   7.1.6- Tax-Spend Nexus: 120
7.2- Concluding Remarks: 120

Chapter 8

Estimation and Results--- 3

8.1- The Analysis of Tax Smoothing for India:
   8.1.1- Decomposition of Total Expenditure Rate Series: 124
   8.1.2- Graphical Analysis: 125
   8.1.3- Co-integration Analysis: 127
   8.1.4- Tax-Spend Nexus: 127
8.2- Concluding Remarks: 128
8.3- General Remarks on Chapters 6 to 8: 129
Chapter 9

Conclusion and Policy Implications 132

9.1- Summary: 132
9.2- Policy Implications: 137
9.3- Future Research Directions: 140

Bibliography 142

Appendixes

Appendix: I 161
The Beveridge-Nelson Decomposition Theory: 161

Appendix: II 165
Wavelet Transformation Theory: 165

Appendix: III 168
Table A. 1- ARIMA Specification for Beveridge-Nelson Decomposition 168

Appendix: IV 169
Table A-2- Error Correction Test (Pakistan) 169
Table A-3- Error Correction Test (Sri Lanka) 171
List of Tables

Table 2.1- Review of Empirical Studies for Tax Smoothing 40

Table 6.1- Descriptive statistics for Selected Developing Countries (1966-2007) 96

Table 6.2- ADF Unit Root Test for Tax rate, Expenditure Rate and Money Growth Rate (Pakistan) 97

Table 6.3- Co-integration Analysis for Pakistan 104

Table 6.4- Error Correction Analysis for Pakistan 106

Table 7.1- ADF Unit Root Test for Tax rate, Expenditure Rate and Money Growth Rate (Sri Lanka) 113

Table 7.2- Co-integration Analysis for Sri Lanka 116

Table 7.3- Error Correction Test (Sri Lanka) 118

Table 8.1- ADF Unit Root Test for Tax rate, Expenditure Rate and Money Growth Rate (India) 123

Table 8.2- Co-integration Analysis for India 126

Table 8.3- Causality Analysis between Tax Rate and WT-Permanent Expenditure Rate (India) 128

Table 8.4- Causality Analysis between Tax Rate and BN-Permanent Expenditure Rate (India) 128
List of Figures and Graphs

Figure 3.1- Tax Revenue for Selected Developing Countries (as % of GDP) 49

Figure 3.2- Total Revenue for Selected Developing Countries (as % of GDP) 49

Figure 3.3- Direct Taxes as a Share of Central Revenue in Pakistan, Sri Lanka and India and Some High-Income countries (2006, %) 52

Figure 3.4- Structural Change of Direct Taxes and Indirect Taxes (% of tax revenue) (Pakistan, Sri Lanka and India) 53

Figure 3.5- Total Expenditure of Selected Developing Countries (% of GDP) 55

Figure 3.6- Structure of Total Expenditure of Selected Developing Countries (% of GDP) 56

Figure 3.7- Fiscal Balance of Selected Developing Countries (% of GDP) 60

Figure 3.8- External Debt of Selected Developing Countries (% of GDP) 63

Graph 6.1- BN-Decomposition of Expenditure Rate Series into Permanent and Transitory Parts (Pakistan) 102

Graph 6.2- WT-Decomposition of Expenditure Rate Series into Permanent and Transitory Parts (Pakistan) 102

Graph 6.3- The Correspondence between Tax Rate and Permanent Expenditure Rate Series (Pakistan) 102
Graph 7.1- BN-Decomposition of Expenditure Rate Series into Permanent and Transitory Parts (Sri Lanka) 113

Graph 7.2- WT-Transformation of Expenditure Rate Series into Permanent and Transitory Parts (Sri Lanka) 114

Graph 7.3- The Correspondence between Tax Rate and Permanent Expenditure Rate Series (Sri Lanka) 114

Graph 8.1: BN-Decomposition of Expenditure Rate Series into Permanent and Transitory Parts (India) 124

Graph 8.2: WT-Transformation of Expenditure Rate Series into Permanent and Transitory Parts (India) 124

Graph 8.3: The Correspondence between Tax Rate and Permanent Expenditure Rate Series (India) 125
Chapter 1
Introduction

Fiscal policy primarily deals with regulating the level and composition of revenue, expenditure and the public debt with a view to achieving a modicum of fiscal sustainability over a period of time. It incorporates numerous basic policy issues including the proper size and role of the government in accelerating economic growth, social development and redistribution of the benefits of the economic growth, improving employment and social justice by reducing inequality in income and wealth between income classes and present and future generations, and ensuring efficiency by promoting optimum allocation of resources.

However, government resources in developing countries are sadly insufficient to achieve these socially desirable fiscal objectives. Therefore, large budget deficits have been persistent in these countries. Now, these deficits can be corrected through fiscal adjustments and regulations in the shape of government spending cuts and/or tax increases. Another problem is the decision of sharing out the burden of fiscal adjustment between expenditure and tax revenue generation and the creation of public debt. This necessitates an assessment of the initial level of taxes and spending to decide whether to adjust them at the desired level is politically and economically realistic. Tax increases may be less problematic as compared to reducing expenditure if the current level of tax revenue is comparatively low based. However, considerations in the former case of the tax smoothing hypothesis acquires vital role.¹ An

¹ Barro (1979)
important issue in this regard is the causality between taxes and spending. Particularly, in order to decide which variable should be given temporal priority, it should be known (for policy decisions) whether changes in spending lead, follow, occur simultaneously, or are independent of the changes in taxes.²

This chapter introduces the highlights of the present study. After this section, section 1.1 deals with the introduction of tax smoothing and gives a brief history of the literature so far and indicates the gaps in the literature. Section 1.2 recounts the recent literature in the area with a view to identifying the main line of research followed in this study. The focus is on the fiscal policies followed in developing countries with a focus on Pakistan, Sri Lanka and India, but it is hoped that it can be generalized other countries as well. Section 1.3 gives the motivation of the study. Section 1.4 states the objectives of the study. Section 1.5 reveals the structure of the present work and the last section offers concluding remarks about the chapter.

1.1- Tax Smoothing:

According to the Ricardian Equivalence Theorem, for a given amount of public expenditure, if taxes are lump-sum then the shifts between taxes and public debt to balance the budget would have no significant effect on real variables. Within the Ricardian framework, approximation of non-lump-sum taxes is also economically valid. However, there is an important second order effect of the excess burden (welfare costs) of taxation over time. Non-

² There are four competing hypotheses regarding the relationship between taxes and spending, i.e. the spend-and-tax hypothesis (Roberts (1978) and Peacock & Wiseman (1979)), the tax-and-spend hypothesis (Friedman (1978)), the fiscal synchronization hypothesis ((Musgrave (1966) and Meltzer & Richard (1981))) and the institutional separation hypothesis (Wildavsky (1988)). The spend-and-tax hypothesis is consistent with the Barro’s (1979) tax-smoothing hypothesis.
lump-sum taxes (like sales tax, excise duties) distort economic incentives and impose what Musgrave (1958) called excess burden on the economy by changing the pattern of economic behavior. The changes in behavior caused by taxes create motivation for taxpayers to move out of taxed activities toward activities that are not being taxed, or are taxed at lower marginal rates. If the taxed activities are valued ones, the substitution effect reduces economic welfare. Because doing without taxes is entirely unfeasible, the dilemma for policy makers is how to finance indispensable government expenditure while keeping welfare cost comparatively low.

And yet the society would benefit if taxes were imposed in a way that minimized the welfare cost of taxation. As most of the time, the tax rate is increased to finance the increments in public expenditure, the changes in marginal rate of taxation consistent with the changes in public expenditure would have distortionary effects and increase the welfare cost of taxation. One way to minimize the welfare cost of taxation is to finance the fiscal imbalances by issuing bonds as an alternative to non-lump-sum taxes. That has the advantage of spreading the burden of these taxes over time. Several previous studies, particularly by Barro (1979, 1981), Sahasakul (1986) and others have analyzed the positive theory of optimal (which in the present study as socially desirable) taxation over time.

To diminish the distortionary effects of taxation Barro (1979) introduced the concept of tax smoothing over time. According to the hypothesis since taxes distort individuals’ choices and since those distortions rise more than proportionally with an increase in the tax rate hence, steady moderate tax rates over time are preferable to those which vary over a periods of high and low tax rates. A tax smoothing policy is preferable especially in the periods when there is a
transitory increase in government expenditure. For example, during wars, earthquakes, tsunamis or other unavoidable events, when productive efficiency is important, increased government expenditures financed by higher tax rates would distort the structure of economic incentives. By financing such events through the periodic issuance of bonds, the government can spread the required tax increase over an extended period of time rather than by increasing the current tax rates each time abnormal expenditure needs arise. Such action would be consistent with the idea of tax smoothing hypothesis.

The optimal form of a government intervention would be one that runs budget surpluses as well as deficits as required by future expectations of expenditure changes. In its basic form, a smooth tax rate implies that when a government anticipates a future increase in its expenditure it increases the tax rate today and runs a budget surplus; on the other hand, if it anticipates future decrease in its expenditure, it then decreases the tax rate today and runs a budget deficit. In the presence of such behavior temporary shocks to the government expenditure and revenue yield fiscal imbalances can cushioned. Such behavior of the government provides a rational for the issuance of public debt. Due to this reason tax smoothing theory is also called a positive theory of public debt.

1.2- Recent Literature and Identification of Research Gaps:

Barro originally used the tax smoothing hypothesis to determine the optimal level of debt. With regard to the level of debt, the argument is that if government spending requirements fluctuate over time, the government should keep tax rates almost invariable and
let the level of debt fluctuate to absorb the fiscal impact of economic fluctuations. Regarding
debt structure, the argument is that a government minimizing the welfare cost of fiscal policy
should manage its debt with the intention of diminishing the risk caused by fluctuations in tax
rate and change tax rate later on in response to economic state of affairs.

Initially, Barro proposed the random walk test of tax rate series to check the presence of
tax smoothing behavior. There are many studies which focused on the random walk test only; however, the presence of tax smoothing behavior has been tested by Serletis and Schorn (1999), Cashin, Olekalns, and Sahay (1998), Cashin, Haque, and Olekalns (2003), Strazicich (2002), Adler (2006) etc. by applying the vector autoregressive approach (VAR) between tax rate and budget surplus of Huang and Lin (1993) and Ghosh (1995). The VAR approach was considered an improvement on early tests of random walk which was considered sufficient for testing tax smoothing behavior. On the other hand, the VAR approach focused on the optimal path of budget surplus.

There are many reasons to proceed beyond the random walk test. First of all, the random walk of the tax rate can also be caused by the behavior of the politicians, unrelated to the tax smoothing behavior. Secondly, it is difficult to assess the economic significance of statistical rejection of random walk. Thirdly, there are useful time-series proprieties that are not explored when focusing exclusively only on random walk test. In view of these reasons Campbell (1987), Campbell and Shiller (1987) and Bohn (1991) provided base for Huang and Lin

---

3 The random walk theory predicts that tax rate changes have the same distribution and are independent of each other, so the past movement or trend of tax rate cannot be used to predict its future movement. The unit test is conducted to see whether the changes in tax rate are predictable or not.

4 (Campbell, 1987)
(1993) and Ghosh (1995) to build a new test for testing the behavior of tax smoothing. In accordance with the VAR approach, the predicted time path of the budget surplus/deficit for a government is calculated. Afterwards the predicted budget surplus/deficit time-series is compared to the actual budget surplus/deficit time-series in order to visually assess the fit and the economic significance of the model. If the model is true then the two series should be identical. The theoretical properties of the tax smoothing hypothesis translate into cross-equation restrictions on the VAR. In this fashion, the standard statistical procedure can be applied as VAR to evaluate the tax smoothing hypothesis.

The model developed by Haung and Lin (1993) and Ghosh (1995) and used in most of the tax smoothing studies is essentially an indirect method of testing the tax smoothing hypothesis because it focuses on the budget surplus due to the difficulty of measuring the permanent government expenditures. However, Sahasakul (1986) uses the direct approach for testing the behavior of tax smoothing. He focuses on the behavior of tax rate and the government permanent expenditure rate. In this contrast, he considers non-defense expenditures as permanent expenditure. Later on, Abeysinghe and Jayawickrama (2006) conclude that co-integration between permanent expenditure rate and tax rate is an economically plausible indication of tax smoothing behavior by the government.

1.3-Motivation and Significance of the Study:

A detailed review of the literature on fiscal policies particularly on tax smoothing indicates that the focus has been so far on testing the economic implications of tax smoothing
policy of the developed countries.\textsuperscript{5} The studies on the developing countries are few and far between and most of the studies have tested the unit root for checking the presence (or absence) of tax smoothing. However, there is no study for developing countries that analyzes for tax smoothing hypothesis in the line of Sahasakul (1986). Therefore, this gap in existing literature on fiscal policies needs to be filled. This is what present study attempts to do for three South Asian developing countries namely: Pakistan, India and Sri Lanka.

Also the studies on developing countries have typically focused on fiscal deficits. Different policy tools have been tried to overcome the problem. This study has tried to check whether these developing countries have in effect adopted the tax smoothing policy to overcome their fiscal deficit and what form such policy has taken and should take. However, there are some studies which have adopted indirect single country technique to test for the tax smoothing hypothesis. On the contrary, the present work adopts direct approach by relating tax rate with permanent part of the government expenditure for South Asian developing countries to test for the tax smoothing hypothesis.

\textbf{1.4- Research Strategy of the Study:}

The present study follows the following research strategy to test that;

1- \textbf{It decomposes the total expenditure rate series for various developing countries into permanent and transitory components.}

\textsuperscript{5} A detailed review presented in the chapter 3 also has the same result.
Permanent and transitory parts of total public expenditure series are not directly available. Different studies have used different approaches to decompose the time-series into permanent and transitory parts. There is no unique way of such decomposition. This study employs the extensively used Beveridge and Nelson (1981) decomposition method (BN) and new in economics Wavelet Transformation (WT).

2- It determines whether tax policies in these developing countries in general and Pakistan in particular, have sought to minimize the welfare cost of taxation?

Social welfare is an important issue for an economy. The exemption is that taxes, when levied, reduce social welfare. Tax smoothing hypothesis argues for keeping tax rates almost stagnant to reduce the welfare costs and to spread their burden overtime. Hence, the study will check whether tax policies adopted by selected developing countries in general and particular in Pakistan have been consistent with tax smoothing hypothesis.

3- It examines the causality between expenditure and taxes in these countries.

There are four competing hypotheses regarding the relationship between tax and spending, i.e. the spend-and-tax hypothesis (Roberts (1978) and Peacock and Wiseman (1979)), the tax-and-spend hypothesis (Friedman (1978)), the fiscal synchronization hypothesis (Musgrave (1966) and Meltzer and Richard (1981)) and the institutional separation hypothesis (Wildavsky (1988)). The spend-and-tax hypothesis is consistent with the Barro’s (1979) tax smoothing hypothesis. An important objective of this study would be try to find out which one
of the above hypotheses is consistent with the fiscal behavior of the developing economies included in the present study.

1.5- The Main Hypotheses of the Study:

This study tests the asymmetry between the relative behavior of the expenditure and tax policies. Following are the main testable hypotheses of the study:

1. The total expenditure rate (total expenditure-to-GDP ratio) series in the selected developing countries do not have significant transitory part.

2. A weak type of tax smoothing has been predicted in developing economies.

3. The fiscal synchronization hypothesis has been envisaged in the selected countries.

1.6- Justification for the Study:

Most developing countries have faced serious fiscal deficits since 1990s. These deficits have created mountains of public debt. A striking example is Pakistan which has faced a severe debt-to-GDP ratio, more than 100% of GDP, in the late 1990s and even now it is more than 50% of GDP. In addition there are no clear defined policies to overcome such deficits. Increasing taxes have been one of the policy tool adopted by the developing countries to finance the deficits. But taxes tend to impose dead-weight loss on the economy by distorting the incentive structure which can also cause a reduction of output growth. Therefore, an attempt has been
made in this study to verify whether the developing countries have sought to minimize the welfare cost of taxation.

1.7- Structure of the Dissertation:

Chapter 2 surveys the relevant theoretical and empirical literature on the tax smoothing hypothesis. The chapter gives an overview both of the theoretical and empirical literature on tax smoothing. The purpose of the review is to highlight issues that require attention in the analysis of tax smoothing hypothesis. In addition, the review aims to identify areas widely covered in the literature and to help select topics for further research. The chapter also gives an overview of fiscal policies. The focus is on what economic theory says about the effects of fiscal policies on the macro-economy. This provides a basis for the reporting of results of analysis undertaken in the subsequent chapters of the present study.

Chapter 3 gives an overview of public finances in Pakistan, with a brief focus on India and Sri Lanka. It gives detailed discussion about the public revenue, tax revenue and non-tax revenue, public expenditure, fiscal deficit and public debt of these developing countries. Furthermore, the chapter gives suggestions to improve the public finances.

Chapter 4 presents the idea of tax smoothing hypothesis given by Barro (1979) and extended by others which provides basis for the estimated model of tax smoothing. Theoretical background and historical progression of the model is narrated in detail. Furthermore, the chapter develops an econometric model for the tax smoothing analysis.
Chapter 5 deals with the data and methodology used for the estimation. An overview of two decomposition techniques namely; Beveridge and Nelson decomposition (BN) and Wavelet Transformation (WT) are presented (See also Appendix I & II for details of these procedures). The chapter also gives details of the estimation procedures adopted for conducting different tests. To test whether the series is stationary or non-stationary the unit root tests have been conducted. In this study Augmented Dicky Fuller (ADF) unit root test and Engle-Granger (1987) approach for co-integration has been used. The purpose of using the Engle-Granger approach is to analyze the long-run and short-run relationships between tax rate and permanent expenditure rate. Another important reason of using the Engle-Granger approach is its characteristic of testing causality indirectly through Error Correction Mechanism (ECM).

Chapter 6, Chapter 7 and Chapter 8 provide the empirical estimation of the tax smoothing models and tests the accuracy of their theoretical predictions for fiscal policies. Chapter 6 focuses on the comparison of descriptive statistics of public finances of Pakistan, Sri Lanka and India. Chapter 6 analyzes the fiscal behavior of Pakistan while Chapter 7 and Chapter 8 do the same for Sri Lanka and India respectively. In these chapters, first the BN and the WT approaches are applied to decompose total government expenditure rate series into permanent and transitory parts. Then single time-series unit root tests are conducted for each series of each country. The ECM is then conducted to find out the relationship between the tax rate series and the permanent expenditure rate series. The error correction co-integration analysis is presented for each of the sample countries separately. Chapter 8 compares the analysis of tax smoothing behavior of three model countries.
Chapter 9 summarizes the central points of the thesis and presents their policy implications for developing countries; and it also suggests future research directions.

1.8- Concluding Remarks:

The present study aims to survey the existing theoretical and empirical literature about the tax smoothing hypothesis to find out the research gaps in the existing literature; and in the light of that knowledge it makes its own contribution to analyze the problem of tax smoothing. On the basis of this analysis, policy recommendations can be made for undertaking fiscal reforms with a view to base them on robust theoretical and empirical foundations.
Chapter 2

Literature Review

This chapter gives an overview of both the theoretical and the empirical literature on tax smoothing. The purpose of this review is to highlight issues that require close attention in the analysis of tax smoothing hypothesis. In addition, it aims to identify areas widely covered in the literature and spells out topics for further research, especially in the context of the developing countries.

The chapter is organized as follows: Section 2.1 provides a brief overview of fiscal policies, while section 2.2 reviews the large literature on tax smoothing hypothesis. The last section concludes the discussion.

2.1- Fiscal Policies:

First, we consider how fiscal policy in general, i.e. expansionary or contractionary, affects output growth. Then we are concerned with the effects of single revenue and spending categories and therefore ask how taxes, transfers, and subsidies affect economic growth.

The vital issues that fiscal policies do and should address are: how a fiscal expansion or a fiscal tightening acts on output. Fiscal expansion increases the budget deficit whereas fiscal tightening decreases it. The expansion is caused by increases in government expenditure, tax
reductions or both at same time whereas fiscal contraction entails cuts in expenditure, an increase of taxes or both at same time. Both have predictable effects on growth and employment.

The relationship between fiscal policies and economic growth has been a subject-matter for research in public finance and macroeconomic modeling. In public finance, the literature has also paid attention to the impact of fiscal policies on economic growth and the mode of financing the government expenditure. The emphasis of macroeconomic modeling has been on analyzing the short-run and the long-run impact of fiscal policies on economic growth. Understanding the impact of fiscal policies on economic growth also provides an insight into the tax smoothing policies.

2.1.1- Ricardian Equivalence:

The neo-classical views are based on the rational expectations hypothesis and the relative unimportance of government policies for changes in the real variables (e.g. economic growth). When individuals have rational expectations, about reliable fiscal policies, they will expect a decline of interest rates in the event of an increase in tax rate and a decrease in price of bonds. That would promote investment and may considerably reduce the negative output effects of contractions and even turn them into a positive effect. In addition, when government expenditure declines, individuals expect a reduction in future taxes that increases their lifetime

---

6 Such a situation will occur when individuals expect that government will tight the fiscal policy at the cost of loose monetary policy. Another reason might be in the event of an increase in tax rate lesser government borrowing requirements reduces interest rate and hence crowds in private investment.
income and present consumption.\textsuperscript{7} In some cases, expectations may also lead to non-contractionary effects of a tax increase. If individuals expect that it will entail a regime shift, they consider this as a once-for-all event and expect no more future changes in wealth. The net effect might well be to reduce tax increases and hence keep consumption unaltered.\textsuperscript{8}

The Ricardian Equivalence Theorem, as the name shows, was first presented by the Ricardo (in 1820); it was revived by Barro (1974). The proposition is closely linked to the concept of expectations. If a government reduces tax rates and issues debt to finance deficit, the individuals’ knowledge that government is fiscally constrained would lead them to expect future tax rate increases. That would reduce their wealth, though their permanent income would be unaffected. It would also lead them to review their life-time consumption, increase savings for future consumption, and reduce present consumption.\textsuperscript{9} Consequently, tax cuts will not typically increase consumption. On the contrary, a reduction in government expenditure, would lead individuals to expect a decline of taxes in future. That will increase their present consumption. According to Ricardian Equivalence theorem only the quantity of government expenditure, not its mode of financing that expenditure between taxes and government borrowing, affects the real variables in the economy. Hence taxes and bond financing have an equivalent effect on the economy.

\textsuperscript{7} Alesina and Ardagna (1998)  
\textsuperscript{8} Alesina and Perotti (1995)  
\textsuperscript{9} See Barro (1974) for details.
2.2- Tax Smoothing:

If Ricardian Equivalence Theorem does in fact anticipate the chain of events described above, then there would then no rationale for a government to issue bonds. However, there is second order effect of the social welfare costs of taxation over time. Because doing without taxes is entirely impossible, the problem for policy makers is how to finance indispensable government expenditure while keeping its welfare cost relatively low. However, the society would benefit if taxes are imposed in a way that minimizes the welfare costs of taxation. The changes in the marginal rate of taxation induced by the changes in government expenditure would generate distortionary effects and increase the social welfare cost of taxation. Therefore, one rationale of removing fiscal imbalances is to minimize the welfare loss of non-lump sum taxes those which distort the structure of incentives by spreading the burden of these taxes over time.

2.2.1- Literature on Tax Smoothing:


To overcome the adverse welfare effects of non-lump-sum taxation Barro (1979) introduced the concept of tax smoothing. According to this hypothesis, since taxes distort
individuals’ choices and since those distortions rise more than proportionally with the tax rate, steady and moderate tax rates are preferable to alternating periods of high and low tax rates. Indeed, the concept of optimal taxation over time is an application of the Ramsey rule to a multi-period situation. The Ramsey rule explains the problem of determining how proportional tax rates should be adjusted in order to minimize the welfare loss resulting from taxation.

There is a limited literature on examining the presence of tax smoothing behavior in developing countries. Cashin, Olekalns, and Sahay (1998), Cashin, Haque and Olekalns (1999), Rocha (2001), Cashin, Haque and Olekalns (2003) have analyzed data for India, Pakistan, Sri Lanka and Brazil for this purpose. All these studies have used the Ghosh (1995) approach to test the tax smoothing hypothesis for these countries. The findings are mixed e.g. the Inter-temporal tax smoothing model is successful in describing the fiscal behavior of India and Pakistan but not that of Sri Lanka and Brazil.

2.2.1.1- Empirical Estimation of the Tax Smoothing Hypothesis:

Barro (1979) has also given an interesting way in which optimal debt theory can be tested. This is done if the planned tax-to-income ratio is kept constant over time. Since changes in this ratio occur only when new information about the time path of government expenditure appears, the theory has the implication that changes in tax rate cannot be

---

10 The Ramsey rule suggests that assuming zero cross-elasticities of consumption demand, it would be optimal to impose higher tax rate on the relatively inelastic consumption good and lower tax rate on relatively elastic consumption good.
11 Sahasakul (1986)
12 Tax-smoothing theory is also called optimal debt theory.
predicted entirely from knowledge of lagged variables, including prior changes in rates. The study therefore developed a positive theory of debt determination which generates the classic tax smoothing result and implications for the consequent growth in public debt. The study demonstrated that government debt policy in the U.S. was consistent with the theory of tax smoothing.

The Ramsey rule applied to the multi period situation for aggregate output in each period and single homogeneous good or economic activity shows that if price elasticities of economic activity are uniform over time then uniform tax rate should follow a random walk.\textsuperscript{13} In particular, any variable, apart from the current tax rate, should have no importance for forecasting the future tax rate. Sahasakul (1986) presents a more direct test for tax smoothing by relating the tax rate to the permanent government expenditure rate. He proposes an alternative approach to test the theory of optimal taxation over time. The study says that under the assumption of uniform taxation, the government should change tax rates if and only if there is a change in permanent government expenditure. The empirical results of regressing the U.S. marginal tax rate on permanent and transitory components of the U.S. expenditure rate and some other variables reveal that besides responding to the permanent government expenditure, the tax rate also respond to temporary defense purchases, the general price level and a time trend. Overall, the empirical estimates reject the tax smoothing hypothesis.

It has been shown that it is not a sufficient condition for tax smoothing that tax rates follow a random walk as suggested by Barro (1979). Trehan and Walsh (1988) explain this

\textsuperscript{13} Sahasakul (1986)
proposition and show that any permanent component of tax changes should be related in the long run to permanent component of government expenditure for the tax smoothing hypothesis to hold. If expenditure time-series is non-stationary, even in the absence of tax smoothing behavior, taxes will also be non-stationary. Hence, in order to find support for the tax smoothing hypothesis one can check if the difference between tax receipts and net interest expenditure is non-stationary. The empirical tests conducted for the U.S. show that the difference is stationary; which again suggests the rejection of the tax smoothing hypothesis.\(^1\)

Another study by Gosh (1995) pinpoints the type of shock that is signaled by the budget deficit. The study assumes that output grows at a constant rate. The empirical tests it conducts, by contrast, utilize actual output rather than its trend value. It suggests that there are at least two reasons to go beyond the random walk tests of tax smoothing models. First, such tests have very low predictive power because it is often difficult to reject the null hypothesis of random walk for many economic time-series in finite samples. Second, even if the tax rate truly follows a random walk this does not necessarily mean that governments should smooth taxes over time. Therefore, tax smoothing is only one of the many possible explanations for tax changes being random (unpredictable). The models of inter-temporal tax smoothing postulate that an expected future increase in government expenditure should be anticipated by an instant increase in taxes, and thus a bigger budget surplus or smaller deficit. It recommends that the tax burden accumulated by a temporary increase in government expenditure should be spread over time, so that such sharp changes in government expenditure are met by issuing

\(^{1}\) However, the present study for Pakistan and Sri Lanka, using a modified estimation technique, accepts the Barro hypothesis.
bonds (budget deficit). This implies that an expected permanent increase in expenditure should be financed by an equivalent increase in taxes with no budget deficit. The technique developed in Ghosh’s study provides a useful benchmark for evaluating the optimality of tax behavior given an expected time path of government expenditure. The empirical estimation of the inter-temporal tax smoothing model developed in this study has been successful in explaining the behavior of the U.S. and Canadian federal governments’ budget deficits.

Most of the studies except that by Sahasakul (1986) present an indirect approach for estimating for the tax smoothing. An attempt was carried out to present a model which provides direct testing of the tax smoothing hypothesis. Abeysinghe and Jayawickrama (2006) made it possible by regressing the tax rate on the permanent component of government expenditure rate. The empirical evidence for six OECD countries reveals that all the countries in the sample follow a weak form of tax smoothing.

2.2.1.2- Tax Smoothing and Optimal Debt Management:

Tax smoothing theory is also called the positive theory of public debt. The theory of public debt as dynamic optimal taxation in an equilibrium model yields a form of tax smoothing as a basis for debt management.\textsuperscript{15} Optimal debt management can be considered in three stages. Firstly, when taxes are lump-sum and other conditions of the Ricardian Equivalence are met—— i.e., individuals have rational expectations—— then the government would be indifferent between the choice of debt and taxes. However, in this case, the level of public debt is indeterminate from an optimal tax perspective. Secondly, when taxes are distortionary, then

\textsuperscript{15} Barro (1995)
the timing of taxes generally matters. That is, tax smoothing may be desirable which determines the level of debt at various dates, but it does not pin down the composition of the debt. Finally, when there is uncertainty about real interest rate, levels of public outlay, GDP and so on, then the relation of tax rate to the states of nature becomes important. Hence, optimal taxation dictates the smoothing of tax rates and this element may pin down the composition of the public debt.

Bohn’s\textsuperscript{16} methodology imposes more realistic constraints on public debt management to find the optimal welfare maximizing public debt portfolios for the OECD countries by using tax smoothing approach.\textsuperscript{17} However, the tax smoothing methodology developed by Bohn to find the optimal government debt portfolios for the United States produces invalid results. The issuing of short-term domestic currency debt provides the best hedge against future decrease in income whereas purchasing instead of issuing long-term currency debt and induced debt can provide a type of tax smoothing leverage.

As suggested above, smoothing of tax rates over time would be optimal for public debt management. One implication of this viewpoint is explained by Barro (1981) ---namely, that future changes in tax rates would be unpredictable based on current information i.e. changes in tax rate follow a random walk. The hypothesis has been tested by investigating the behavior of the U.S. federal and total government tax and non-tax receipts relative to GNP. The random walk tests for aggregate federal and total government tax rates support the tax smoothing

\textsuperscript{16} See Bohn (1990)
\textsuperscript{17} Hawky and Wright (1997)
hypothesis at conventional significance level, although they reject the ratio of government spending to gross national product and output.

Bohn (1998) has attempted to analyze the typical government reaction to the accumulation of debt. He finds that the U.S. government has previously responded to increases in the debt-to-GDP ratio by reducing the primary deficit, or by raising the primary surplus. In univariate regressions the response tends to be obscured by war-time spending and by cyclical fluctuations; but tax smoothing model shows that if one corrects for fluctuations in government spending and in aggregate income, it would demonstrate a significant impact of debt on primary surpluses. The positive response of primary surpluses to the debt-to-GDP ratio also implies that it should be mean-reverting, regardless of the fact that a unit root is almost impossible to reject in standard univariate time-series tests. The unit root tests are inconsistent and misleading because they do not properly adjust for fluctuations in GDP and in government spending. To conclude, the primary surplus, which is an increasing function of the debt-to-GDP ratio, can be interpreted as a new test for the sustainability of fiscal policy.

To analyze the optimal structure of government debt in a stochastic environment Barro’s welfare approach can be extended in a setting with distortionary taxes. In such a situation a welfare maximizing government should smooth tax rates over states of nature as well as over time.\textsuperscript{18} This necessitates state-contingent government liabilities that provide safeguard against shocks to the budget. Bohn (1990) concludes that tax smoothing as a positive theory of policy cannot be rejected on the basis of the time path of taxes for the U. S. economy.

\textsuperscript{18} Bohn (1990)
The estimation of optimal debt portfolios provide strong support for using nominal, non-indexed, government debt, but weak evidence on the distribution of the maturity structure. Furthermore, it is suggested that the government could improve tax smoothing by having some nontraditional liabilities, for example, foreign-currency debt, or a short position in the stock market.

To contribute towards understanding the performance of government debt two implications of the tax smoothing hypothesis are analyzed for a panel of nineteen industrial countries. Firstly, the random walk hypothesis predicts that the tax rate will be non-stationary; and, secondly, tax smoothing requires that tax rate changes will be random. The economic and political variables have been checked for their ability to predict tax rate changes. The results cannot reject the null hypothesis of (i.e., non-stationarity); and hence, they support tax smoothing by each country, except Finland. On the whole, the empirical findings present support for tax smoothing as a theory of government debt.

2.2.1.3- Tax Smoothing and Fiscal Policy Rules:

There is a detailed discussion in the literature on to whether government should keep its budget balanced or keep a system of tax rate smoothing. Bohn (1991) argues that sustainable policy rules (e.g. balanced budgets or tax rate smoothing) should not be taken for granted in a stochastic environment because sustainability is often sensitive to assumptions about debt management. Assuming no uncertainty, balanced budgets, and tax smoothing both are sustainable. In case of an upper bound on tax rates neither tax smoothing nor the balanced

\[ \text{Strazicich} (2002) \]
budget rule is sustainable. It is a reality that balanced budgets can be maintained in an environment of perfect certainty.

The non-sustainability result for balanced budgets and tax smoothing with a safe size of real debt turns out to be more generally valid for generic debt-financing methods, with the debt policy that supports perfect tax smoothing being the unique exception. In particular, balanced budgets in nominal terms and tax smoothing policies are unsustainable when debt is expressed in nominal terms. The use of ad hoc debt management policies are the source of unsustainability. If state-contingent debt is used for tax smoothing then the resulting policy of perfect tax smoothing will be sustainable.

An examination of the case for rules versus discretion in fiscal policy in the presence of political distortions shows that the political biases make fiscal deficits and government debt become positive even when balancing the budget is the optimal policy. When there are shocks to output, tax smoothing implies that government surpluses or deficits would be optimal even if the government’s fiscal policy is not politically biased. There are obvious trade-offs between rules and discretion. The benefits of tax smoothing come at the cost of a persistent political bias in a discretionary political equilibrium. In contrast, the benefits of binding deviant governments to follow a balanced budget rule outweigh the cost of not allowing tax smoothing. When there are no political biases, transitory output shocks imply that a social planner’s optimal fiscal rule would be full tax smoothing, and that it would also be the first-best policy.

---

20 Corsetti and Roubini (1997)
The balanced budget rules are not sufficient to discard tax smoothing, as governments could build up budget surplus in good times to smooth budgets deficits over the business cycle. In the case of governments doing the tax smoothing budget surpluses are endogenous. If governments are smoothing tax rates, it could explain the behavior of their budget deficits and surpluses. The empirical estimation of the tax smoothing hypothesis in United States and Canada reveals that almost every state government in the United States follows a balanced-budget policy; but the provincial governments in Canada have no balanced-budget rule. Hence the provincial governments’ smooth tax rates while the state governments do not. The reason for the difference in tax smoothing results may be due to greater resource mobility between the states than between the provinces.

In search for a general equilibrium model of optimal growth and endogenous fiscal policy that explains the interaction between private agents and fiscal authorities the U.S., former West Germany, Japan and the U.K. data have been analyzed by Malley and Philippopoulos (2000). The starting point is the basic version of Barro’s (1979) tax smoothing model in which it is not optimal for the government to follow state contingent tax policy rules. The empirical findings of the model reveal that fiscal authorities in West Germany and Japan are concerned about the current welfare of private agents; while in the U.S. and the U.K. they do not appear to act so.

\[^{21}\] Strazicich (1996)
What are the implications for debt outcomes when it is difficult to predict level of permanent output? Different fiscal rules in an economy where output shocks are composed of random walk components are considered to thrash out this issue. Tanner and Carey (2005) claim that, under conditions of certainty, tax smoothing implies a constant debt-to-GDP ratio. Such a policy does not prefer the present over the future or otherwise. However, uncertainty makes policy makers become unsure about the exact assessment of permanent output. The analysis points up that in tax smoothing both debt levels and tax rates are not easy to keep constant and may drift upwards. One practical remedy would be to target the debt; but the outcome of such strategy is likely to increase tax rate volatility over time and reduce counter-cyclical borrowing. As an alternative, a precautionary regime is considered preferable that links the primary surplus to the debt ratio and relates the optimal primary surplus to the volatility of the debt ratio. Such a policy is expected to reduce the level of debt. By contrast with tax smoothing, a precautionary regime provides safeguard against future tax and debt increases.

2.2.1.4- Tax Smoothing and Smooth Tax Rates:

Does the basic tax smoothing result hold when expenditure is not exogenous? To address this issue at theoretical level, a simple two-period model was set up by Pinfield (1998). It looks at the effects on the results of expenditure control, in the shape of an exogenous reduction in expenditure from its originally projected level. This model shows that tax smoothing is not optimal tax policy under any circumstance. The economic gains from tax

---

22 Tanner and Carey (2005)
23 Pinfield (1998)
smoothing can only be achieved if the resulting surpluses, in the initial period, are successfully preserved.

A related question to answer is: does the tax smoothing theory of minimizing the welfare costs of taxation always imply that tax rates should remain constant over time?\textsuperscript{24} The discussion of the question has found that smooth tax rates are not always optimal, and optimal policy can deviate from a policy of smooth tax rates. Moreover, progressive and pro-cyclical taxation can be justified on entirely efficiency grounds.

2.2.1.5- Tax Smoothing and Seigniorage:

A link between consumption-smoothing and tax smoothing approaches in an open economy model explores that such a model can explain the paradox of the apparent lack of international capital mobility. An empirical test of the model for OECD countries presents evidence that international markets are widely integrated and the paradox of the apparent lack of international capital mobility can be explained by the significant role of fiscal deficits in the determination of the current account and the saving behavior.\textsuperscript{25} Moreover, an important source of revenue in developing countries is seigniorage.

There is no doubt that seigniorage is an important source of revenue for developing countries. A study has been conducted to ascertain whether an optimal taxation policy includes inflation tax.\textsuperscript{26} It tested an extended tax smoothing model for developing countries. The model

\textsuperscript{24} Andersen and Dogonowski (2004)
\textsuperscript{25} Roubini (1998)
\textsuperscript{26} Ashworth and Evans (1998)
implies that tax rates and the rate of inflation should move together in the same direction, because there seems to be a long run relationship between tax rates and inflation. The empirical estimates reject the testable restrictions of the extended tax smoothing model; which suggests that the principles of optimal taxation are not being followed to raise revenue from inflation to minimize the social cost of financing expenditure in developing countries.

The extended tax smoothing hypothesis has been tested for the Italian annual data by Ricciuti (2001) as well. The size of seigniorage is calculated as the ratio of the variation in the monetary base of the treasury over GDP lagged one period. The analysis shows that fiscal policy supports tax smoothing in Italy for longer period of almost 140 years but not for shorter period of the recent 48 years. When analysis is extended to revenue generation from money creation, it is found that revenues from implicit and explicit taxation act independently of each other for both periods. Hence, there is an indication in support of the extended tax smoothing and revenue-smoothing model.

In order to test the predictions of tax smoothing and revenue-smoothing hypotheses Serletis and Schorn (1999) conducted a study. The integration and co-integration properties of the series for Canada, France, the U.K. and the U.S. have been analyzed by conducting unit root, co-integration and the VAR approaches. There is strong evidence from the unit root tests and the VAR approach for the tax- and inflation-smoothing hypotheses. However, there is no evidence from the co-integration tests to support the revenue-smoothing hypothesis.

27 Mankiw’s (1987) revenue-smoothing hypothesis assumes that a government uses its monetary policy to create resources to finance its spending.
2.2.1.6- Tax Smoothing and Disaggregated Taxation:

An important question to ask is: whether or not tax rate should change systematically with the state of the economy and how should tax rate react to unanticipated shocks to either government expenditure or the tax base? To answer these questions under the assumptions of incomplete and complete bond markets, Scott (1999) developed a macroeconomic model to derive an expression for labor and capital tax rates. In case of complete bond markets any positive or negative shock should be financed by the government debt; and, hence, only tax rates should be changed if it helps to minimize social welfare costs of taxation. Even under such a situation labor tax rates may vary over time with employment. It is possible to increase labor tax rates when employment is high and vice versa but capital tax rates should kept equal to zero. However, under incomplete bond markets the sole concern of the government is to change tax rates in such a way that the social welfare costs of taxation are minimized. In such a case optimal labor tax rate has a unit root which, on the one hand, tries to minimize welfare costs and changes directly with employment; and, on the other hand, it changes permanently in response to the fiscal shocks. Under incomplete markets to set capital tax rate at zero is not optimal. Using the United States data it is found that the most of fluctuations in the marginal tax rates are due to fluctuations in the social welfare cost of taxations.

To tackle the issues of optimal taxation in a dynamic setting Werning (2005) provides remarkable benchmarks for perfect tax smoothing. Like Scott (1999) he also finds that perfect tax smoothing can be achieved by keeping marginal taxes on labor constant over time, but zero on capital.
2.2.1.7- Tax Smoothing and Private Sector:

There are two propositions on the topic. The first proposition argues that a lower current level of private dis-saving causes sluggish growth in tax returns. The second proposition argues that a lower current level of financial pressure made up of the fiscal deficit and private dis-saving predicts a rapid growth in government outlays. The fundamental implication of each proposition has been confirmed for the U.S data.

Niepelt (2002) considers the principal effects of fiscal policy as first order consideration (private sector does not neutralize) against Barro’s approximation that considers it as second order (direct) impact on wealth distribution. The budget deficit or the surplus can significantly shift the burden within generations although having no net effect on the generational accounts. The study conducts the analysis in a framework with distortionary taxes and operative inter-generational transfers. It argues that the welfare implications of intergenerational tax shifting are significant particularly due to the second order welfare effects of tax distortions. Moreover, institutional deficit constraints settle tax-shifting conflicts in favor of individuals with high-income groups with distortionary taxes.

Berck, Lipow and Steinhauser (2006) address the question as to whether tax smoothing explain the cross-country pattern of privatization? Several statistical tests have been conducted to deal with this subject. They show that privatization generally improves firms’ efficiency level whereas the impact of privatization on fiscal efficiency has been overlooked. The empirical findings support the proposition that fiscal considerations can influence privatization. Using the

tax smoothing proposition it is asserted that privatization may have an important impact on the welfare losses associated with tax collection and the impact can either increase or decrease the efficiency of taxation. Studies on the subject conclude that tax smoothing considerations could account for observed differences in the cross-country pattern of privatization.

2.2.1.8- Tax Smoothing and Budget Deficit:

A government runs a budget deficit whenever it expects that the growth rate of its expenditure is going to turn down or the growth rate of national income is expected to move up with the view that future savings/earnings will fill the gap. Haung and Lin (1993) utilize a log-linearization approach to derive an exact linear relation across realization of the budget deficit and changes in government expenditure and the tax base. The budget deficit provides a base for tax smoothing. While examining the implied cross-equation precincts on a vector auto-regression (VAR) model using the U.S. data the hypothesis is rejected for the full sample period but not for the sub-sample period. Further analysis reveals that the statistical rejection should be attributed to sharp differences in the statistical properties of the data for different periods rather than to the breakdown of the hypothesis itself.

How should fiscal policy accommodate the growing expenditure allied with an ageing population? The empirical analysis on this issue has been presented by Davis and Fabling (2002) for New Zealand. The study investigates whether to smooth tax rates or run a balanced budget for this purpose. The estimate shows significantly higher welfare benefits from tax smoothing than balancing the budget. However, a reliable long-term commitment to the tax

29 Davis and Fabling (2002)
smoothing strategy is required for achieving the welfare benefit to maintain tight budgetary control in the presence of a very strong balance sheet. The efficiency gains of tax smoothing are cancelled when the assumption of exogenous government expenditure is relaxed; and when it is assumed that political decision-makers spend a significant proportion of the financial assets for tax smoothing. Hence, for attaining the welfare gains from tax smoothing there must be strong fiscal institutions.

Goff and Tollison (2002) review a variety of tests contending theoretical and empirical models for the U.S. federal deficits which provide different explanations of the federal deficits. Joint estimation of opposing hypotheses in a generalized reduced form provides the strong conclusion that tax smoothing is important in explaining primary debt movements, even with symmetrical effects between debt-increasing and debt-decreasing influences. Nevertheless, holding tax smoothing or the Ricardian Equivalence factors constant, political and interest group factors also have effects on the deficits.

Inter-temporal optimization by a government to minimize the distortionary effects of tax collection is based on the assertion that even if government expenditure and tax collections are non-stationary, the budget surplus/deficit might be stationary.\footnote{Olekalns (1997)} Empirical analysis of the Barro’s tax smoothing hypothesis for Australia reveals that although the data are consistent with the random walk and causality predictions, the theoretical optimal budget surplus and the actual surplus are different. The actual budgetary surplus is too volatile to be consistent with tax smoothing. Hence, estimation results indicate that Australian fiscal policy over the sample
period has not been conducted optimally, in the line with the predictions of tax smoothing hypothesis.

Barro’s tax smoothing hypothesis has been generalized, and empirically tested by Adler (2002), to ascertain whether it can explain the shifts in Swedish government’s budget balance. The tax smoothing hypothesis assumes that government is always subject to an optimal degree of discretion in fiscal policy. On the other hand, generalized tax smoothing hypothesis proposed in this article considers that a government that aims to smooth out taxes may be subject to a degree of discretion in fiscal policy. The data analysis indicates that, in contrast to the tax smoothing hypothesis, the generalized model provides close to a perfect fit. Hence, it is concluded that tax smoothing behavior in combination with more discretion in budget policy relative to what is optimal can explain most, if not all, of the shifts in the budget balance.

Barro’s theory of optimal deficits is based on Inter-temporal tax smoothing. The theory predicts that nominal debt grows in proportion to anticipated inflation, varies contra-cyclically with respect to real income cycles, and pro-cyclically with respect to war cycles. Horrigan (1986) reexamines Barro’s test, using quarterly U.S. data and finds stronger support for Barro’s hypothesis than Barro himself who used annual data. The difference in results was perhaps due to different definitions of anticipated inflation and public debt in the two studies. The results in the paper give strong support to the notion that fiscal deficits tend to smooth tax rates, though the smoothing is less than what Barro predicts. The study also finds that state and local governments do not engage in tax smoothing behavior.
2.3.1.9- Growth and Tax Smoothing:

The new growth theory (endogenous growth theory) presents possibilities to policy makers for affecting long-term growth rates and level of welfare. The endogenous growth models predict that permanent innovations in government policies can have permanent effects on the per capita growth rate of output. A less recognized difference between the models is their predictions about whether temporary innovations in government policies can affect per capita level of output. In neoclassical growth models such policies cannot affect the per capita level of output while in endogenous growth models they can.31

Barro’s (1979) tax smoothing hypothesis says that, if the marginal cost of raising tax revenue is increasing in the tax rate, the optimal tax rate is a random walk. This implies that changes in the tax rate will be permanent and, given their differential effects on growth under the two types of growth models, they should be very useful in empirically distinguishing between the exogenous and endogenous models. Jones (1995), Karras (1999), and Tomljanocich (2004) have tested empirically whether tax policies have transitory or permanent impact on growth rate. However, their research deals with only developed economies.

Karras (1999) estimates the data for a panel of 11 OECD countries to test the predictions of the growth theories. He concludes that, consistent with the tax smoothing hypothesis, changes in tax rates can cause significant persistent changes while output growth rates may not. Moreover, an increase in tax rate permanently reduces the level of output but has no permanent effects on the output growth rate. These findings suggest that the relationship

31 Kocherlakota & Yi (1996)
between output and the tax rate consistent with the tax smoothing hypothesis is best described by the neoclassical growth model. Tomljanocich (2004) carries out the same analysis for the U.S. states. His findings are not very different than Karras (1999).

2.2.1.10- Tax Smoothing in Developing Countries:

There is insufficient empirical literature on examining the presence of tax smoothing behavior in developing countries. Cashin, Olekalns and Sahay (1998), Cashin, Haque and Olekalns (1999), Rocha (2001), Cashin, Haque and Olekalns (2003) have analyzed data for India, Pakistan, Sri Lanka and Brazil for this purpose. All these studies (as reported in chapter 1) used the Ghosh (1995) approach to test the tax smoothing hypothesis for these countries.

The version of Barro’s tax smoothing hypothesis for Indian central government and its states governments’ is tested by Cashin, Olekalns and Sahay (1998). The vector autoregressive (VAR) approach indicates that the Inter-temporal tax smoothing model explains the behavior of the budget deficits of Indian central government, indicating that the central government did keep its tax rates relatively smooth in the presence of temporary, anticipated shocks to expenditure. On the other hand, the volatility of state taxes has been excessive relative to those which would be consistent with the requirements of minimizing the welfare cost arising from distortionary taxation; which suggests that Indian state governments have not smoothed tax rates.

Tax smoothing and tax-tilting are two basic motives to run budget deficit. The tax smoothing behavior results in fiscal deficits because in the presence of non-lump-sum taxes,
optimizing governments minimize the welfare cost of taxation by keeping tax rates constant over time. The fiscal deficits may also arise due to tax-tilting\textsuperscript{32} behavior even if expenditure remains stable over time. When the government's discount rate differs from the effective interest rate, then there is motivation for government to shift taxation across time. Similar studies have been carried out by Cashin, Haque and Olekalns (1999) and Cashin, Haque and Olekalns (2003). They test the tax smoothing model, which assumes Inter-temporal optimization by a government seeking to minimize the welfare costs of taxation, for Pakistan and Sri Lanka. The empirical results show that the Inter-temporal tax smoothing model successfully explains the fiscal deficits behavior of Pakistan. Hence in the presence of temporary shocks to expenditure the Pakistani government does keep its tax rates relatively constant. In contrast over time, the volatility of tax rates in Sri Lanka has been excessive relative to those which would be consistent with minimizing the welfare cost arising from the imposition of distortionary taxes. This suggests that fiscal deficits behavior of Sri Lanka has not been consistent with tax smoothing behavior. Brazilian data have been used to test the tax smoothing hypothesis by Rocha (2001) in the patterns of Cashin, Haque and Olekalns (1999). The empirical estimates show that the Brazilian government was not able to smooth taxes over the specified period; perhaps because the Brazilian economy has been facing large budget deficits for several years.

How do the developed and developing countries set fiscal policy over the business cycle? The analysis of the question by Talvi and Vegh (2000) claims that fiscal policy in G-7

\textsuperscript{32} Tax-tilting behavior: If the government's discount rate differs from the effective interest rate, as then there is motivation for government to shift taxation across time.
countries follows tax smoothing behavior; while, in sharp contrast, fiscal policy in developing countries has been highly pro-cyclical. To explain this contrasting behavior an optimal fiscal policy model incorporates political distortions. These distortions increase public spending that makes it costly to run budget surpluses due to the pressures of plentiful fiscal resources. A government that faces large fluctuation in the tax base due to political distortions will find it optimal to run a pro-cyclical fiscal policy because to generate budget surplus in good times becomes increasingly costly which would be compulsory to attain full tax smoothing. The model forecasts that in the presence of political distortions optimal fiscal policy is pro-cyclical. The study also argues that the difference in fiscal policy between G-7 and developing countries has been due to the higher tax volatility observed in developing countries.

2.3- Conclusion:

This chapter has described the existing theoretical and empirical literature on tax policies especially tax smoothing in both the developing and developed countries. Its findings are: state-contingent public debt might work as a shock absorber against sudden changes in the budget deficits. In such a situation smoothing of tax rate would be optimal for public debt management. In the presence of political biases fiscal deficits and public debt become positive even when balancing the budget deficit is the optimal policy. When there are no political biases, transitory output shocks imply that a social planner’s optimal fiscal rule would be full tax smoothing and would also be the first-best policy.

33 Larger fluctuations in tax base will result in more pro-cyclical fiscal policy.
The discussion of the issue about whether smooth tax rates always imply tax smoothing the studies found that smooth tax rates are not always optimal, and optimal policy can deviate from a policy of smooth tax rates. Moreover, progressive and pro-cyclical taxation can be justified on entirely efficiency grounds. The extended tax smoothing hypothesis implies that tax rates and the rate of inflation should move together in the same direction, which suggests a long run relationship between tax rates and inflation. The analysis of factor taxation implies that it is possible to increase labor tax rates when employment is high and vice versa but capital tax rates should be kept equal to zero. These studies also suggest that the relationship between output and the tax rate consistent with the tax smoothing hypothesis is best described by the neoclassical growth model.

The estimation procedure of the tax smoothing hypothesis began with Barro (1979, 1981), who argued in favor of checking the presence of the unit root in tax rate series for this purpose. Sahasakul (1986) and Trehan and Walsh (1988) present more direct tests by relating permanent government expenditure to the tax rate series directly, but Gosh (1995) suggests estimating the VAR between the budget surplus and tax rate series.

It may be noted that most of the literature is about the developed countries. There is a little work on developing countries and all these studies adopted the same indirect Ghosh (1995) VAR technique to test for the tax smoothing hypothesis. The findings are mixed as Intertemporal tax smoothing model has been successful in describing the fiscal behavior of India and Pakistan but not that of Sri Lanka and Brazil. On the contrary, this study aims to adopt Sahasakul (1986) direct approach for Pakistan, India, and Sri Lanka to test for the tax smoothing
hypothesis. The study aims to use time-series analysis for each country. Moreover, the study also intends to seek the causality direction between expenditure and revenues.
### Table 2.1
Review of Empirical Studies for Tax Smoothing

<table>
<thead>
<tr>
<th>Author</th>
<th>Country</th>
<th>Sample/Period</th>
<th>Major Variables</th>
<th>Technique/Test</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Major findings:</strong></td>
<td></td>
<td></td>
<td>The study provides evidence in support of tax smoothing</td>
<td></td>
</tr>
<tr>
<td><strong>Major findings:</strong></td>
<td></td>
<td></td>
<td>The study reveals evidence in support of tax smoothing hypothesis.</td>
<td></td>
</tr>
<tr>
<td><strong>Major findings:</strong></td>
<td></td>
<td></td>
<td>The empirical estimation supports tax smoothing hypothesis.</td>
<td></td>
</tr>
<tr>
<td>Sahasakul (1886)</td>
<td>The U.S.</td>
<td>1837-1982 Annual</td>
<td>Permanent government spending, Initial public debt, Defense purchasing, Marginal tax rate</td>
<td>OLS</td>
</tr>
<tr>
<td><strong>Major findings:</strong></td>
<td></td>
<td></td>
<td>Tax smoothing hypothesis is rejected.</td>
<td></td>
</tr>
<tr>
<td><strong>Major findings:</strong></td>
<td></td>
<td></td>
<td>The study provides stronger support for tax smoothing hypothesis than previous studies.</td>
<td></td>
</tr>
<tr>
<td><strong>Major findings:</strong></td>
<td></td>
<td></td>
<td>The study provides evidence against tax smoothing.</td>
<td></td>
</tr>
<tr>
<td>Author</td>
<td>Country</td>
<td>Sample/Period</td>
<td>Major Variables</td>
<td>Technique/Test</td>
</tr>
<tr>
<td>-------------------</td>
<td>-----------------------</td>
<td>---------------------</td>
<td>----------------------------------------------------------------------------------</td>
<td>-------------------------------------</td>
</tr>
<tr>
<td><strong>Major findings:</strong></td>
<td></td>
<td></td>
<td>Tax smoothing as positive theory of tax smoothing cannot be rejected.</td>
<td></td>
</tr>
<tr>
<td><strong>Major findings:</strong></td>
<td></td>
<td></td>
<td>The tax smoothing hypothesis is rejected for period 1929-1988 and cannot be rejected for period 1947-1988.</td>
<td></td>
</tr>
<tr>
<td><strong>Major findings:</strong></td>
<td></td>
<td></td>
<td>The tax smoothing model is successful in explaining the behavior of federal government deficit for both countries.</td>
<td></td>
</tr>
<tr>
<td><strong>Major findings:</strong></td>
<td></td>
<td></td>
<td>Tax smoothing hypothesis is rejected by state governments and cannot be rejected by provincial governments.</td>
<td></td>
</tr>
<tr>
<td><strong>Major findings:</strong></td>
<td></td>
<td></td>
<td>The fiscal policy has not been conducted optimally according to the predictions of the tax smoothing hypothesis.</td>
<td></td>
</tr>
<tr>
<td><strong>Major findings:</strong></td>
<td></td>
<td></td>
<td>Tax smoothing considerations have not been significant elements in determining the behavior of seigniorage.</td>
<td></td>
</tr>
<tr>
<td>Author</td>
<td>Country</td>
<td>Sample/Period</td>
<td>Major Variables</td>
<td>Technique/Test</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>------------------------------</td>
<td>--------------------</td>
<td>---------------------------------------------------------------------------------</td>
<td>-------------------------</td>
</tr>
<tr>
<td><strong>Major findings:</strong></td>
<td></td>
<td></td>
<td>The study provides evidence against tax and revenue-smoothing in developing countries is seigniorage.</td>
<td></td>
</tr>
<tr>
<td><strong>Major findings:</strong></td>
<td></td>
<td></td>
<td>The tax smoothing hypothesis cannot be rejected for the central government. However, it is rejected for the state governments.</td>
<td></td>
</tr>
<tr>
<td>Scott (1999)</td>
<td>The U.S.</td>
<td>1913-1989 Annual</td>
<td>Marginal tax rate, Average hours worked,</td>
<td>Unit root test</td>
</tr>
<tr>
<td><strong>Major findings:</strong></td>
<td></td>
<td></td>
<td>Tax smoothing does not necessarily imply smooth tax rates.</td>
<td></td>
</tr>
<tr>
<td><strong>Major findings:</strong></td>
<td></td>
<td></td>
<td>There was strong evidence for tax and inflation smoothing but not for the revenue-smoothing hypotheses.</td>
<td></td>
</tr>
<tr>
<td><strong>Major findings:</strong></td>
<td></td>
<td></td>
<td>Pakistan’s fiscal behavior is consistent with tax smoothing, but not Sri Lanka’s.</td>
<td></td>
</tr>
<tr>
<td><strong>Major findings:</strong></td>
<td></td>
<td></td>
<td>Fiscal policies in G-7 countries follow tax smoothing behavior while in developing countries are highly pro-cyclical.</td>
<td></td>
</tr>
<tr>
<td>Author</td>
<td>Country</td>
<td>Sample/Period</td>
<td>Major Variables</td>
<td>Technique/Test</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>--------------------------</td>
<td>---------------------</td>
<td>------------------------------------------------------</td>
<td>---------------------------------------------</td>
</tr>
<tr>
<td>Major findings:</td>
<td>The tax smoothing hypothesis is rejected for the sample of countries.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major findings:</td>
<td>The government was not able to keep the tax rates on the smooth path.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major findings:</td>
<td>There is evidence in favor of the extended tax smoothing model.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major findings:</td>
<td>Tax smoothing in recipe with more discretion in budget policy can explain all reallocations in the budget balance.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major findings:</td>
<td>The fundamental implications of consumption and tax smoothing proposition are confirmed.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major findings:</td>
<td>The study provides evidence in support of tax smoothing by the national governments.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Author</td>
<td>Country</td>
<td>Sample/Period</td>
<td>Major Variables</td>
<td>Technique/Test</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>----------------------------------------------</td>
<td>--------------------------</td>
<td>---------------------------------------------------------------------------------</td>
<td>------------------------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Major findings:</strong> The fiscal behavior is consistent with tax smoothing but stock of public liabilities is not on a sustainable path.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Major findings:</strong> Stronger statistical support for the tax smoothing among developing countries but not in developed countries.</td>
<td></td>
</tr>
<tr>
<td>Ricciuti (2003)</td>
<td>Italy</td>
<td>1861-1998 Annual</td>
<td>Government revenue-GDP ratio, Total budget outlays-GDP ratio</td>
<td>Unit root test, Granger causality analysis</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Major findings:</strong> There is evidence in favor of the tax smoothing model.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Major findings:</strong> The tax smoothing hypothesis is rejected for the period 1952–1999; however, it is rejected for the period 1970–1996.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Major findings:</strong> All the countries in the sample follow a weak form of tax smoothing</td>
<td></td>
</tr>
</tbody>
</table>
Chapter 3

An Overview of Public Finances of Developing Countries with a Focus on Pakistan

Fiscal robustness is an important pre-condition for achieving overall macroeconomic stability and economic growth. Main concern of the study is doing tax smoothing in a regime of expanding permanent and transitory expenditures, which require a fiscal response. Fluctuations in the government expenditures or/and output and the need for financing it make taxes volatile. To minimize this volatility in tax rates it is optimal for a welfare maximizing government to create budget deficit in the event of necessary expenditure needs by creating debt rather than changes in tax rate too often. The plausibility of such a policy has been established by Ricardian Equivalence Theorem. As a prelude to a detailed treatment of these matters (partly reported in the introductory chapter), the present chapter seeks to achieve familiarity with the public finances of Pakistan, Sri Lanka and India, and how well it can meet the objectives of fiscal policy—namely, the determination of the proper size of the state, the role of the government in accelerating economic growth, social development, and redistribution of the benefits of the economic growth, improving employment and social justice by reducing inequality in income and wealth between present and future generations and optimum allocation of resources. But before that let have a bird’s eye view of these three economies
3.1- An Overview of the Economies of Pakistan, Sri Lanka and India:

3.1.1- Pakistan:

Having a per capita income of over US$925, Pakistan is placed in the community of a medium-income country. With population of about 158.17 million in 2007 and growing at about 1.80% annually, approximately 55% of its population is literate. Pakistan’s budget has been constrained by low-revenue yields, and a rising expenditure. Owing to lack of sufficient government control over revenue sources, it continued dependence on indirect taxes, unacceptably high budget deficit and sky-rocketing public debt burden. All these are potentially hazardous policy options in that they can lead an acceptably higher public debt and significantly low and unstable economic growth. Substantial macroeconomic reforms since 2000, most notably privatization of State Owned Enterprises (SOEs), the financial sector reforms, have however, helped the economy to recover from financial stress. In 2005, the World Bank named Pakistan the top reformer in the region and among the top 10 international reformers.

3.1.2- Sri Lanka:

With an economy of US$27.4 billion in 2006, Sri Lanka is another important economy in the South-Asian region. It has been deregulating, privatizing, and opening the economy to international competition since 1977. Twenty years of civil war has seriously affected its spending and taxation decisions, especially the late 1980s. Economic growth has been uneven in the ensuing years as the economy faced a large number of global and domestic economic and political challenges. In 2002, the economy commenced a gradual recovery. The government has, however, been able to exert a modicum of fiscal control, and inflation trended down.
However, the resumption of the civil-war in 2005 has led to a steep increase defense expenditures. In 2001, Sri Lanka faced bankruptcy with debt reaching 101% of GDP.

3.1.3- India:

The economy of India, the biggest in the region and twelfth largest in the world, had a GDP of around US$1 trillion in 2008. With a 9.1% growth rate of GDP for the fiscal year 2007-08, it ranked as the second fastest among emerging economies in the world after China. Its economy is essentially diverse and therefore more able to absorb external and internal shocks. In 2003-04, India’s GDP growth rate jumped to 8.5%. Vigorous growth with strong macroeconomic fundamentals has characterized developments in the Indian economy in 2006-07. However, there are some genuine concerns on the inflation front. Sustaining a growth rate of 9.0 per cent and 9.2 per cent in 2005-06 and 2006-07 respectively. India has followed a socialist-inspired approach, at least in name, for most of its independent history, with strict government control over private sector participation, foreign trade, and foreign direct investment. However, since the early 1990s, India has gradually opened up its markets through privatization and deregulation.

The ensuing section 3.2 provides a brief definition and objectives of fiscal policy, section 3.3 reviews the trends of public finance and the last section concludes the chapter.
3.2- Public Finances in Pakistan, Sri Lanka and India:

This section analyzes such key fiscal indicators as total expenditure, total revenue, total fiscal deficit, and total public debt of the selected developing countries with a focus on Pakistan.

3.2.1- Public Revenue:

An efficient tax system raises enough revenue to finance essential expenditures without resort to unwarranted public sector borrowing and increases revenue in a way that is equitable, and which improves social welfare but minimizing its disincentive effects on economic activities. In most of the developing countries tax-to-GDP ratio is lower than the international standards. Scully (1994 & 1996) specifies the optimal tax/GDP in the US as 23% and for New Zealand it estimated as 19.7% of GDP. Mackness (1999) puts similar estimates for Canada at about 20 to 30% of GDP. For high-income countries these estimates are 26.0 %, and in the European Economic and Monetary Union it was even 35.7 %. In sharp contrast, according to the World Bank estimates, the share of central government revenues to GDP in developing countries was only 13 % in 2004----which is demonstrably low even allowing for their low incomes. There are a number of reasons that might have affected the willingness and ability of governments to mobilize more state revenues in developing countries. These include ineffective tax systems, a burgeoning shadow economy, weak tax authorities, shifting profits to low-tax jurisdictions, capital flight to tax havens and trade liberalization and tariff reductions.34 Other relevant factors contributing to this result are: their narrow tax base, overreliance on import and

34 (Martens, 2007)
withholding taxes, complicated tax mechanism, tax evasion and weak tax administration. All these factors have led to the emergence of high fiscal deficits in all these countries.

Figure 3.1 brings out clearly the inadequacy of the tax effort in Pakistan, Sri Lanka and India over time. The tax ratio was about 14% in Sri Lanka while 10% in Pakistan and India in 2007. The total tax-to-GDP ratio in Pakistan was 13.8% in 1980s, 13.4% in 1990s, 13.8% in 2005, and 10.2% in 2007. Throughout Sri Lankan economic history its tax-to-GDP remained higher than its neighboring countries.

Figure 3.1
Tax Revenue for Selected Developing Countries (as % of GDP)

Source: Key Indicators for Asia and the Pacific (2008) and World Development Indicators (2008)

Figure 3.2
Total Revenue for Selected Developing Countries (as % of GDP)

Source: Key Indicators for Asia and the Pacific (2008) and World Development Indicators (2008)
Figure 3.2 shows total revenue as percentage of GDP for Pakistan, India, and Sri Lanka. The graph shows, as noted above, that total revenue-to-GDP ratio of Sri Lanka was more than 20 percent per annum on average in the decade 1970s which was the highest among these countries and is still highest, though with declining trend during these decades. India had the lowest total revenue-to-GDP ratio that remained between 10 to 13% of GDP throughout its economic history. Total revenue collection of Pakistan, which was 16.8% in the 1970s, in recent years has declined to 14.9% of GDP. On the whole Pakistan’s total revenue-to-GDP ratio remained equal to the average of these countries.

To overcome the gravity of the fiscal deficit in these countries a wide range of reforms have been launched by successive governments, though not always with significant success. To make the reforms fruitful certain actions are required. These should include fiscal transparency, reducing the tax rates, broadening the tax base to untaxed and under-taxed sectors and shifting the incidence of taxation from imports and investment to consumption and income. Of late, some fiscal reforms have been undertaken in these countries—which incidentally are similar to those recommended for the industrial countries. In most cases, they involve the introduction of measures to broaden the tax base and simultaneously flatten the tax rates. The trends seen in these developing countries in taxation system are: heavy dependence on the value-added taxes, lower personal and corporate income taxes, broadening of the tax bases and

---

35 The Federal Bureau Revenue of Pakistan (FBR) has introduced some reforms which include; improving the tax compliance of the tax administration, implementing amnesty scheme, self-assessment scheme, and extension of the general sales tax to the services sector. The quantum of government revenues has greatly improved in recent years, as a result of higher economic growth, tax administration reforms, the privatization of public utilities and telecommunications. Similar reforms have been launched by other countries in the beginning of current decade.
simplification of the tax bands for corporate and personal income taxes, elimination of export
taxes, reduction and simplification of import and excise duties.

But to overcome their fiscal deficits the tax net has to be broadened by taxing the
property, agriculture and growing services sector (especially lawyers, consultants and doctors).
Another core issue in this regard is an awareness and simplification of the tax system. For this
purpose, like developed countries, a system of postal addresses for tax billing and collection can
be introduced, computerization for tracking tax payments can be launched, a telephone or web
site can be setup where one can download tax forms and instructions and have questions
answered.

3.2.2- Direct and Indirect Taxes:

Tax revenue broadly comprises direct taxes and indirect taxes. The direct and indirect
taxes are different in nature, tax base, and method of collection and have different implications
for economic activity--- and more relevant to the subject-matter of this study, it impacts
differently on the cost of economic welfare. In developing countries direct taxes are normally
imposed on income and levied in the form of income tax, wealth tax, capital value tax,
corporate tax, and worker’s welfare fund etc. Indirect taxes are a leading contributor to the tax
revenue. These normally include outlays and levies like custom duties, excise duties, sales tax
etc.
3.2.2.1 Temporal Shifts in Direct and Indirect Taxes in the Region:

With structural reforms in the tax system, there has taken place a considerable shift from indirect taxes to direct taxes in Pakistan and India but in the case of Sri Lanka such changes have been insignificant. The share of direct taxes in the total tax revenue has increased to 36% in Pakistan and 49% in India in FY2006; but Sri Lanka continues to rely heavily on indirect taxes. This shows that the structural transformation from indirect taxes to direct taxes is higher in India as compared to both Pakistan and Sri Lanka. In FY2007 the direct taxes were contributing almost 50% of the total tax revenue in India which is nearly highest among the low-income countries. In developed countries the share of direct taxes are much higher than indirect taxes. Figure 3.3 shows different patterns of tax structure in low-income, 

36 See figure 3.3 for comparison.
middle-income and high income countries. The reality is that high-income countries tend to tax income and property, whereas low-income countries tend to rely on indirect taxes on international trade and goods and services. But there are exceptions in all these groups.  

**Figure 3.4**

Structural Changes in the Share of Direct Taxes and Indirect Taxes in Total Tax Revenue (% of tax revenue) (Pakistan, Sri Lanka and India)

(Pakistan)

![Pie charts](image)

Source: Different issues of Economic Survey, Ministry of Finance, Pakistan.

(India)

![Pie charts](image)


---

37 The share of indirect taxes in Pakistan’s total taxes in 1990-91 was 82% which has decreased to 68.3% in 2006-07. In 1990 the share of custom duty was 54.9% in indirect taxes while in 2006-07 has declined to 32.3%. This shows paradigm shift in dependence on taxes on international trade. In the same period revenue from central excise duty has declined from 27.5% to 14.1% of indirect taxes. The central excise duty (CED) has become a dying tax. The decline in the share of custom and central excise duty has been compensated by rise in the share of sales tax in indirect taxes from 17.6% to 70.5% which implies a shift of tax incidence towards consumption based taxes.
Although there is a considerable shift from indirect taxes to direct taxes, in India and Pakistan, but the share of direct taxes in total taxes is not still high enough especially in Pakistan. This is a disadvantage because direct taxes are considered superior for reasons of economic efficiency, economic development and social welfare. The situation of Sri Lanka is alarming in this regard because, on one hand, it has highest tax-to-GDP ratio in the region, and yet it has the lowest highest share of indirect taxes in the tax revenue. Therefore, Sri Lanka needs to reform its fiscal policy so that the burden of taxation from the poor for equity and social justice is significantly reduced.

3.2.2- Public Expenditures:

Government plays an active role in a market economy by using public expenditures as a tool of public policy. The government uses public expenditure to reveal its preferences for public goods and thus creates effective demand for goods and services in the market. It finances various expenditures like spending on defense, internal law and order, infrastructure development, disposes off administrative activities and incurs expenditure to accomplish social
and economic activities. In the modern age, the size of public expenditure has grown by leaps and bounds, possibly due to an increase in population, growth of state activities, increase in national wealth, modernization of defense services, provision of public utility services, expansion in social services, technological advancement, expansion of the domain of public services, political and social factors, inclusion of new activities in the domain of welfare responsibilities, growth of employment and economic development.\(^{38}\)

Figure 3.5 shows total expenditure as percentage of GDP of the developing countries. Total expenditure-to-GDP ratio of Sri Lanka was 28.3% per annum on average in the decade of 1970s, 32.5% in 1980s after that it has decreasing trend and in 2007 it is at 23.2% in 2007. The case of Sri Lanka is interesting as it has the highest total expenditure as percentage of GDP like revenue-to-GDP ratio. India has lowest total expenditure-to-GDP ratio during the same period. It was only at 11.3% of GDP in 1970s and still in 2007 it is the lowest at 15.1% in the sample.

**Figure 3.5**

Total Expenditure of Selected Developing Countries (% of GDP)

Source: Key Indicators for Asia and the Pacific (2008) and World Development Indicators (2008)

\(^{38}\) (Dewett, 2005)
The total expenditure incurred by Pakistan in the 1960s averaged at 11.6% of GDP; since then it has increased to 21.5% in the 1970s and 24.9% in the 1980s. However, on the eve of structural adjustment program (SAP) of the World Bank and the IMF the expenditure slightly shrank to 24.1% in the 1990s, mainly because of frequent slicing down of the development expenditure. It had a rising trend since 1960s but it could not keep the momentum owing to resource crunch of the 1990s, which resulted in substantial slowdown in the economic growth in the 1990s. The marked improvement in the selected developing countries is witnessed in the backdrop of reversal of declining trend in development expenditure. The growth-enhancing potential of expenditures is well illustrated during the last five years in these developing countries. These countries are mostly net dis-savers, i.e. their current expenditure has exceeded their tax and non-tax revenue. Therefore, it needs to enhance private sector savings to finance a part of even its current expenditure. The main cause of the deficit has been the incapability of the government to bring under control current expenditure within manageable limits. To varying degrees the same is true of Sri Lanka and India.
Development expenditures are normally incurred to make incremental changes in the existing capital stock—e.g., by building roads, highways, buildings, schools, hospitals etc. In Pakistan, India and Sri Lanka, like other developing countries, development expenditure has been the main victim of all sorts of fiscal adjustments and expenditure rationalizations in the decades of the 1980s and the 1990s. It was 7.2% of the GDP in the 1980s but declined to 4.7% of GDP in the 1990s and reached lowest ever level of 2.1% of GDP in 2000-01 in Pakistan. It bounced back and rose to 4.8% of GDP in 2005-06. The situation of India is similar to Pakistan with only 4.3%, 2.4%, 2.3% and 2.6% in 1990, 1995, 2000 and 2007 respectively. The situation of Sri Lanka is far better with development expenditure at around 6% in 1990s and present decade. Sharp changes in development expenditure have had serious implications for socio-economic development in the 1990s. Upsurge in the development spending would be a positive sign for infrastructure development and augmenting growth momentum in the economy of these countries. The development expenditure is mostly allocated to big projects, sometimes those with questionable economic value. Such projects give rise to larger budget deficits and neglect of the social sectors like health, education, and population planning. Moreover, since project financing is either through foreign loans or domestic borrowings; inefficiency and waste, which are common in the public sector, make them more costly in the context of the repayment and servicing liabilities generated by such financing. The situation is no different in other countries.

3.2.3- Fiscal deficit and Public Debt:

There is an important distinction between fiscal deficit and public debt. Fiscal deficit is the gap between total revenue and total expenditure during the course of a fiscal year whereas
public debt is the total value of government bonds outstanding at any particular point in time. Hence, fiscal deficit is a flow variable while public debt is a stock variable. Public debt refers to the borrowing by a government from inside or outside the geographical boundaries of a country over a period of time. Fiscal deficit normally requires financing and thus leads to accumulation of the debt. The government can finance its budget and development efforts by borrowing and/or by taxing income. Whereas, taxes cause distortion in the economy, public expenditures financed by borrowing increase welfare and promote economic growth. And yet an extended prevalence of fiscal deficit financed by borrowing cause the accumulation of huge debt accompanied by the accrual of excessive burden of debt servicing in the selected developing countries. In the end, taxes have to be raised to retire and service public debt. So there is a real trade-off between taxing, spending and borrowing. Needless to add, if public expenditure financed by borrowing is wisely done and leads to economic growth then it becomes easier to pay it off and service through taxation.

Not only Pakistan, India and Sri Lanka, but most of the developing countries have run large fiscal deficits and have faced similar consequences in 1980s and 1990s, partly because not much prudence has been shown in using public expenditure to accelerate economic growth. Several steps have been taken by their governments to restore fiscal balance. Tax smoothing has also been used as policy tool, among many others. The issue of fiscal imbalances has attracted a great deal of attention over the two past decades, especially by the IMF. In developing countries all macro-indicators have been badly affected by the persistently higher fiscal deficits and the way they have been financed. The higher budget deficits have resulted from lackluster efforts made by governments to mobilize additional resources to meet the
needs of rising finances. Its adverse affects show up in the shape of rising interest driven public expenditures and excessive domestic and external borrowing to face the challenges of fiscal suffocation.

Jha (2004) indicates that fiscal deficits of many developing countries are un-sustainable. He ascertains whether in the long-term public revenue and public expenditure are related in the sense that any excess of expenditure over revenue can be financed by generating budgetary surpluses over long-run. His study reveals that in a number of developing countries this cannot be assured and their fiscal deficits are not sustainable. Mendoza and Ostry (2007) argue that while fiscal policy in many developing countries is responsive to budget deficits highly indebted countries incur the risk of unsustainable fiscal stance.  

Both current account deficits and fiscal deficits have been unsustainable among many developing countries. Higher fiscal deficit have also led to a sharp deterioration of almost all macro indicators like interest rate, GDP growth, current account deficit, public debt, etc. Fiscal deficit in Pakistan, Sri Lanka, and India remained high because of the government's inability to mobilize additional resources or to curtail current expenditures. The deficit of Sri Lanka has remained highest among these countries in spite of having highest tax-to-GDP ratio in the region. It was more than 10% of GDP in 2001. To meet such a situation Fiscal Management (responsibility) Act 2003 in Sri Lanka and Fiscal Responsibility and Debt Limitation Act 2005 in Pakistan have aimed at ensuring that government’s financial strategy must based on principles of responsible fiscal management and facilitating public scrutiny of fiscal policy performance.

---

39 Findings show that Malaysia, Hungary, Ecuador, Morocco, Panama, Philippines, Indonesia, Bulgaria, Egypt, Israel, Jordan, Lebanon, Nigeria, and Pakistan are on such a risk.
40 Jha (2004)
The large and persistent fiscal deficits engendered considerable concerns about sustainability of the economic growth. There has been a consensus that the large and persistent deficit reduces economic growth. Fiscal deficit in Pakistan accelerated from 5.3% of GDP in 1970s to 7.1% in the 1980s compared to modest 2.1% in the 1960s. The decade of the 1990s witnessed some half hearted and lackluster attempts to bring deficit around 4% of GDP but overall fiscal deficit remained as high as 6.9% of GDP, slightly lower than the level of the 1980s. In the recent years it has remained around 4% of GDP. The situation of India has remained similar to Pakistan which witnessed the deficit remained in-between 4% to 7% of GDP in 1990s. However, after 2001 it started declining and by 2007 it became 3.1%. The most alarming

---

41 Romer (2001)
42 The improvement in revenues, coupled with disciplined spending, saw a substantial reduction in fiscal deficit during last seven years and reached as low as 3.3 percent of GDP in 2004-05; first time it fell below 4 percent of GDP in over 30 years. After that main reason behind increased deficit being earthquake rehabilitation expenditures and rising development related expenditures. The rise in the deficit due to earthquake rehabilitation reveals that the government has tried to smooth its tax rate as most of the expenditures have been financed by foreign aid and debt whereas no tax has been imposed in the name of earthquake expenditure which was a transitory increase in the government expenditure.
situation has been for Sri Lanka which deficit never came below 6.7% of GDP since 1990, in spite of, having highest tax-to-GDP ratio in the region.

3.2.3.1- Public Debt:

Excessive deficits have had important macroeconomic consequences. However, doing without debt is almost impossible. Increasing large public expenditure is inevitable to promote pro-poor growth, and provide basic services such as education, health, sanitation, housing, law and order, defense and justice etc. Consequently, governments finance their spending and development efforts by borrowing, taxing output or printing money. However, tax-tilting, tax smoothing, and stability are there main reasons that explain why public debt may on the margin, be better than taxation. Tax-tilting permits a more equitable manner in which a country can expand investment opportunities with long-gestation periods. In a growing economy, it would be to some extent unfair to tax current (poorer) generations to pay for investments that will benefit future (richer) generations. Alternatively, tax smoothing provides a more efficient way for conducting counter-cyclical policies or fulfilling transitory spending requirements. Raising and lowering taxes frequently involve welfare cost, efficiency losses and generate economic uncertainty.\textsuperscript{43} Moreover, excessive reliance on printing money could lead to high and volatile inflation, which affects prices and hurts investment.\textsuperscript{44} But, debt has eventually to be repaid hence borrowing is simply postponed taxation.

Sovereign debt can help developing countries via financing the distortionary taxes in the context of tax smoothing. It enables their governments to facilitate growth take-offs by

\textsuperscript{43} Barro (1979)  
\textsuperscript{44} Gill & Pinto (2005)
investing in a critical mass of infrastructure projects and in the social sectors when taxation capacity is limited, or when the alternative would be to print money and compromise macroeconomic stability. Debt also facilitates tax smoothing and counter-cyclical fiscal policies, essential for reducing output volatility and it permits an equitable alignment of benefits and costs for long-gestation projects by shifting taxation away from current generations. This is what theory tells us. However, there are many reasons to believe that governments which borrow and spend prudently will reap these benefits in practice.

The public debt could also be a constraint on growth and development in developing countries. According to the World Bank (2003), beyond an optimal point, public debt becomes a constraint on the composition of government spending as interest payments consume a growing fraction of revenues. It could also constrain financial sector reform and development, because the government is reliant on a captive financial system to buy its debt, thus affecting resource allocation and reduce private investment to the extent that it exploits complementarities with public investment.

In practice, there has been a plethora of costly macroeconomic crises during the 1990s with public debt either being a central cause, e.g., Russia in 1998 and Argentina in 2001, or else absorbing the brunt of the impact in Indonesia, Korea, Malaysia, and Thailand during 1997-98. The external debt crisis of the 1980s and controversial financial liberalization of the early 1990s have also raised serious questions about the benefits of market-based external finance for developing countries (Gill & Pinto, 2005). Public debt has generated several financial crises in large emerging markets over the past decade. Although it was not a major cause in the Asian
crises of the late 1990s however, was a main feature in the crises in Argentina, Brazil, Mexico, Russia, and Turkey.\(^{45}\)

**Figure 3.8**

External Debt of Selected Developing Countries (% of GDP)

![Graph showing external debt of Sri Lanka, Pakistan, and India from 1990 to 2006.](image)

Source: Key Economic Indicators Asia and the Pacific (2008).

Pakistan, India and Sri Lanka the concerns have been with fiscal deficits and with the size and maturity of the country's external debt. Across South Asia, debt has been a focus of government policy. In 2006 in Sri Lanka, public debt stood at 93 per cent of the GDP. In India, public debt was about 70% of GDP in 1990 increased to 87% 2004 and it was 82% in 2006. The share of external debt is the major part of public debt of these countries. Like total public debt external debt has also decreasing trend as percentage of GDP. Its share decreased from 74, 50 and 27 percent of GDP in 1990 to 43, 28 and 17 percent in 2006 in Sri Lanka, Pakistan and India, respectively. Sri Lanka’s external debt-to-GDP ratio has been highest in the region however, a gradual declining trend is observed from a peak level of 62% in 1989 to 38% at end 2007.

\(^{45}\) (Rangarajan & Srivastava, 2003)
However, the country’s total external debt-to-GDP ratio is still above the internationally accepted comfortable level.\textsuperscript{46}

The governments’ growing indebtedness has become a dilemma for developing economies. Sky-scrapping public debt and very large external debt has far reaching implications for macroeconomic and fiscal sustainability in developing countries. The large and persistent twin deficit, unwise use of borrowed resources, deteriorating debt carrying capacity and rising real cost of government borrowing were some of the main reasons that were hallmark of Pakistan’s economic situation in the 1990s.\textsuperscript{47} The country had entered into a vicious debt trap and more debt was contracted to service older debt obligations. An unstable macroeconomic environment produced by high public debt has always potential to generate misallocation of resources, for example undertaking of low economic priority development projects, which reduces the efficiency and productivity of capital, leading to deceleration of economic growth.\textsuperscript{48}

Analysis of the causal relationship between the public debt and economic growth by researchers presents quite a complex picture.\textsuperscript{49} There is an almost consensus that high public debt has negative impact on economic growth above the threshold level, either in the shape of internal or external, especially in the developing countries, the same is true for Pakistan.\textsuperscript{50} The

\textsuperscript{46} The public debt of Pakistan grew at the rate of 18\% per annum on average in the 1980s and 15\% per annum on average in the 1990s. The root cause of raising debt burden was the large fiscal and current account deficits in these two decades. The public debt-to-GDP ratio was almost 56\% at the end of the 1970s increased to 92\% at the end of the 1980s, and further to over 100\% by the end of the 1990s. From this position of height it came down to 53.4\% of GDP by the end of June 2007.

\textsuperscript{47} Debt Committee Report (March 2001)

\textsuperscript{48} Moss & Chiang (2003)


\textsuperscript{50} Siddiqui & Malik (2001) have analyzed the impact of public debt whereas; Waheed (2006) has analyzed the impact of internal debt on economic growth for Pakistan.
decade of the 1990s is a classical example when fiscal suffocation has led to deterioration of growth and investment figures.

Debt profile of selected developing countries witnessed a significant improvement in recent years. The most important development being the sharp cutback in the cost of debt and the lengthening of the maturity profile, which ultimately reduced the dependence on external debt and resulted into a sharp drop in the debt-to-GDP ratio. In fact, the growth in external debt stock of these countries has slowed significantly in recent years, driven primarily by the governments’ improved fiscal position, prepayment of expensive debt and the strengthening domestic currency. The reductions in the debt burden came by way of rescheduling, a debt swap for social spending, debt cancellation and pre-payment of expensive debt in Pakistan.

3.3- Conclusion:

Public finances of Sri Lanka, India and Pakistan are broadly similar. One interesting thing is that with highest tax- and expenditure-to-GDP ratio in the region Sri Lanka has also highest public debt-to-GDP ratio in the region while, India with lowest tax and expenditure ratios has also lowest public debt-to-GDP ratio. Pakistan and India fall in the low-income countries group while Sri Lanka in middle-income countries. However, the share of direct taxes in the total tax revenue is less than Pakistan and India.

The economies of Pakistan, Sri Lanka and India were characterized by severe fiscal deficit, sky-rocketing public debt and stumpy economic growth in the 1990s. This is a typical case of developing countries with higher incidence of the public debt. They landed into

---

51 World Development Indicators (2008)
difficulties because of fiscal profligacy and for not taking important decisions to smooth their current and future consumption with their current and future taxation. The unfortunate 9/11 episode proved to be a blessing in disguise for Pakistan and many other developing countries.\textsuperscript{52} Pakistan was successful in restructuring its public finances though temporarily. It has got much needed fiscal space but it is debatable whether Pakistan actually adjusted its taxation and expenditure structures to get long term benefits. It seemed that has followed the historical path of haste and waste. The debt explosion coupled with higher fiscal and current account deficit resurfaced as major threatening syndromes in our public policy debate in 2008 which is very alarming. The situation of the Sri Lanka is similar to that Pakistan. However, India has kept its fiscal deficit reasonably low as compare to the other two countries. Going forward these Asian developing countries would require tremendous resources to finance their development and to support growth momentum. Given the downward rigidity of the current expenditure, and crucial importance of the development expenditure, the only way would be to mobilize additional resources is by generating higher level of revenues. They have to bring under-taxed and/or un-taxed sectors in the tax net, and above all we should capitalize the room of plugging loopholes in the revenue system. This for sure would generate immense resources.

The current greater deficit tolerance and the debt accumulation of these developing economies would land them in situations like the 1990s. They required generating primary surpluses to reduce public debt burden by continued fiscal adjustments. And these adjustments have been achieved at the cost of cut in the development expenditure rather by inducing these

\textsuperscript{52} Pakistan could restructure its foreign debt through easy credits and debt swapping. The developing countries also received more remittances than earlier.
countries in engaging in serious revenue mobilization efforts to increase domestic tax revenue. It will be seen that the dictates fiscal solvency will require, among other things, the adoption of tax smoothing behaviour to finance the requirements of the fiscal gap. It will also require the government to finance all its permanent expenditures with taxes and only contingent debt should be created to finance the temporary expenditures. To this end, not only should expenditure be controlled but taxation system but the taxation system will have to be revamped.

The developing countries’ tendency to acquire both external and internal debt without deep analysis must be constrained. The foreign debt burden in South Asia shows that the increasing dependency of South Asian countries on foreign debt is alarming. This may place these countries are on the edge of economic insolvency. Moreover, debt-to-GDP ratio shows rising trends of foreign dependency beyond sustainable level. In the case of external debt, non-concessionary loan and loans with too many cost-pushing strings should not be taken. Foreign debt restructuring and debt swapping should be analyzed in depth to reduce the burden of the existing foreign debt. In the case of domestic debt, bank and non-bank borrowings through various savings schemes and saving institutions for budgetary support should be kept within the safe limits. It should be harmonized with debt management and monetary policies in order to endorse assimilation of the capital and money market. Furthermore, privatisation earnings should be used to retire the huge domestic borrowing rather than to finance expenditure.

---

53 Chaudhary & Anwar (2000)
In the last analysis the fundamental problem for the developing countries is low tax collections. There are many reasons but the most important reason is corruption in tax paying and collection activities. Indeed, if there are proper monitoring and anti-corruption procedures, collection may be increased which is rarely present in developing countries. The revenue can also be increased by decentralizing and privatizing the tax collection. In every case, the decision to decentralize and privatize is political. The evidence is that the rich counties of the world are those who have decentralized the tax system. To improve the tax collections in developing countries tax laws should be made as simple as possible; the tax system should have few exemptions, credits, rebates or deductions, and should not be designed to achieve too many social and economic goals.\footnote{Wallschutzsky (1989)}
Chapter 4

Theoretical Model

The idea of tax smoothing, given by Barro (1979) and extended by others, is discussed at some length in this chapter. It gives theoretical background of the tax smoothing model. After this introduction of the chapter section 4.1 briefly discusses the details about the development of the tax smoothing model and derives empirically testable form of the model by solving a constraint optimization problem that a real-life government would typically face. The last section summarizes the chapter.

4.1- Theoretical Derivation of the Model:

Tax smoothing hypothesis assumes that the individuals' efforts to reduce their average tax burden impose social welfare costs on society. It is assumed that these costs would increase if not minimized by a policy of tax-rate smoothing. The tax smoothing hypothesis assumes the representative agent and the government share a common time horizon, and the agent’s utility function is unaltered by the provision of goods by the government.

In most of the studies reviewed in chapter 2 the main assumption is that since the government expenditures are exogenously given and distortion in taxes involves a social welfare loss such as collection cost, taxes create a motivation for taxpayers to substitute away from taxed activities toward untaxed one, or are taxed at lower marginal rates. It is further
assumed that the government seeks to reduce the distortions caused by taxation. The distortions created by taxes are likely to increase more than proportionally with the increase of revenue raised. As in the model presented in this chapter and other standard models of Bohn (1990), Ghosh (1995), Abeyesinghe & Jayawickrama (2006), and Adler (2006) that recommend low taxes, the distortionary costs are approximately proportional to the square of the revenue raised. Therefore, the welfare cost (dead-weight loss) of taxation per unit of output is defined as,

$$z(\tau_t) = \frac{\tau_t^2}{2}$$  \hspace{1cm} (4.1)

Where \( \tau \) is the tax rate, the quadratic deadweight loss function assures that \( z'(\tau_t) > 0 \) and \( z''(\tau_t) > 0 \). In a stochastic environment, the deadweight loss is determined by the expectations of future tax rates. Since a single tax rate is assumed for the whole economy, we obtain the total dead-weight loss of the whole economy multiplying expression (1) by income \( Y_t \).

The government typically wants to minimize the present value of distortions from raising revenue subject to the constraint that the present value of its revenues be not less than some specific level. Because of increasing marginal distortionary costs of raising revenue through raising taxes, the government will rationally choose a smooth path for taxes. The government’s objective function is given as,

$$V = Min \left\{ \frac{1}{2} \sum_{i=0}^{\infty} \rho^i E_t \tau_{t+i}^2 Y_{t+i} \right\}$$  \hspace{1cm} (4.2)
According to the basic version of the tax smoothing hypothesis, given by Barro (1979) as derived by Gosh (1995), the dynamic budget constraint faced by government is as follows

\[ D_t = (1 + r)D_{t-1} + G_t - T_t \]  \hspace{1cm} (4.3)

Where “\( r \)”, the real interest rate is related to “\( \rho \)” discount rate as \( \rho = \frac{1}{1+r} \). \( D_t \) is government debt and \( D_{t-1} \) is the government debt of the previous year, \( G_t \) is government non-interest expenditure and \( T_t \) is government tax revenue. The values of \( G, D \) and \( T \) are in real terms.

This model assumes that government expenditure is exogenously given. In a stochastic setting, the inter-temporal budget constraint states that when a no-ponzi game condition is imposed on debt, the sum of present discounted value of expected government expenditure and initial debt must be equal to the present discounted value of expected tax rates.\(^{55}\) When expectations are taken into account and no-ponzi game condition on debt is imposed then equation (4.3) gives

\[ \sum_{i=0}^{\infty} \rho^i E_t G_{t+i} + D_{t-1} = \sum_{i=0}^{\infty} \rho^i E_t T_{t+i} \]  \hspace{1cm} (4.4)

Dividing expressions in (4.2) and (4.4) by \( Y_{t+i} \) and solving the constrained optimization problem we get the following expression

\[ E_t \tau_{t+i} = \tau_t \hspace{0.5cm} \text{for all } i = 1, 2, 3, ... \]  \hspace{1cm} (4.5)

\(^{55}\) The no-ponzi game condition rules out unlimited lending or borrowing by the government.
The expression (4.5) gives the time path of taxes that minimizes the present value of the welfare costs subject to the requirement that it satisfies the overall budget constraint. It states that changes in tax rate cannot be predicted. That is, tax rate follows a martingale (follows a random walk). It is the basic implication of tax smoothing hypothesis. The random walk for tax smoothing has been tested in most of the empirical studies including Barro (1981) and many others.

Even though expression (4.5) nicely captures the tax smoothing hypothesis; yet, in the line with Campbell (1987) formation, Bohn (1998) states that the unit root tests are inconsistent and deceptive because they might not properly adjust for fluctuations in the GDP and in government expenditures. Therefore, there may be many reasons to proceed beyond the unit root test. First, the random walk of the tax rate can be a political process which might be unrelated to the tax smoothing behavior. Second, reason is that it is difficult to assess the economic significance of the statistical rejection of expression (4.5). Third, some time-series proprieties cannot be explored when focusing exclusively on (4.5). For these reasons, Huang and Lin (1993) and Ghosh (1995) went beyond the unit root test. They proposed a vector auto-regression (VAR) for tax rate and the budget surplus. In this approach they propose to estimate the forecasted time path of the budget surplus that is optimal for the government to follow. The forecasted budget surplus time-series can then be compared to the actual budget surplus time-series in order to evaluate the fit and the economic significance of the model. In the case of the tax smoothing, both series would follow the same time path. Moreover, the

---

56 A martingale is a stochastic process (i.e., a sequence of random variables) such that the conditional expected value of an observation at some time is equal to the observation at that earlier time.
57 They went beyond the unit root test by depending on the research made by Campbell (1987), Campbell & Shiller (1987), and Bohn (1991).
standard statistical testing in the VAR can easily be implemented to formally test the authenticity of the hypothesis.

The Gosh (1995) model offers an indirect method of testing the tax smoothing hypothesis. He focused on the predicted budget surplus due to difficulty in measuring the permanent expenditure. However, Sahasakul (1986) has provided a direct approach to test the tax smoothing hypothesis. To this end, he has used the permanent component of government expenditure. (Abeysinghe and Jayawickrama (2006) also follow this procedure)

To continue beyond the unit root test, the instantaneous borrowing constraint of the government is given in expression (4.5). Putting expression (4.5) into (4.4) optimal tax rate can be obtained as follows,

\[
\tau_t = \left(\frac{1-\psi}{\psi}\right) d_t + \left(\frac{1-\psi}{\psi}\right) \sum_{i=0}^{\infty} \psi^i E_t g_{t+i}
\]  

\(4.6\)

Where \(\psi = \frac{(1+r)}{(1+n)}\), and \(n\) represent long-run output growth rate and \(d_t, g_t\) and \(\tau_t\) are the debt rate \(\left(\frac{D_t}{Y_t}\right)\), expenditure rate \(\left(\frac{G_t}{Y_t}\right)\) and tax rate \(\left(\frac{T_t}{Y_t}\right)\) respectively and assuming \(\psi < 1\). (i.e. \(n < r\) which assures dynamic efficiency of an economy).

According to expression (4.6) the only martingale that satisfies the tax smoothing hypothesis is that which sets the tax rate exactly equal to the annuity value of the sum of government debt and the present discounted value of expected government expenditures. The right hand side of the expression (4.6) is the constant flow of expenditure that is expected to
sustain for the remaining government’s time horizon. It is made up of all the long-run components of permanent government expenditure rate and is symbolized as \( g_t^p \).

\[
\tau_t = g_t^p
\]  

(4.7)

Plugging (4.7) into (4.5) we get,

\[
E_t \tau_{t+i} = g_{t-1}^p
\]  

(4.8)

This can be written in the empirical testable form to test the co-integration between permanent expenditure rate series and tax rate series as,

\[
\tau_t = \beta g_{t-1}^p + \mu_t
\]  

(4.9)

Where \( \beta = 1, \mu_t = \phi \mu_{t-1} + \epsilon_t \) and \( \epsilon_t \) is assumed to be zero-mean white noise process. Autocorrelation parameter \( \phi, (0 \leq \phi \leq 1) \), measures the degree of co-integration. We can, therefore, assess the tax smoothing depending on the co-integration parameter. The Error Correction Mechanism (ECM) might be estimated for testing co-integration and seeking causality direction on the basis of data requirements. For tax smoothing along with long-run co-integration causality should run only from permanent expenditure rate to tax rate.\(^{58}\)

There should be no effect of exogenous variables on the tax rate other than permanent expenditure for fully complying with the tax smoothing. For perfect tax smoothing only permanent government expenditure should prompt additional taxes but in the case of inverse

\(^{58}\) i.e., Such a situation would be consistent with the spend-and-tax hypothesis. See chapter 1 for details.
there is no tax smoothing.\(^{59}\) Conversely there may be two additional situations: one, if both cause each other; and, the second, when none of the two cause each other. In former situation there is weak tax smoothing and in the latter it does not exists. However, if any other exogenous variable with permanent expenditure also have effect (may be positive or negative) on taxes then there will be a weak tax smoothing. On the basis of the error-correcting parameter in the estimated ECMs we can decide which of the tax-spend hypothesis applicable for each country in the sample.

4.2- Conclusion:

This chapter presents a brief historical development of the theoretical model for testing the tax smoothing hypothesis. It starts discussion from the Barro (1979, 1981) who argues for testing the random walk of the tax rate series. Even though the random walk test nicely captures the essence of the tax smoothing hypothesis, yet the unit root tests might be inconsistent and deceptive because these tests do not properly adjust for fluctuations in the GDP and government expenditures. This requires going beyond the random walk test to check for the tax smoothing behavior.

Gosh (1995) develops a test with the base provided by Huang and Lin (1993). His test marked an improvement on the previous test of random walk. However, data for permanent expenditure are not readily available. Due to this reason, researchers have focused on examining the relationship between fiscal deficit and the changes in government expenditure.

\(^{59}\) i.e., If only changes in tax rate cause permanent expenditure then there would be no tax smoothing.
Contrasting Sahasakul (1986), they have adopted indirect procedure which uses non-defense expenditure as permanent expenditure. However, Abeysinghe and Jayawickrama (2006) extracted permanent expenditure component from total government expenditure using Baveridge-Nelson Decomposition (BN) technique. This study extracts permanent and transitory parts of total expenditure using BN-Decomposition and Wavelet Transformation (WT) techniques.

The model presented in this chapter provides an opportunity to test the tax smoothing hypothesis directly by checking co-integration between the tax rate and permanent expenditure rate series. For this purpose Engle-Granger (1987) approach will be used. The Engle-Granger Error Correction Mechanism (ECM) analyzes long-run and short-run relation between tax rate and permanent expenditure rate series. Moreover, it allows introducing additional I(0) exogenous variables in the ECM. The ECM also provides an opportunity to evaluate the tax-spend nexus via significance of the error-correcting term.
Chapter 5

Data and Methodology

This chapter deals with data and methodology for estimation of the models discussed in chapter 4. Section 5.1 gives the details of the data used for empirical analysis. Section 5.2 deals with the decomposition of the expenditure rate series into permanent and transitory and permanent components. It explains decomposition procedure of Beveridge-Nelson and Wavelet Transformation. Section 5.3 explains the process of integration and narrates Augmented Dickey-Fuller (ADF) unit root test procedure. Section 5.4 explains the co-integration process and gives details of Granger Representation Theorem to test co-integration. The last section concludes the chapter.

5.1- The Data:

Depending on the data availability we selected sample period from 1965 to 2007 for Pakistan, India and Sri Lanka. Data for Government Revenue, Government Expenditure, Gross Domestic Product (GDP) and Money is obtained from:

1. International Financial Statistics
2. World Development Indicators.
Revenue is cash receipts from taxes, social contributions, and other revenues such as fines, fees, rent and income from property or sales.\textsuperscript{60} The GDP at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Expenditure is cash payments for operating activities of the government in providing goods and services. It includes compensation of employees (such as wages and salaries), interest and subsidies, grants, social benefits, and other expenditures such as rent and dividends.

The series which are used for estimation are formed from the above main variables. The average marginal tax rate should be computed using changing weights. The computation of average marginal tax rate is difficult due to unavailability of data. The average tax rate, revenue-to-GDP ratio, would be a better proxy for the effective tax rate than a fixed-weighted average marginal tax rate.\textsuperscript{61} Another reason to use revenue-to-GDP ratio is that governments are directly concerned to its total revenue, not the tax revenue alone, while deciding its expenditures. Therefore, we will use the average tax rate in our exercise.

The expenditure rate is average expenditure rate calculated as total government expenditure-to-GDP ratio. Permanent expenditure rate and transitory rate series are formed by

\textsuperscript{60} Grants are also considered as revenue but are excluded here.

\textsuperscript{61} There are several reasons to choose the total revenue-to-GDP ratio as a proxy of tax-to-GDP ratio. First, the data of taxes for selected countries are not available for reasonable long period for empirically valid results. Second, the present study is concerned with enhancing government’s ability to minimize the budget deficit and reduce fluctuations in it --- and also to reduce the incidence of public debt that is directly related to total public revenue rather than taxes alone. Taxes form a major proportion of total revenue. Third, Ghosh (1995), Olekalns (1997), Ashworth and Evans (1998), Adler (2006) and many others consider the average tax rate calculated as total revenue-to-GDP ratio a better proxy for average marginal tax rate.
decomposing the expenditure rate series by two different techniques namely; Baveridge-Nelson Decomposition and Wavelet Transformation.

5.2- Decomposition

Many economic theories (e.g. consumption theories, business cycle theories, etc.) require the decomposition of a time-series into permanent and temporary components. The idea of decomposition of a series into permanent and transitory components is not new. Initially it was discussed by Burns and Mitchell (1946) for dating the business cycle in the USA. Later, Fellner (1956) and Friedman (1957) proposed that trend is a deterministic function of time whereas the cyclical component is the residual. Mintz (1969, 1972) suggests that transitory component can be extracted as residual from the centered moving average of the data and centered moving average can be used as the permanent part of the time-series.\textsuperscript{62}

There is no unique way to decompose a series into permanent and transitory components. Main detrending techniques recently being used are: Hodrick-Prescott filter, Beveridge-Nelson\textsuperscript{63} decomposition, linear trend, segmented trend, first order differencing, unobservable components model, Band-Pass Filter (BP), Baxter-King (BK), and others. The survey articles by Harvey and Jaeger (1993) and Dupasquier, Guay, and St-Amant (1997), Canova (1998) explores the properties of the detrending techniques. The consensus is that, both quantitatively and qualitatively, decomposition of a time-series into permanent and transitory components varies widely since alternative detrending filters extract different types

\textsuperscript{62} See Beveridge and Nelson (1981) for details.
\textsuperscript{63} Beveridge and Nelson (1981)
of information from the data. Also, all the structural time-series models suffer from significant deficiencies. There are a number of ways to decompose a time-series into permanent and transitory components. However, this study will use the Beveridge and Nelson (1981) (BN) decomposition method and Wavelet transformation (WT) to decompose the government expenditure rate series into permanent and transitory components.

5.2.1- Beveridge-Nelson Decomposition:

An extensively used decomposition method in literature is the BN method. The BN-decomposition technique extracts from a time-series the unit root (random walk) component as the permanent component and cyclical part as the transitory component. Beveridge and Nelson (1981) originally used this method to examine the business cycle pattern in macroeconomic variables. Later, Watson (1986), Campbell and Mankiw (1987), Stock and Watson (1988) and others employed to decompose time-series variables into permanent and temporary components. We will decompose the total expenditure rate series into permanent and temporary components separately for each of the developing countries included in the sample.

If a series under consideration has a deterministic trend then the decomposition is straightforward. Such deterministic change can be subtracted from the actual change in the series in order to obtain the ‘irregular’ component. Enders (1995) also explains the mechanism of the BN-decomposition.

---

64 Watson (1986), Campbell & Mankiw (1987), and Stock & Watson (1988), and others have also used the BN-decomposition method.
5.2.1.1- Beveridge-Nelson Decomposition Procedure:

To decompose a series with BN-decomposition method the following procedure is normally applied:65

- Unit root test is applied to test whether the series is stationary or non-stationary.
- Box-Jenkins (1970) technique is used to select and estimate the best-fit ARMA \((p, q)\) model for the first difference sequence of the series.66
- Wold (1954) representation is used to estimate the \(\psi^*(L)\) of the best-fit ARMA \((p, q)\) model for the first difference sequence of the series. Where \(\psi^*(L)\) measures the permanent effect of a shock of, \(\epsilon_t\), \(L\) is the lag operator.

\[
\psi^*(L) = \frac{(1+\beta_1 L + \beta_2 L^2 + \ldots + \beta_n L^n)}{(1+\alpha_1 L + \alpha_2 L^2 + \ldots + \alpha_n L^n)},
\]

\(\beta_s\) and \(\alpha_s\) are constants with MA and AR terms in the best-fit estimated ARMA\((p, q)\) model respectively.

- \(\sum_{j=1}^{t} \epsilon_j\) are calculated by using the residuals gained from estimated ARMA \((p, q)\) model for the first difference sequence of the series.
- The permanent, \(P_t\), component of the series is estimated by using the following representation

\[
P_t = g_0 + \delta t + \psi^*(L) \sum_{j=1}^{t} \epsilon_j \tag{5.1}
\]

65 Morley, Nelson, & Zivot (2003) have explained the method of extracting the BN-trend from an actual time-series by estimating appropriate ARMA\((p,1,q)\) model.

66 To identify ARMA model is a kind of an art rather than a science. A more rigorous procedure to identify an ARMA model is to use formal model selection criteria. Present study have used two widely used model selection criteria namely, the Akaike information criterion (AIC) and the Schwarz information criterion (SIC).
δ is the constant in the best-fit ARMA \((p, q)\) estimated model and \(g_0\) is the initial condition for the series.

- The temporary component is obtained by subtracting the permanent part \(P_t\) from the actual series \(g_t\).

### 5.2.2- Wavelet Decomposition:

The second method that has been used in the present work to decompose the government expenditure rate series is the wavelet transformation method. The wavelet transformation uses a mathematical function to divide a given function into different frequency components and study each component with a resolution that matches its scale. It is a relatively new mathematical tool in economics that decomposes a time-series into different time space horizons. The main advantage of the wavelet analysis is its ability to decompose a time-series into more elementary components. A detailed introduction and discussion has been provided by Daubechies (1992), Percival and Walden (2000), Gencay, Selcuk, and Whitcher (2002) and Ramsey (2002). Many researchers have applied this method to decompose an economic time-series into transitory and permanent components for example Gallegati (2008) and Mitra (2006) and many others. However, it is also being used in engineering, medical, computer sciences, electronics, and space sciences.

### 5.2.2.1- Wavelet Transformation Procedure:

In order to decompose a series with wavelet transformation procedure in proper manner certain important decisions have to be made before starting the estimation;

1. The choice of the filter,
2. Managing the boundary conditions,

3. The sample size.

This study is considering government expenditure rate series for selected developing countries having different sample size therefore, Daubechies (1992) D4 filter has been used because it can handle any sample size. To handle the problem of data at boundaries we used the method of padding the value after the last value. For this purpose the value of the last year is repeated to keep the series smooth.

Following are the steps involved in the decomposition of the government permanent expenditure rate series into smooth and transitory components.

- X is the matrix of the actual time-series of government expenditure rate series that we want to decompose into permanent (smooth) part and transitory part.
- We have $W = \nu X$, \hfill (5.2)

Where $W$ and $X$ are $T \times 1$ vector matrices, $W$ is the vector matrix of the wavelet coefficients ($\tilde{\omega}_i$), $i$ is the level of transformation, and $\nu$ is a $T \times T$ transfer matrix of coefficients of the wavelet filter. As we are using Daubechies (1992) D4 wavelet filter so we can write the expression (5.2) as follows;

$$
\begin{bmatrix}
W_1 \\
W_2 \\
W_3 \\
\vdots \\
W_T
\end{bmatrix}_{T \times 1} =
\begin{bmatrix}
\tilde{\omega}_0 & 0 & 0 & \cdots & 0 & \tilde{\omega}_3 & \tilde{\omega}_2 & \tilde{\omega}_1 \\
\tilde{\omega}_1 & \tilde{\omega}_0 & 0 & \cdots & 0 & 0 & \tilde{\omega}_3 & \tilde{\omega}_2 \\
\tilde{\omega}_2 & \tilde{\omega}_1 & \tilde{\omega}_0 & \cdots & 0 & 0 & 0 & \tilde{\omega}_3 \\
\vdots & \vdots & \vdots & \ddots & \vdots & \vdots & \vdots & \vdots \\
0 & 0 & 0 & \cdots & \tilde{\omega}_3 & \tilde{\omega}_2 & \tilde{\omega}_1 & \tilde{\omega}_0
\end{bmatrix}_{T \times T}
\begin{bmatrix}
g_1 \\
g_2 \\
g_3 \\
\vdots \\
g_T
\end{bmatrix}_{T \times 1}
$$ \hfill (5.3)

Where $\tilde{\omega}_i = \frac{\omega_i}{\sqrt{2}}$, while $\omega_0 = \frac{1-\sqrt{3}}{4\sqrt{2}}$, $\omega_1 = \frac{-3+\sqrt{3}}{4\sqrt{2}}$, $\omega_2 = \frac{3+\sqrt{3}}{4\sqrt{2}}$, $\omega_3 = \frac{-1-\sqrt{3}}{4\sqrt{2}}$ and $g_1, g_2, g_3, \ldots, g_T$ are the values of the actual time-series at time $t$. 
Transitory (cyclical) part $C$ of the actual series can be extracted by using the expression;

$$C = \psi^T W$$  \hspace{1cm} (5.4)

Where $C$ is the transitory part at level one of actual series and $\psi^T$ is the transpose of the matrix $\psi$.

- Similarly we can determine smooth (permanent) part ($P$) of the actual series by using expression;

$$V = \Phi X$$  \hspace{1cm} (5.5)

Where $\Phi$ is the $T \times T$ matrix of coefficients of the scale components ($\tilde{\omega}_i$), and $i$ is the level of transformation, in our case we have $L=4$, hence $P$ can be calculated from the expression;

$$P = \Phi^T V$$  \hspace{1cm} (5.6)

- The relationship between decomposed parts and actual series is given by the following relationship.

$$X = \sum_{j=1}^{J} C_j + P_j;$$  \hspace{1cm} (5.7)

where in our case $J=1$, therefore ,

The transitory and permanent components can also be computed by only calculating one and extracting the other by using the (5.7) relationship.
5.3- Integration:

There are vital distinctions between stationary and non-stationary time-series. Shocks to a stationary time-series are temporary and the series revert to its long-run mean level. Enders (1995) compares stationary and non-stationary process as follows. A stationary time-series;

1. Fluctuates around its constant long-run mean.
2. Time invariant i.e. has finite variance.
3. Has theoretical correlogram that diminishes as lag length increases.

A time-series is covariance stationary if its variance and all auto-covariance are unaffected by a change of time origin. This kind is called weakly stationary. However, a strongly stationary process need not have a finite mean and/or variance. Therefore, weak-stationarity has strict conditions than strong-stationarity.\(^\text{67}\)

While, mean and/or variance are time dependent of a non-stationary series. The effect of any shock is permanently incorporated into the series. Therefore, a non-stationery time-series,

1. Does not revert to a long-run mean.
2. Has time dependent variance.
3. Theoretical autocorrelations do not die out.

The effect of any shock to a non-stationary series is permanently incorporated into the series. Often time-series data are non-stationary, and appear to be integrated.

\(^{67}\) See Enders (1995) for details.
As suggested in chapter 4 for tax smoothing tax rate should follow a random walk. A random walk is a special case of integrated at order one process I(1) series. Equation 4.6 can be written in empirical form as follows:

\[ \tau_t = \tau_{t-1} + \mu_t \]  \hspace{1cm} (5.8)

Or \[ \Delta \tau_t = \mu_t \]

\( \mu_t \) is a white noise term with zero mean and variance \( \sigma^2 \). Equation (5.8) represents a random walk process and states that the value of \( \tau \) at time (t) is equal to its value at time (t-1) in addition to a random shock. In general the random walk can be written as:

\[ \tau_t = \tau_{t-1} + \sum \mu_t \]  \hspace{1cm} (5.9)

The process (5.8) may have optional exogenous regressors that may consist of a constant or a constant and trend. A non-stationary series can be transformed into a stationary series by differencing it. The series is integrated of order \( d \) if it becomes stationary after differencing \( d \) times and is called I(\( d \)) series. Most of the economic time-series are I(1).

5.3.1- Testing for Unit Root:

Augmented Dickey-Fuller (ADF) test is used in this study. The ADF test is presented by Dickey and Fuller (1979). Dickey and Fuller (1979) presented following equation:

\[ \Delta \tau_t = \alpha \tau_{t-1} + \delta X_t' + \epsilon_t \]  \hspace{1cm} (5.10)
Whereas, $X_t'$ are optional exogenous regressors, these may be trend or a constant or both. $\alpha$, and $\delta$ are parameters to be estimated, and $\epsilon_t$ are error term assumed to be white noise. The null and alternate hypothesis can be stated as:

$$H_0: \alpha = 0$$

$$H_1: \alpha < 0$$

“t-ratio” for $\alpha$ is as under:

$$t_\alpha = \frac{\hat{\alpha}}{se(\hat{\alpha})}$$  \hspace{1cm} (5.11)

Where, $\hat{\alpha}$ is the estimate of $\alpha$ and $se(\hat{\alpha})$ is the standard error of $\hat{\alpha}$.

The DF unit root test is valid only if the series follows first-order autoregressive process. However, not all time-series processes can be well represented by the AR(1) process. To overcome such a situation the Augmented Dickey-Fuller (ADF) test presents AR($p$) process by adding $p$ lagged difference terms of the dependent variable $\tau$ to the right hand side of the test regression:

$$\Delta \tau_t = \alpha \tau_{t-1} + \delta X_t' + \beta_1 \Delta \tau_{t-1} + \beta_2 \Delta \tau_{t-2} + \cdots + \beta_p \Delta \tau_{t-p} + \upsilon_t$$  \hspace{1cm} (5.12)

An important characteristic given by Said and Dickey (1984) about the ADF test is that it is asymptotically valid even in the presence of a moving average (MA) component if sufficient lagged difference terms are included in the test regression.
5.4- Co-integration:

Most of the economic time-series are non-stationary. The estimates of ordinary least square (OLS) are not valid in the case of non-stationary series. The ordinary least square regression of an integrated series on another unrelated integrated series produces t-ratios of the slope parameter which indicates a relationship much more often than they should be at the nominal test level. This problem does not disappear even with the increased sample size, and is called spurious regression problem.68

A spurious regression can be detected by observing $R^2$ greater than the DW statistics with small standard errors and inflated t-ratios. Such a regression can be transformed into a valid regression by taking differences of the variables. This action solves only the statistical problems but not the economic interpretation of the regression. By taking differences important information is lost and also it is not the same information contained in a regression involving growth rates than in a regression involved the levels of the variables.

A spurious relationship may result when one non-stationary time-series is regressed against one or more non-stationary time-series. The best way to guard against spurious regressions is to check for co-integration between the variables used in time-series modeling. Co-integration is the existence of a long-run equilibrium relationship among time-series variables. It is a property of two or more variables moving together through time and despite following their own individual trends will not drift too far apart since they are linked together in

some sense. Co-integration is possible when both variables are integrated of same order and both variables move together in long-run.

5.4.1- Testing for Co-integration:

Two methods are extensively used to test for co-integration; The Johansen (1988) methodology and the Engle-Granger (1987) approach. This study uses Engle-Granger approach to analyze long-run and short-run relation between tax rate and permanent expenditure rate series. Moreover, it allows introducing additional I(0) exogenous variables in the Error Correction Mechanism (ECM). The Engle-Granger methodology tests whether the residuals of the equilibrium relationship are stationary, and then if the residuals are stationary these are used in the regression for error correction. The procedure of estimation through Engle-Granger Methodology is described in the following section.

5.4.1.1- Granger Representation Procedure:

The Granger representation theorem states that if variables are co-integrated, the relationship between them can be expressed as an Error Correction Mechanism (ECM). The Error Correction Mechanism brings together the static long-run equilibrium relationship of co-integrated time-series with its dynamic short-run disequilibrium. Engle and Granger’s procedure has concentrated on a single equation, with one variable designated as the dependent variable, explained by other variables that are assumed to be weakly exogenous for the parameters of interest.
If two variables are co-integrated, there exists an Error Correction Mechanism (ECM) representation. According to Granger representation theorem co-integration is a necessary condition for the ECM and vice versa. There are potential problems of using non-stationary data, but there are also great advantages. Structural economic models contain many structural equilibrium relationships. By equilibrium we mean relationships which hold on average over a long period of time.\(^{69}\)

Before the ECM can be formed there should be evidence of co-integration between the series. Given that co-integration implies a significant error correction term, co-integration can be viewed as an indirect test of long-run causality. It is possible to have evidence of long-run causality, but not short-run causality and vice versa. Provided two time-series are co-integrated, the short-run disequilibrium relationship between them can always be expressed in the error correction form.

Engle-Granger approach estimates long-run relationship and incorporates residuals for short-run fluctuations in the model. Following is the procedure suggested by Engle-Granger;

**Step 1:**

First step is to test the order of integration of the variables, for co-integration it is necessary that the variables should be of the same order of integration. If both variables are stationary I(0) then we need not to proceed as standard ordinary least square (OLS) applies to such time-series. However, if both variables are I(1) then we can proceed. For tax smoothing it

\(^{69}\) Such relationship may not essentially market clearing.
is necessary that tax rate should be integrated at order one. As we are going to find out the integration between tax rate and permanent expenditure rate series expenditure rate series therefore, both the series should be integrated at order one.

**Step 2:**

If the unit root test of variables in step 1 shows the series are I(1) then, next is to estimate the long-run equilibrium relationship between the tax rate and the permanent part of expenditure rate in following form;

\[ \tau_t = c + \beta g_{t-1}^p + \mu_t \] (5.13)

Here \( \beta = 1, \ \mu_t = \mu_{t-1} + \epsilon_t \) and \( \epsilon_t \) is assumed to be zero-mean white noise process. The equilibrium errors are represented by \( \mu_t \) obtained from the equation (5.13). There exists co-integration between the two I(1) variables if \( \mu_t \) series is I(0). Standard student t-statistics are not valid to check stationarity of the residuals, appropriate tables for this purpose are provided by Engle Granger. If the residuals are stationary the series the co-integration exists between them.

**Step 3:**

When the series are co-integrated the relationship between them can be expressed as an Error Correction Mechanism. The Error Correction Mechanism (ECM) between tax rate series and permanent part of the expenditure series can be represented as;

\[ \] 70 This regression is derived from the model presented in chapter 4.
\[
\Delta \tau_t = \gamma_1 + \sum \gamma_2 \Delta \tau_{t-i} + \sum \gamma_3 \Delta g_{t-i} + \sum \gamma_4 x_{t-i} + \alpha_1 EC_{t-1} + \epsilon_t \\
(5.14)
\]

\[
\Delta g^P_t = \sigma_1 + \sum \sigma_2 \Delta \tau_{t-i} + \sum \sigma_3 \Delta g^P_{t-i} + \sum \sigma_4 x_{t-i} + \alpha_2 EC_{t-1} + \epsilon_t \\
(5.15)
\]

All variables in model (5.14 & 5.15) are stationery. \( EC_{t-1} \) is the lagged residuals obtained from equation (5.13) is introduced in the ECM as error correcting term. \( x_t \) are the additional I(0) exogenous variables. \( \gamma's \) and \( \sigma's \) capture the short-run effects of exogenous and lagged dependent variables on dependent variables. \( \alpha_1 \) and \( \alpha_2 \) capture the rate at which the tax rate adjusts to the equilibrium state after a shock i.e. it captures the speed of error correction. All the I(1) variables are in difference form and \( EC_{t-1} \) is also I(0). Therefore, using the residuals from the long-run equilibrium relationship (5.13), we can estimate the error correction models with OLS. The values of \( \alpha_1 \) and \( \alpha_2 \) are directly related to the characteristics roots of the difference equation system. The convergence necessitates that \( \alpha_1 \) be negative and \( \alpha_2 \) be positive and at least one of these should be significant.

**Step 4:**

The fourth step is assessing adequacy of the model. The ways to check the adequacy of the Error Correction Model are given below:

- While estimating the model it is necessary to assure that the residuals are not serially correlated. In case of serially correlated residuals it is need to allow longer lags for some variables.
• The speed of adjustment is noted from coefficients $\alpha_1$ and $\alpha_2$ in equations (5.14 & 5.15). For co-integration one of these coefficients should be significantly different from zero. If both of the coefficients are zero, there is no co-integration between the variables. Moreover, both variables do not converge to long-run equilibrium if both $\alpha_1$ and $\alpha_2$ are zero.

5.5- Conclusion:

Both decomposition techniques are cumbersome and laborious. The BN is based on the ARIMA estimation whereas the WT is new in economics and non-parametric technique. In the case of BN-decomposition, there is a loss of initial values of the series which vary depending upon the best fit ARIMA $(p, d, q)$. In WT-decomposition there may be a problem in initial and end values however, it can be covered by padding appropriate data before the initial value and after the last value in actual series before transformation. The WT-transformation has advantages over traditional BN-decomposition method for representing functions that have discontinuities and sharp peaks. In opposite to the BN-decomposition, the WT-transformation needs not to make the series stationary before decomposition.

The chapter also gives details of estimation procedure adopted for different tests. In time-series analysis first step is to see whether the series is stationary or non-stationary. To test whether the series is stationary or non-stationary unit root tests are used. In this study ADF unit root test will be used for this purpose. In case of stationary time-series OLS can be used for estimation otherwise, co-integration analysis will be conducted. According to the requirements
of our data and model we will use Engle-Granger (1987) approach. The purpose of using the Engle-Granger approach is to analyze the long-run and short-run relationship between tax rate and permanent expenditure rate. Moreover, it allows introducing additional I(0) exogenous variables in the model. Another important reason of using the ECM procedure is its characteristics of testing causality indirectly.
Chapter 6

Estimation and Results--1

Chapter 6, chapter 7 and chapter 8 contain the main findings of the present study. These chapters deal with the estimation of the models discussed in chapter 4 and 5—in ways not fully explored in the area of smoothing; and comes to conclusion not amenable commonsense interpretation. These find, among other things, that the fiscal behaviors of the governments of Pakistan and Sri Lanka have been consistent with the weak tax smoothing hypothesis whilst Indian behavior has not been consistent at all with tax smoothing hypothesis. The tax-and-spend policies in Pakistan are consistent with the fiscal synchronization hypothesis suggesting that the tax-and-spend decisions are not taken in isolation. Such fiscal behavior is consistent with weak tax smoothing. The behavior of the Sri Lankan government has been in accordance with the spend-and-tax hypothesis which is also another form of tax smoothing hypothesis. The fiscal situation in India has remained completely different from those of Pakistan and Sri Lanka over the sample period. Indian behavior seems to have been consistent with the institutional independence hypothesis—which suggests that tax and spend decisions in India have not been sufficiently coordinated with each other.

Section 6.1 compares the descriptive statistics of average tax rate and average expenditure rate for the selected developing countries. Section 6.2 discusses the results of empirical analysis for Pakistan. The last section concludes.
6.1- A Comparison of Average Tax Rate and Average Expenditure Rate in Pakistan Sri Lanka and India:

The study seeks to ascertain the fiscal behavior of Pakistan, Sri Lanka and India. This section compares the average tax rates and average expenditure rate of these developing countries to form an idea of the fiscal adequacy of these countries. The tax-to-GDP and expenditure-to-GDP ratios are important for maximizing economic growth. Kennedy (2000) and Hill (2008) demonstrate that the optimal tax rate would be just the average tax rate—-this incidentally, is also interpretation adopted in the present study. However, Scully (1994 & 1996) and Mackness (1999) argue that it may be higher or lower than the actual average tax rate that like the growth maximizing tax rate there is also growth maximizing expenditure rate. The growth maximizing tax rate may also be higher or lower than the actual expenditure rate.

The tax and expenditure rates are a lot lower in developing countries than in the developed ones, which in one form or other display characteristics of a welfare state. Their governments regulate social conditions and provide pension, health care, and other necessities for the poor. Not so in the developing countries, which are characterized with low tax and expenditure rates which are mostly not sufficient to meet the basic needs of the citizens.

---

71 Scully (1994 and 1996) specifies the optimal tax rate in the US as 23% of GDP and for New Zealand is 19.7% of GDP. Mackness (1999) estimates the optimum size of the tax rate for Canada at about 20 to 30% of GDP.
73 On the basis of the Armey (1995) curve Vedder and Gallway (1998) found that the optimal expenditure-to-GDP ratio that maximizes the economic growth was 17.45 % for the US. Grossman (1987) considers the optimal size for the US to be 20 % of the GNP. Pevcin (2004) shows that the optimal size of government expenditure for Italy, France, Finland, Sweden, Germany, and Holland are 37.09, 42.90, 38.98, 45.96, 38.45, and 44.86 percent of GDP respectively. Tanzy and Schuknecht (1998) study a wide range of countries and find out the optimal level of government spending between 20% and 40% of GDP. Mavrov (2007) finds the optimum ratio for government expenditure as percentage of GDP in Bulgaria is equal 21.42%.
Needless to say; this is not what they should be doing. For one thing, they must develop which requires making structural changes of their societies with a view to attaining and sustaining high growth rates, much higher than the historical rates observed in the European countries. As a first step in that direction, they must achieve high tax/GDP and expenditure/GDP ratios which are a necessary, though not sufficient, condition for achieving the avowed objectives of a high growth fiscal policy that is also efficient and just. The examples of the East Asian countries are bright examples of what all developing countries in general and Pakistan, Sri Lanka and India in particular must be doing. The additional spending is to be financed through higher tax revenues on the one hand, and reallocations in the expenditure side on the other. Governments and their officials in a welfare state have been custodians of public interest and seek to maximize social welfare based on their benevolence or the need to ensure electoral success in democracies.

**Table 6.1**

**Descriptive statistics for Selected Developing Countries (1966-2007)**

<table>
<thead>
<tr>
<th></th>
<th>Pakistan</th>
<th>Sri Lanka</th>
<th>India</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tax Rate</td>
<td>Expenditure rate</td>
<td>Tax Rate</td>
</tr>
<tr>
<td><strong>Mean</strong></td>
<td>0.13316</td>
<td>0.16717</td>
<td>0.195275</td>
</tr>
<tr>
<td><strong>Median</strong></td>
<td>0.13485</td>
<td>0.16462</td>
<td>0.197322</td>
</tr>
<tr>
<td><strong>Maximum</strong></td>
<td>0.15989</td>
<td>0.20753</td>
<td>0.263565</td>
</tr>
<tr>
<td><strong>Minimum</strong></td>
<td>0.10288</td>
<td>0.12746</td>
<td>0.153432</td>
</tr>
<tr>
<td><strong>Std. Dev.</strong></td>
<td>0.01473</td>
<td>0.02517</td>
<td>0.042350</td>
</tr>
<tr>
<td><strong>Coefficient of Variance</strong></td>
<td>0.11062</td>
<td>0.15057</td>
<td>0.216874</td>
</tr>
</tbody>
</table>

*Source: Key Indicators for Asia and the Pacific (2008) and World Development Indicators (2008)*

Mean value of average tax rate was 13.32%, 19.52% and 12.29% of GDP in Pakistan, Sri Lanka and India respectively. The highest tax-to-GDP ratio was in Sri Lanka and the lowest in
India. The tax rate of Sri Lanka has been most volatile and the least volatile in India. This shows that the country with higher tax rate has been more volatile and country with lower tax rate less volatile. Mean value of the expenditure-to-GDP ratio in Pakistan, India and Sri Lanka has been 16.72%, 28.16% and 13.80%. Again similar to tax-to-GDP ratio, the expenditure-to-GDP ratio of Sri Lanka has been the highest and lowest in India. But expenditure rate of India has been most volatile and the least volatile in Sri Lanka.

6.1.1- Pakistan:

Pakistan’s budget has been constrained by low-revenue yields.\textsuperscript{74} Owing to a lack of sufficient government control over revenue sources, it has suffered from continued dependence over indirect taxes, unacceptably high budget deficit, and sky-rocketing public debt burden. All this has seriously compromised its capacity to sustain high growth rates and reduce poverty and inequities in the society. Table 6.1 presents descriptive statistics for average tax rate and average expenditure rate for Pakistan, India and Sri Lanka. The mean value of average tax rate of Pakistan is 13.32% of GDP. When we compare average tax rate of Pakistan with other countries we see its rate is rather low. The mean value of average government expenditures for Pakistan is also very low: it is only 16.71% of GDP.

Pakistan needs to fulfill rather urgently the basic needs of the poor and promoting equity in the country---if only to forestall social upheaval. For this purpose it requires much higher government expenditure-to-GDP ratio than its present level. To finance the extra

\textsuperscript{74} Having a per capita income of over US$925, Pakistan is placed in the community of medium-income countries. With the population of about 158.17 million in 2007 growing at about 1.80% annually, approximately 55% of population is literate. Pakistan is the second largest country in South-Asia.
expenditures it requires an increase its revenue. For extra revenue increase in tax rate would be required. That could be generated by increasing the tax base and taxing the untaxed activities. However, while generating revenue from tax increases the implications of tax smoothing hypothesis must be kept under consideration.

6.1.2- Sri Lanka:

Due to various reasons recounted in Chapter 3 Sri Lanka has faced high fiscal deficits throughout Sri Lankan economic history. Mean value of tax-to-GDP and expenditure-to-GDP ratios for Sri Lanka are 19.52% and 28.16% respectively which are higher than Pakistan. Tax-to-GDP ratio is almost at optimal level of other developing countries as reported above. The expenditure-to-GDP ratio is also in the given range of optimal level proposed by Tanzy and Schuknecht (1998). However, as noted in Chapter 3, the tax structure of Sri Lanka has been typically like other developing countries. The share of indirect taxes in the total central revenue in 2006 was 76% of GDP very high as compare to Pakistan and India having 64% and 51% respectively. This has affected its capacity to keep the social cost of taxation reasonably low and its tax-expenditure ratio at the socially desirable.

6.1.3- India:

Vigorous growth with strong macroeconomic fundamentals has characterized developments in the Indian economy since the early 1990. It has maintained those rates since then. And yet surprisingly, the mean values of tax-to-GDP and expenditure-to-GDP ratios in India are 12.30% and 13.80% which are low, like Pakistan, by international standards.
Therefore, actions should be taken to increase the revenue so that higher expenditure should be financed.

6.2- The Analysis of Tax Smoothing for Pakistan:

For the analysis of tax smoothing the usual first step is to check for unit root in the tax rate series as suggested by Barro (1986) and Trehan and Walsh (1988). According to them, the presence of unit root in the tax rate series of a country argues for the tax smoothing hypothesis. Table 6.2 reports Augmented Dicky Fuller (ADF) unit root test results for tax rate, actual expenditure rate and money growth rate series in Pakistan. It shows clearly that the null hypothesis of non-stationarity cannot be rejected for tax rate and expenditure rate at the usual significance level; but the series of growth rate of money is stationary. The unit root test is estimated for first difference only for those series for which the null hypothesis of non-stationarity cannot be rejected. The results reveal that all variables having unit root for level are stationary in first difference.

<table>
<thead>
<tr>
<th>Country</th>
<th>Unit Root Test in</th>
<th>Exogenous</th>
<th>Tax rate</th>
<th>Expenditure rate</th>
<th>Money Growth rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pakistan (1966-07)</td>
<td>Level</td>
<td>Constant</td>
<td>-2.2188</td>
<td>-1.3078</td>
<td>-5.2037*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Const and Trend</td>
<td>-2.6204</td>
<td>-0.1652</td>
<td>-5.3862*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>None</td>
<td>-0.0978</td>
<td>-0.6003</td>
<td>0.1414</td>
</tr>
<tr>
<td></td>
<td>First Difference</td>
<td>Constant</td>
<td>-5.9955*</td>
<td>-7.8433*</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Const and Trend</td>
<td>-5.8739*</td>
<td>-8.0827*</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>None</td>
<td>-6.7697*</td>
<td>-7.9645*</td>
<td></td>
</tr>
</tbody>
</table>

Null Hypothesis: The series has a unit root. * Null is rejected at 5% level. ** Null is rejected at 10% level. Test critical values: 1%, 5% and 10% level are -2.6272, -1.9498 and -1.611469 respectively.
Many of the tax smoothing studies check only unit root in tax rate series and decide about tax smoothing behavior of a country. [For example, Barro (1986), Trehan and Walsh (1988), Strazcich (1996) and Scott (1999) have taken this route in their studies.] However, the unit root in tax rate series is a necessary condition to hold for the presence of tax smoothing behavior. It is by no means a sufficient condition. Table 6.2 shows ADF-unit root test results in tax rate series for Pakistan. The unit root in the tax rate series shows that it is a martingale, indicating that changes in the tax rate are permanent. The results are consistent with the findings of Cashin, Haque and Olekalns (2003). However, Ashworth and Evans (1998) could not find unit root in the tax rate series of Pakistan; they therefore, conclude there has been no significant tax smoothing, although both studies used data almost for same time period. However, we will show that this result too is inconclusive. The problem lies with their method of checking for the presence or absence of tax-smoothing. However, their results do show that we cannot draw any conclusion just using the unit root test on tax rate series only.

6.2.1- Decomposition of Total Expenditure Rate Series:

To get sharper results about tax smoothing in Pakistan (and elsewhere in the region) is we need to look at the expenditure series. To this end, we need to decompose the total expenditure series into permanent expenditure and transitory components. The main reason for this decomposition is that, contrary what Barro asserts, a random walk in tax rate does not

---

necessarily indicate tax smoothing. Campbell (1987) and Ghosh (1995) show that there are many reasons to go beyond the random walk test.\textsuperscript{76}

Sahasakul (1986) developed direct test of the tax smoothing hypothesis by relating the tax rate to the permanent component of the government expenditure rate. To establish the need for tax smoothing permanent government expenditure rate and tax rate series should move together. However, since the permanent expenditure rate data are not available, we use two different techniques namely; Beveridge-Nelson Decomposition (BN) and Wavelet Transformation (WT), to decompose the total expenditure rate series into permanent and transitory components. The procedure of decomposing the series was presented in chapter 5.

The best fit ARIMA (p, d, q) model for BN-decomposition is ARIMA (1, 1, 0). The decomposed components of the government expenditure rate series of using techniques are presented in Graphs 6.1 and 6.2.\textsuperscript{77} The conclusion from all the theoretical discussion and visual examination of the graphical representation of both types of decomposed series is that both techniques provide almost similar results. However, the smoothed series obtained by the WT-transformation has less sharp peaks than the smoothed series obtained by the BN-decomposition. Moreover, government transitory expenditures have been negligible for most of the economic history of Pakistan.

\textsuperscript{76} See chapter 1 of this study for details.
\textsuperscript{77} Detailed estimation results for BN-decomposition are given in the appendix I.
Graph 6.1
BN-Decomposition of Expenditure Rate Series into Permanent and Transitory Parts (Pakistan)

Graph 6.2
WT-Decomposition of Expenditure Rate Series into Permanent and Transitory Parts (Pakistan)

Graph 6.3
The Correspondence between Tax Rate and Permanent Expenditure Rate Series (Pakistan)
6.2.2- Graphical Analysis:

Graph 6.3 shows that with the exception of the early 1970s, there has been a close correspondence between tax rate and the permanent expenditure rate (i.e. both moved in the same direction in the respective years). Main reasons for deviation between the two series in 1970s seem to be political instability and high defense expenditures in that period. High and a sudden increase in tax rate as compared to expenditure rate shows that Pakistan had to finance war by sharply increasing tax rate. In other words, the government did not try to minimize the welfare cost of taxation by keeping tax rate constant in that period. In such a situation, it would have been better to create debt to finance such transitory expenditures and then retire it with the return of normalcy. However, with this exception, the movements in both series are in the same direction and have had close correspondence. The gap between the two series in 1990s indicates that Pakistan has not tried to keep its budget balance. This gap has decreased after 2002, indicative of greater fiscal responsibility. The Fiscal Responsibility and Debt Limitation Act 2005 (FRDL Act, 2005) is an example in this regard.\(^\text{78}\)

A close association between movements in the tax rate and permanent part of the expenditure rate over the whole sample period implies that Pakistan has tried to minimize distortions in tax rate when it expects permanent changes in its expenditures but not

\(^{78}\) Mainly the FRDL Act 2005 requires the following: The federal government of Pakistan shall take all appropriate measures to eliminate the revenue deficit, reduce total public debt and maintain it within prudent limits. The following shall be the principles of sound fiscal and debt management namely; (1) reducing the revenue deficit to nil not later than June 30, 2008, and thereafter maintaining a revenue surplus; (2) ensuring that within a period often financial years, beginning from July 1, 2003 and ending on June 30, 2013. The total public debt at the end of the tenth financial year does not exceed 60% of the estimated gross domestic product for that year and thereafter maintaining the total public debt below 60% of gross domestic product for any given year; (3) ensuring that in every financial year, beginning from July 1, 2003, and ending on June 30, 2013, the total public debt is reduced by not less than 2.5% of the estimated GDP for any given year.
completely. Lack of fiscal space, unnecessary expenditures, difference between actual and expected expenditure and revenue have been some of the reasons behind such imperfect behavior.

6.2.3- Co-integration Analysis:

It may be noted that the moving together of the tax rate and government permanent expenditure rate indicates, as Grilli (1989) has argued, that there exists a co-integrating relationship. The model developed in chapter 4 gives the procedure to test for co-integration in both series. Since the tax rate series and BN- and WT-permanent components of expenditure rate series are also I(1) by definition. The Error Correction Mechanism (ECM) is estimated according to the procedure presented in Chapter 5.

<table>
<thead>
<tr>
<th>Table 6.3</th>
<th>Co-integration Analysis for Pakistan (Dependent variable $\tau_t$)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>BN Unit Root Series</td>
</tr>
<tr>
<td>$g_t^p$</td>
<td>0.79189 (71.83)</td>
</tr>
<tr>
<td>DW statistics</td>
<td>0.560570</td>
</tr>
<tr>
<td>Rho($q$)</td>
<td>0.711388</td>
</tr>
<tr>
<td>ARCH</td>
<td>4.770059 [0.035555]</td>
</tr>
<tr>
<td>AR(2)</td>
<td>18.56362 [0.000003]</td>
</tr>
<tr>
<td>ADF unit root test of residuals</td>
<td>-3.652**</td>
</tr>
</tbody>
</table>

NOTE: Durbin-Watson values are greater than 1% critical value (0.511) indicating that the series are co-integrated at 1% level. Critical values are -3.92 at 5% and -3.38 at 10% level. ** denotes significance at the 10% level. Critical values are from Charemza and Deadman (1997).

Table 6.3 presents the OLS estimates of $\beta$ from the regression in (5.13) based on both BN and WT measures of the permanent expenditure rate. The ADF estimates of residuals
obtained from the regression are stationary. It indicates that tax rate and permanent expenditure rate series are co-integrated. In simpler words, they both move in the same direction in the long-run. The estimates of $\beta$ are very similar under both measures at 0.79, implying that 79% of the changes in permanent expenditures have been reflected in the taxes. The test also supports insights derived from unit root in tax rate. It also validates the graphical analysis of graph 6.3 that the changes in permanent expenditure have been reflected in tax rate changes. Moreover, it shows that Pakistan has done smoothing of its tax rate overtime but not perfectly. It is interesting to note that although we have applied a more direct approach, even then our findings are similar to Cashin, Olekalns, and Sahay (1998) and Cashin, Haque and Olekalns (2003) who have used indirect approach for India and Pakistan respectively.\footnote{The findings of Sahasakul (1986) are just the opposite who could not find tax smoothing using direct approach for the US.}

6.2.4- Error Correction Analysis:

The residual-based ADF test supports co-integration between tax rate and both measures of the permanent expenditure rate. The residuals exhibit both autocorrelation and Autoregressive Conditional Hetero-Skedasticity (ARCH) effects in BN-method but only ARCH effects in WT-method. Although ARCH effects do not violate the tax smoothing hypothesis, residual autocorrelation does violate the strong version of the hypothesis. Therefore, we proceed with the WT-permanent expenditure rate component for further analysis based on the Error Correction Mechanism (ECM) presented in chapter 4. As the above noted findings show, tax rate and permanent expenditure rate are co-integrated. In other words, there exists a long-
run equilibrium relationship between the two. Of course, there may be disequilibrium in short-run. To analyze such a situation Table 6.4 displays the ECM estimation results.

### Table 6.4

#### Error Correction Analysis for Pakistan

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 1</th>
<th>Model 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\Delta \tau_t$</td>
<td>$\Delta g^p_t$</td>
</tr>
<tr>
<td><strong>Dependent</strong></td>
<td>[Coefficient [t-Statistic]]</td>
<td>[Coefficient [t-Statistic]]</td>
</tr>
<tr>
<td>$C$</td>
<td>0.000631 [0.413165]</td>
<td>0.000654 [1.23108]</td>
</tr>
<tr>
<td>$EC_{t-1}$</td>
<td>-0.29195* [-2.09576]</td>
<td>0.103653* [2.139955]</td>
</tr>
<tr>
<td>$\Delta g^p_{t-1}$</td>
<td>0.863931* [2.223016]</td>
<td>0.905727* [6.702593]</td>
</tr>
<tr>
<td>$\Delta g^p_{t-2}$</td>
<td>-0.69319** [-1.771166]</td>
<td>-0.387749* [-2.849325]</td>
</tr>
<tr>
<td>$\Delta \tau_{t-1}$</td>
<td>-0.08787 [-0.490736]</td>
<td>-0.206822* [-3.322063]</td>
</tr>
<tr>
<td>$m_{t-1}$</td>
<td>--------</td>
<td>--------</td>
</tr>
<tr>
<td>$g^p_{t-1}$</td>
<td>--------</td>
<td>--------</td>
</tr>
</tbody>
</table>

**Note:** The coefficient t values are given in brackets and diagnostic p-values are given in parentheses. * Indicates significance at 5% level. **Denotes significance at 10% level. For detailed residual based, model selection and stability tests for all models are also presented in Appendix III.

$EC_{t-1}$ is error correcting term. Residual based, model selection and stability tests for all models indicate no serious problem of Autocorrelation, Normality and Auto-Regressive Conditional Hetero-Skedasticity (ARCH) in the models. Ramsey Regression Specification Error Test (RESET) indicates that models are stable with no specification error.\(^{80}\)

---

\(^{80}\) Detailed results of residual based tests are presented in the Appendix III.
The ECM is presented in Table 6.4 (Model 1) with $\Delta \tau_t$ and $\Delta g_t^P$ as dependent variables. The error correction term ($EC_{t-1}$) coefficients are significant and have the expected signs indicating that in long-run taxes and permanent expenditures have moved together in the same direction i.e. they are co-integrated in the long-run. The estimated lagged error correction term also suggests that error correction is happening in the model. The feedback coefficient (Error Correction term) is -0.29, which suggests that approximately 29% of disequilibrium in previous year is corrected in the current year.

These results reveal that in short-run current taxes are significantly affected by previous period’s permanent expenditures but not by previous taxes. While, current permanent expenditures are significantly influenced by previous period’s permanent expenditures as well as taxes, the results indicate that short-term variables had affected taxes. This shows that factors other than permanent expenditures might also have caused changes in the tax rate. So it can be gathered from above discussion that there has been a weak tax smoothing in Pakistan over the sample period. The findings are similar to those of Cashin, Haque and Olekalns (2003) for Pakistan. Abeysinghe and Jayawickrama (2006) also find similar results for six OECD countries. Perhaps the most important implication of the analysis presented so far is that, although tax rate and permanent expenditure rate are co-integrated, yet there is a big gap between them. The gap between them indicates that budget deficits are a persistent characteristic of Pakistan’s fiscal scene. The analysis also has the important policy implication that Pakistan should meet all or most of its permanent expenditure from taxes; and only the transitory shocks to the economy should be financed by debt creation. However, such financing
should be contingent and should be retired when the shock is over and normal conditions return.

6.2.5- Error Correction Analysis with Additional Transitory Variables:

There may also be transitory components other than permanent expenditure that tend to force observed average tax rate to alter. In this regard additional I(0) variables, growth rate of M1 and transitory component of government expenditure, are introduced in the ECM to check whether they have any significant impact on changes in the tax rate. The growth rate of M1 captures both inflation and seignorage effects. Its effect is expected to be positive because higher inflation and higher nominal incomes push individuals into higher nominal tax brackets. However, government’s transitory expenditure might have positive as well as negative effects. A significant effect of both or any one of these variables would point to weak or no tax smoothing. To sort out these matters, the ECM with additional I(0) variables is presented in Model 2 in Table 6.4.

It may be noted that the ECM results involving additional I(0) exogenous variables remain the same as they were without the introduction of exogenous variables. The coefficient of money has expected positive sign but insignificant in both models. This probably indicates that seignorage and inflation via higher nominal incomes could not push individuals into higher tax brackets. Insignificance of both additional I(0) variables shows that they have not exercised an independent effect on taxes changes. This result accords with Evans and Amey (1996), who estimate the extended tax smoothing model for a significant number of OECD countries and
found that seignorage has not been used for tax smoothing.\footnote{The extended tax-smoothing model implies that tax rates and the rate of inflation should move together in the same direction.} Ashworth and Evans (1998) did the same for almost 32 developing countries and could not find that rate of taxation grew with the increase in nominal income. They argue that the governments try to keep growth of government debt constant with respect to inflation to raise revenue from taxation and reduce the real value of the debt. This is in accordance with the hypothesis that reductions in the burden of government debt can be obtained through money creation.

The second included exogenous variable in the ECM was transitory component of government expenditure to test whether it has any impact on tax rate changes. The coefficient of transitory expenditures is insignificant, this indicates that tax rate has not responded to transitory changes in government expenditures; which supports the presence of tax smoothing in Pakistan.\footnote{Contrary to our findings Sahasakul (1986) finds that tax rate responds significantly not only to the permanent government expenditure rate but also to the transitory component in the US.} The insignificant impact of transitory expenditure on tax rate changes may be because of their negligible size in total government expenditure. Another possible reason would be the financing of transitory expenditures via issue of bonds.

6.2.6- Tax-Spend Nexus:

For perfect tax smoothing the error correcting term should be significant only in the tax equations in Models (1 & 2) presented in Table 6.4. However, it may be noted from both models, that the term is also significant in the expenditure rate equation. This shows bidirectional causality between the revenues and expenditures relating to both the short-run and
long-run relations. It also suggests that the government takes the expenditure allocation policy into consideration when making decisions about the level of tax revenues, and vice versa. Such a behavior is consistent with the fiscal synchronization hypothesis presented by Musgrave (1966) and Meltzer and Richard (1981). The hypothesis states that government’s decision on the optimal levels of spending and taxation in revenue decisions are not made in isolation. The decisions are made concurrently and are welfare-maximizing based on the comparison of their marginal benefits and cost of public services (Meltzer and Richard (1981)). However, for perfect tax smoothing government expenditures are considered exogenous to which taxes adjust.\textsuperscript{83} These findings are different from those of Narayan (2005) and Hussain (2005). Narayan could not find any causal relationship between revenue and expenditure while Hussain found that Pakistan has followed the spend-and-tax hypothesis. The main reason for differences in results may be that they use total expenditure while we have employed permanent part of the total expenditure. The other reason may have to do with the use of different econometric techniques and differences in the estimation.

6.3- Concluding Remarks:

The general conclusion that emerges from this exercise is that Pakistan has not been smoothing its tax rate perfectly over the sample period i.e. there has been weak tax smoothing in Pakistan. Like other developing countries Pakistan has been facing difficulties in arranging revenue requirements to finance transitory shocks to its expenditures from bond financing.

\textsuperscript{83} This is also consistent with the spend-tax hypothesis presented by Roberts (1978) and Peacock and Wiseman (1979) which is another version of tax-smoothing hypothesis. The spend-tax hypothesis argues that expenditures are first independently determined by the government and then revenues are adjusted to fulfill the desired level of expenditures.
Hence, it has found it difficult to smooth tax rate to finance its transitory expenditures. For example in the present recession period Pakistan is facing serious liquidity constraint. In such a situation the government is forced to collect additional revenue through other sources; for example, by not reducing oil prices in spite of significant reduction in international market, increase of taxes on telecommunication etc. The other fact is that the governments cannot (and perhaps should not) adjust the marginal income tax rates and corporate tax rates so frequently in response to changes in expenditure requirements. That shows that temporary departures of the effective tax rate from the permanent government expenditure rate are quite common. The presence of such departures should not be considered as a severe violation of the tax smoothing hypothesis.
Chapter 7

Estimation and Results—2

In this chapter we present estimation results for Sri Lanka. The estimation technique for Sri Lanka is similar to that for Pakistan. The ensuing analysis presents Sri Lankan experience. Section 7.1 of the chapter discusses the results of empirical analysis for Sri Lanka and the last section concludes.

7.1- The Analysis of Tax Smoothing for Sri Lanka:

As a first step, the necessary condition (of random walk in tax rate) for tax smoothing was checked for Sri Lanka as was done for Pakistan. Its fulfillment indicated that changes in the tax rate have been permanent; however, as noted in previous chapters it is not a sufficient condition. The findings so far are similar to Cashin, Haque and Olekalns (1997) who argue for random walk in the tax rate series of Sri Lanka but could not find out tax smoothing using Vector Auto-regressive (VAR) process between tax rate and actual part of the budget balance.

So, as a next step, the unit root test for expenditure rate series was carried out. The null hypothesis of non-stationarity could not be rejected for tax rate (as described earlier) and expenditure rate at level i.e. both the series are integrated at order one. However, the series of growth rate of money (M1) turned out to be stationary. (The unit root test has been estimated for first difference only for those series which are non-stationary at the required significance
The results reveal that all variables having unit root at level are stationary at first difference.

**Table 7.1**

ADF Unit Root Test for Tax rate, Expenditure Rate and Money Growth Rate (Sri Lanka)

<table>
<thead>
<tr>
<th>Country</th>
<th>Unit Root Test in</th>
<th>Exogenous</th>
<th>Expenditure rate</th>
<th>Money Growth rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sri Lanka (1966-07)</td>
<td>Level</td>
<td>Constant</td>
<td>-2.956314</td>
<td>-2.459686</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Const and Trend</td>
<td>-3.618188</td>
<td>-2.858643</td>
</tr>
<tr>
<td></td>
<td></td>
<td>None</td>
<td>-0.837740</td>
<td>-0.664242</td>
</tr>
<tr>
<td></td>
<td>First Difference</td>
<td>Constant</td>
<td>-6.104672*</td>
<td>-9.081539*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Const and Trend</td>
<td>-5.440512*</td>
<td>-9.066434*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>None</td>
<td>-6.001924*</td>
<td>-9.167377*</td>
</tr>
</tbody>
</table>

*Note: Null Hypothesis: The series has a unit root. * Null is rejected at 5% level, ** Null is rejected at 10% level.

**Graph 7.1**

BN-Decomposition of Expenditure Rate Series into Permanent and Transitory Parts (Sri Lanka)
7.1.1- Decomposition of Total Expenditure Rate Series:

The decomposed components of Sri Lankan government expenditure rate series with BN and WT techniques are presented in Graphs 7.1 and 7.2. The best fit ARIMA (p, d, q) model for BN-decomposition is ARIMA (1, 1, 0). The graphs show that Sri Lanka has faced considerable
transitory shocks to its expenditure from mid-1970s to mid-1980s. Unlike Pakistan, there seems to be a considerable transitory component in the total expenditure during this period in Sri Lanka. The decomposed transitory part with Wavelet Transformation shows higher values than that of BN-decomposed series.

7.1.2- Graphical Analysis:

Graph 7.3 shows the correspondence between tax rate series and both permanent parts of expenditure rate series i.e. BN and WT. The gap between the two series, which is the fiscal deficit, is higher in Sri Lanka than in Pakistan. It widens in late 1970s and 1980s; the main reason being that Sri Lanka started privatization and deregulation in 1977 and faced civil war in 1980s. One of the main consequences of the deficit is the accumulation of huge public debt due to easy and concessional availability of external loans. Due to these reasons Sri Lanka enjoys the dubious distinction of being the highest indebted country in the region. Furthermore, its skyrocketing debt became unsustainable in the beginning of this decade. However, things looked a little bit cheerful as the fiscal deficit started decreasing in 1990s and was at its lowest in 2006.

It is interesting to note that despite a big gap between tax rate and permanent expenditure rate series, indicating fiscal deficit, Graph 7.3 shows a close correspondence between them. The correspondence is almost perfect before and after 1980s. However, the decade of 1980s was very crucial when country faced a civil war. So naturally for this period the correspondence is not perfect. On the whole, the graph indicates that expected changes in permanent expenditure have been reflected in the changes in tax rate. The correspondence is
relatively tight for Sri Lanka than for Pakistan, which suggests that Sri Lanka has tried to minimize the welfare cost of taxation more than Pakistan has done.

### Table 7.2

Co-integration Analysis for Sri Lanka
*(Dependent variable $\tau_t$)*

<table>
<thead>
<tr>
<th></th>
<th>BN Unit Root Series</th>
<th>Wavelet Smooth Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>$g^p_t$</td>
<td>0.686174 (53.01)</td>
<td>0.686524 [54.34106]</td>
</tr>
<tr>
<td>DW statistics</td>
<td>0.595821</td>
<td>0.648686</td>
</tr>
<tr>
<td>Rho($\rho$)</td>
<td>0.681968</td>
<td>0.655866</td>
</tr>
<tr>
<td>ARCH</td>
<td>17.84558 [0.000150]</td>
<td>50.35472 [0.00000]</td>
</tr>
<tr>
<td>Serial Corr. LM</td>
<td>17.16263 [0.000005]</td>
<td>13.71580 [0.000035]</td>
</tr>
<tr>
<td>$F$ Test</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ADF unit root</td>
<td>-3.404350**</td>
<td>-3.608709**</td>
</tr>
<tr>
<td>test of residuals</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:** Durbin-Watson values are greater than 1% critical value (0.511) indicating that the series are co-integrated at 1% level. Critical values are -3.92 at 5% and -3.38 at 10% level. ** denotes significance at the 10% level. Critical values are from Charemza and Deadman (1997).

#### 7.1.3- Co-integration Analysis:

Tax rate and permanent expenditure rate series for Sri Lanka, like it is in Pakistan, are $I(1)$. Therefore, co-integrating analysis could be conducted between the two. Table 7.2 shows that the situation is very similar to Pakistan’s i.e. residuals from equation (5.13) are stationary, which indicates that co-integration exists between the tax rate and expenditure rate series. The estimates of $\beta$ are identical under both BN- and WT-measures of permanent expenditures at 0.68, implying that 68% of changes in permanent expenditures are reflected in the taxes, and that although there has been tax smoothing, it is not perfect (i.e. $\beta \neq 1$). The test also supports
insights derived from unit root in tax rate and Graph 7.3 i.e. Sri Lanka is smoothing its tax rate overtime, though again not perfectly.

7.1.4- Error Correction Analysis:

The results so far are very similar to those for Pakistan. We begin the analysis with the WT-permanent expenditure rate component for further analysis based on the ECM. The ECM is presented in Table 7.3 (in Model 3) with tax rate and permanent expenditure rate as dependent variables. The error correction terms \((EC_{t-1})\) have expected sign in both equations while it is significant only for tax equations. This indicates that in long-run tax decisions in Sri Lanka have been made in the light of previous permanent expenditure decisions.

The results in Table 7.3 (Model 3) reveal that in the short-run current taxes are also significantly affected by previous period’s permanent expenditures and taxes. The current permanent expenditures are influenced by both previous period’s permanent expenditures and taxes significantly. The results indicate that lagged difference variables of tax rate and permanent expenditure rate have significant effects on changes in tax rates. This reveals that tax decisions are being made in the light of previous expenditure and tax decisions--- and that the government of Sri Lanka is smoothing its tax rate over time.
### Table 7.3

**Error Correction Test**  
(Sri Lanka)

<table>
<thead>
<tr>
<th>Variable</th>
<th>ECM</th>
<th>ECM with Additional I(0) Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\Delta \tau_t$</td>
<td>$\Delta g_t^p$</td>
</tr>
<tr>
<td><strong>Dependent</strong></td>
<td>Coefficient [t-Statistic]</td>
<td>Coefficient [t-Statistic]</td>
</tr>
<tr>
<td>$C$</td>
<td>-0.00342 [-1.435633]</td>
<td>-0.00113 [-0.56868]</td>
</tr>
<tr>
<td>$EC_{t-1}$</td>
<td>-0.72397* [-4.588281]</td>
<td>0.068789 [0.589415]</td>
</tr>
<tr>
<td>$\Delta g_t^p_{t-1}$</td>
<td>0.997207* [4.040469]</td>
<td>1.278663* [6.142566]</td>
</tr>
<tr>
<td>$\Delta g_t^p_{t-2}$</td>
<td>-1.54267* [-4.060171]</td>
<td>-0.84302* [-2.908262]</td>
</tr>
<tr>
<td>$\Delta g_t^p_{t-3}$</td>
<td>0.981204* [2.624466]</td>
<td>0.193118 [0.932295]</td>
</tr>
<tr>
<td>$\Delta g_t^p_{t-4}$</td>
<td>-1.08099* [-3.969337]</td>
<td>-----------</td>
</tr>
<tr>
<td>$\Delta \tau_{t-1}$</td>
<td>-0.2995 [-1.814392]</td>
<td>-0.12595 [-0.899777]</td>
</tr>
<tr>
<td>$\Delta \tau_{t-2}$</td>
<td>-0.28362 [-1.666578]</td>
<td>-0.11966 [-0.842291]</td>
</tr>
<tr>
<td>$\Delta \tau_{t-3}$</td>
<td>-0.341202* [-2.219347]</td>
<td>-0.00662 [-0.056287]</td>
</tr>
<tr>
<td>$\Delta \tau_{t-4}$</td>
<td>-----------</td>
<td>-----------</td>
</tr>
<tr>
<td>$m_{t-1}$</td>
<td>-----------</td>
<td>-----------</td>
</tr>
<tr>
<td>$g_{t-1}$</td>
<td>-----------</td>
<td>-----------</td>
</tr>
</tbody>
</table>

**Note:** Other lagged explanatory variables are also included in the ECM depending upon the AIC and SIC model selection criteria. * indicates significant at 5% level. See appendix for detailed results.

The estimated results reveal that error correction is happening in the model. The coefficient of feedback is -0.72, implying that approximately 72% of disequilibrium in previous
year is corrected in the current year.\textsuperscript{84} The lagged difference variable of permanent expenditure is also significant in both cases implying that it also impacts on tax rate in the short-run.

7.1.5- Error Correction Analysis with Additional Transitory Variables:

The ECM with additional transitory I(0) variables is presented in Table (7.3) with tax rate and permanent expenditure rate as dependent variables with additional I(0) variables (Model4). The error correction terms \((EC_{t-1})\) have expected signs in both equations, though significant only for tax equations. The results are similar to that of Model 3. But with additional I(0) exogenous variables of money and transitory expenditures the feedback coefficient (error correcting term) becomes weaker, implying that only 46% of disequilibrium is corrected. The coefficient of money has expected positive sign but insignificant in both models. However, unlike in Pakistan, the transitory part of government expenditure is significant. However, it may be noted that occurrence of such transitory effects does not violate the tax smoothing hypothesis. As we noted above, the transitory expenditures for Sri Lanka are higher than both India and Pakistan and have significant impact on taxes. Therefore, it can be concluded that Sri Lanka has been financing civil war transitory expenditures through higher fiscal deficits by getting concessional loans. These deficits have been accumulated in the form large public debt due to the availability of concessional loans from international sources. This easy approach to debt made the external debt of Sri Lanka unsustainable in 2001.\textsuperscript{85} To avoid such a situation Sri

\textsuperscript{84} In the case of Pakistan the speed of adjustment in disequilibrium was same with and without additional exogenous I(0) variables but far less than Sri Lanka.

\textsuperscript{85} Chaudhary & Anwar (2000)
Lanka should keep its budget balanced and finance all its permanent expenditure from taxes; and only transitory shock to the economy should be financed by bonds. Such financing should be contingent and should be retired when the shock is over. However, if civil war goes on for too long, and transitory expenditures also become permanent part of government expenditures, then they should also be financed at least partly by increasing tax rates. (Since mercifully, it has ended, things should become fiscally more manageable.)

7.1.6- Tax-Spend Nexus:

Contrary to Pakistan’s case, the error correcting term for Sri Lanka is significant only in the tax equation. This shows that the decisions to change the tax rate are made only in the light of previous permanent expenditure, at least in the short-run. On the contrary, the insignificance of the error-correcting term shows that taxes have had no effect on permanent expenditure in the short-run. Now, such behavior is consistent with the tax smoothing hypothesis and suggests that only expenditures cause taxes ---thereby supporting the spend-and-tax hypothesis. The spend-and-tax hypothesis is valid if unidirectional causality runs from government expenditures to government revenues. In other words, changes in the expenditures lead to changes in government revenues.

7.2- Concluding Remarks:

The findings of our analysis for Sri Lanka are consistent with those of Narayan (2005), but are opposite to those of Cashin, Haque and Olekalns (1999). The latter have concluded that fiscal behavior of Sri Lanka is not consistent with the tax smoothing hypothesis. The main
reason for our results being radically different from those of Cashin, Haque and Olekalns (1999) is the differences in the estimation periods of the two studies. The sample period used in the Cashin et al study was 1964-1997 while the present study uses a much longer estimation period of 1965-2007. This is also clear from Graph 7.3 which shows a more close correspondence between the two series after 1980s than before. Another reason may be the use of different estimation techniques used in the two studies.

Temporary increases in government expenditure (justified by natural shocks) tend to become enduring and lead to permanent tax increases required to finance them. Under such a situation the optimal solution to controlling the budget deficit is clearly expenditure cuts. But if expenditure reduction would not be possible then a combination of tax increases and bond financing should be feasible alternatives. In such a situation tax increases should not be in response to transitory increase in expenditures. Hence, keeping with our findings in this chapter it can be concluded that Sri Lanka, has to some extent, tried to minimize the welfare cost of taxation by smoothing the tax rate, though not perfectly, over the sample period.

86 Barro (1979) and Peacock & Wiseman (1979)
In this chapter we present estimation results for India. The estimation technique used in India’s case to check on the extent and frequency of tax smoothing practices is different from that applied in Pakistan and Sri Lanka’s cases because the error correction mechanism could not be fully applied there. However, to check the tax-and-spend nexus Granger causality analysis is conducted. The graphical analysis for India also tells a lot about its fiscal characteristics.

Section 8.1 presents empirical analysis for India. Section 8.2 gives concluding remarks of the analysis. The last section compares the situation of Pakistan, India and Sri Lanka.

8.1- The Analysis of Tax Smoothing for India:

As in the case of Pakistan and Sri Lanka, we start out our analysis of India’s tax smoothing practices by testing unit root. The ADF unit root test results are given in table 8.1 for tax rate, actual expenditure rate and growth rate of money.
Table 8.1

<table>
<thead>
<tr>
<th>Country</th>
<th>Unit Root Test in</th>
<th>Exogenous</th>
<th>Tax rate</th>
<th>Expenditure rate</th>
<th>Money Growth rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>India (1966-07)</td>
<td>Level</td>
<td>Constant</td>
<td>-1.649538</td>
<td>-1.180676</td>
<td>-6.006001*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Const and Trend</td>
<td>-1.541088</td>
<td>-1.318805</td>
<td>-6.283777*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>None</td>
<td>0.555881</td>
<td>0.928110</td>
<td>-0.201285</td>
</tr>
<tr>
<td></td>
<td>First Difference</td>
<td>Constant</td>
<td>-7.037184*</td>
<td>-5.303293*</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Const and Trend</td>
<td>-7.266399*</td>
<td>-5.376779*</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>None</td>
<td>-6.893413*</td>
<td>-5.106425*</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** Null Hypothesis: The series has a unit root. * Null is rejected at 5% level. **Null is rejected at 10% level.

These results illustrate that tax rate and total expenditure series are I(1) while the growth rate of money series is I(0). The random walk in tax rate shows that necessary condition for tax smoothing holds for India. They confirm the findings of Cashin, Olekalns, and Sahay (1998) and Ashworth and Evans (1998) for India. However, as we know, what is necessary may not be sufficient. In the present case, for sufficient condition to be satisfied, there should be co-integration between tax rate and permanent expenditure rate series. To that end, as in the case of Pakistan, the expenditure series needs to be decomposed into permanent and transitory parts, as shown in Graph 8.1. Needless to point out that this is by no means a non-trivial exercise.
8.1.1- Decomposition of Total Expenditure Rate Series:

In order to separate out the permanent part of government expenditure, we employed BN and WT techniques to decompose total expenditure rate series. The graphs derived from an application of these procedures are presented in Graphs 8.1 and 8.2. Both decomposition
techniques reveal that the series does not contain a considerable transitory component, except in early 1970s and in 2005.

**8.1.2- Graphical Analysis:**

To analyze whether tax rate and permanent expenditure rate have moved together in the same direction with view to minimizing tax rate variations, Graph 8.3 gives a graphical representation of the tax rate and the BN- and WT-permanent components of expenditure rate series. The graph shows that the gap (fiscal deficit) between both series up to early 1980s is very small. After that it started widening and even now it is very high.

![Graph 8.3](image)

Moreover, the tax rate series is more volatile than permanent expenditure rate series and the movements of both series are not in the same direction in the respective years. This is an indication that the government of India has not tried to minimize its welfare costs incurred by taxation through tax increase or expenditure cut. As the tax-to-GDP and expenditure-to-GDP
ratios are much lower by international standards, these findings suggest that the best policy would be to reduce fiscal deficit by raising revenue through tax increases rather than by expenditure cuts. There has been a close correspondence between tax rate and permanent components of expenditure rate series till 1990. Afterwards, the movements in both have not been in same direction. Therefore, it can be concluded that before 1990s India did try to minimize welfare cost of taxation. This is almost the same period for which Cashin, Olekalns, and Sahay (1998) have argued for tax smoothing in India. However, after 1990 our graphical analysis does not show a close correspondence between these series, which shows that India did not make a conscious effort to do tax smoothing. In this respect, therefore, India scores lower than Pakistan and Sri Lanka.

Table 8.2

<table>
<thead>
<tr>
<th>Co-integration Analysis for India</th>
<th>BN Unit Root Series</th>
<th>Wavelet Smooth Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Dependent variable $\tau_t$)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$g_{t}^p$</td>
<td>0.838125</td>
<td>0.837209</td>
</tr>
<tr>
<td></td>
<td>[73.56283]</td>
<td>[70.14811]</td>
</tr>
<tr>
<td>DW statistics</td>
<td>0.367937</td>
<td>0.464424</td>
</tr>
<tr>
<td>Rho($q$)</td>
<td>0.851895</td>
<td>0.793744</td>
</tr>
<tr>
<td>ARCH</td>
<td>33.23042 (0.000002)</td>
<td>24.27745 (0.000021)</td>
</tr>
<tr>
<td>AR(2)</td>
<td>32.75966 (0.000000)</td>
<td>25.17777 (0.000000)</td>
</tr>
<tr>
<td>ADF unit root test of residuals</td>
<td>-1.407076</td>
<td>-1.778876</td>
</tr>
</tbody>
</table>

NOTE: Critical values are -3.92 at 5% and -3.38 at 10% level. ** denotes significance at the 10% level. Critical values from Charemza and Deadman (1997).

8.1.3- Co-integration Analysis:

The random walk in tax rate is only the necessary condition for tax smoothing to hold. For sufficient condition there should be co-integration in the tax rate and the permanent expenditure. The tax rate and permanent expenditure rate series are $I(1)$. So, to make our analysis comprehensive and robust we proceed to check for co-integration between the series. Like Pakistan and Sri Lanka, we proceeded with Engle-Granger methodology to check co-integration. The first step shows that residuals obtained from equation 5.13 are non-stationary. This shows that tax rate and permanent expenditure rate series are not co-integrated. Therefore, we cannot run an ECM for further analysis. The results are same as suggested by Graph 6.9 that India’s fiscal behavior is not consistent with the predictions of the tax smoothing hypothesis. The findings are opposite to the predictions of Cashin, Olekalns, and Sahay (1998) who have argued for tax smoothing in India. One of the reasons of difference in results may be different estimation techniques but as suggested by the graphical analysis main reason is different sample period used in this study.

8.1.4- Tax-Spend Nexus:

As there is no co-integration between tax rate and permanent expenditure rate series and on its basis we cannot conduct Error Correction Mechanism, it follows that none of the tax rate and permanent expenditure rate changes have caused the other. In other words, tax and expenditure decisions in India have not been properly synchronized. This finding is consistent with the institutional separation hypothesis proposed by Wildavsky (1988) i.e., taxes and
expenditures are causally independent. However, to make further progress, we carried out the Granger causality test.

Table 8.3 and 8.4 show Granger causality analysis between tax rate and both parts of the permanent expenditure rate series. The results from both estimation results show that neither taxes cause permanent expenditure, or permanent expenditure cause taxes. The findings are similar to that of earlier co-integration test conducted in this study.

**Table 8.3**

**Causality Analysis between Tax Rate and WT-Permanent Expenditure Rate (India)**

<table>
<thead>
<tr>
<th>Null Hypothesis</th>
<th>F-Statistic</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>WT-Permanent Expenditure does not Granger Cause Tax Rate</td>
<td>1.47223</td>
<td>0.24454</td>
</tr>
<tr>
<td>Tax Rate does not Granger Cause WT-Permanent Expenditure Rate</td>
<td>0.06423</td>
<td>0.93791</td>
</tr>
</tbody>
</table>

**Table 8.4**

**Causality Analysis between Tax Rate and BN-Permanent Expenditure Rate (India)**

<table>
<thead>
<tr>
<th>Null Hypothesis</th>
<th>F-Statistic</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>BN-Permanent Expenditure does not Granger Cause Tax Rate</td>
<td>0.05277</td>
<td>0.94868</td>
</tr>
<tr>
<td>Tax Rate does not Granger Cause BN-Permanent Expenditure Rate</td>
<td>0.48236</td>
<td>0.62174</td>
</tr>
</tbody>
</table>

These findings are consistent with those of Narayan (2005). They also confirm the graphical analysis (Graph 8.9) --- that the government tax and spend decisions have been taken independently since 1992. Fiscal Responsibility and Budget Management Act (2003) (FRBM act, 2003) in India was passed in India to overcome the fiscal deficit and to build coordination between fiscal decisions. Since the imposition of FRBM act (2003) the graph shows somewhat correspondence between tax rate and permanent expenditure rate.
8.2- Concluding Remarks:

The main finding of this study is that India’s government has not tried to smooth their tax rates. The findings are consistent with Narayan (2005) but different from those of Cashin, Olekalns, and Sahay (1998) mainly because the present study uses a different estimation time periods. Differences in estimation technique may also be one of the reasons for the differences in our results. The results in the present study are robust as the graphical analysis and the Engle-Granger methodology provide same results.

The present study also marks an improvement on early random walk test of tax smoothing, because of its focus on tax rate and permanent expenditure rate, rather than on tax rate alone. One of the many reasons behind such behavior in India has been a large share of government expenditures for the provision of public goods. In such a situation the utility loss from the distortionary taxes may be balanced by the utility gain from the provision of such goods. Yet another reason for the persistence of departures from the tax smoothing theory is that Barro’s analysis is conducted in an infinite horizon, but a real-life governments’ tenure is finite.88

8.3- General Remarks on Chapters 6 to 8:

It will be instructive in the end to present a comparative analysis of the test results presented in chapters 6, 7 and 8 to check on the presence or absence of tax smoothing in Pakistan, Sri Lanka, and India. To this end, the first step was to compute ADF unit root tests for

tax rate, expenditure rate and growth rate of money for these three countries. Going by the results of the Unit root in tax rate alone, one can legitimately conclude that tax smoothing has been present in all these countries. The second step, to make the analysis more robust, an Error Correction procedure was adopted. For this purpose two separate analyses have been conducted ---one between tax rate and the BN-permanent expenditure rate series and the other between the tax rate and the WT-permanent expenditure rate series. To test for the long-run relationship equation (5.13) reported in chapter 5 is estimated separately for each country.\footnote{\(\tau_t = \beta g_{t-1}^p + \mu_t\) is the equation (5.13) presented in chapter 5.} Then residuals obtained from the regression (5.13) are checked whether these are I(0) or not. This exercise shows that they are stationary for Pakistan and Sri Lanka but not for India. The stationarity of the residuals allows us to estimate a long-run and short-run relationship between taxes and expenditure for Pakistan and Sri Lanka through ECM. The residuals for India were not stationary so we could not conduct ECM analysis for India. Hence, the OLS estimate of \(\beta\) will not represent a long-run relationship for India. This suggests lack of evidence for tax smoothing in India. However, the regressions on equation 5.1 give long-run relationship between tax rate and permanent expenditure rate series for Pakistan and Sri Lanka. The ECMs presented in equations (5.14) and (5.15) presented in chapter 5 are estimated. These equations are also estimated including other I(0) variables which can force the tax rate to alter temporarily. The ECM models without and with additional exogenous I(0) variables also demonstrate that there is tax smoothing in both Sri Lanka and Pakistan but it is not perfect. A reason behind this is; both countries have been financing their permanent expenditure by creating debt. However, unlike Pakistan, Sri Lanka has been changing its taxes also in response
to transitory increases in the expenditures. But tax smoothing theory suggests that transitory and unexpected expenditure should be financed via issuing bonds and only permanent change in expenditure should be financed by increase in taxes.

Overall, results indicate weak tax smoothing in Pakistan and Sri Lanka whilst fiscal policy in India has not been conducted in an optimal fashion in accordance with the predictions of the hypothesis. The tax and spend policies of Pakistan are consistent with the fiscal synchronization hypothesis suggesting that the tax and spend decisions have not been done in isolation i.e. tax and spend decisions have been made in the light of each other, but this implies weak tax smoothing in Pakistan. The behavior of Sri Lanka is in accordance with the spend-and-tax hypothesis which is also another form of tax smoothing hypothesis. As for India the ECM could not be estimated so for tax-spend nexus analysis, as an alternate, Granger causality analysis was conducted which shows that the situation of India is completely different from these two countries. Indian behavior is consistent with the institutional independence hypothesis. This suggests that tax and spend decisions have been carried out independently of each other. Such a behavior is completely opposite to the tax smoothing hypothesis.

The findings in this chapter suggests some scope may exist for fiscal policy to explicitly aim to minimize welfare cost of taxation to some extent in Pakistan and Sri Lanka; and even more so in India. Therefore, tax and tariff reforms associated with expenditure reforms of adopting optimal approach for gradual shifting and reformation may be adopted in these countries. The desired expenditure may be identified which should be economically efficient to set targets for tax collections and revenue utilization. Once the desired expenditure decisions
are made then steps can be taken to generate revenue for its financing. The revenue generation decisions should be efficient to decide what part of expenditure has to be financed with tax increase and how much it is done by issuing bonds. If these steps are taken the fiscal policy would then be in accordance with the tax smoothing hypothesis.
Chapter 9

Conclusion and Policy Implications

This chapter concludes the study. After this introduction section 9.1 gives a brief summary and presents the main conclusion of the present study. Section 9.2 and Section 9.3 draws out some of the policy implications and whatever indications there are for future research.

9.1- Summary:

The present study has investigated whether fiscal policies adopted so far by Pakistan, Sri Lanka and India have been consistent with the tax smoothing hypothesis; and, if not, then how have the tax and spend decisions have been made. As a background to the study and to highlight the main areas of research chapter 2 reviewed the literature in the field. It shows, among other things, that there is no unique pattern of tax smoothing practices across countries, and also that most of the work in the field has focused on developed countries. This leaves ample room for research for studies on developing countries, like the present one. The review also revealed some methodological problems, which the present study has sought to repair. For instance, it notes that the studies so far have used the same VAR technique to test for the tax smoothing hypothesis. We, therefore, decided to adopt a direct approach (rather than the indirect approaches taken so far) which has permitted us to investigate the
relationship between taxes and spending in an integrated fashion. There are four different hypotheses in this regard, namely the tax-and-spend, the spend-and-tax, the fiscal synchronization, and the institutional separation hypothesis. We explore as to which one of these hypotheses holds in the countries included in the study.

Attention was then focused on the experience of public finances in these developing countries (Chapter 3). It concludes that public finances of Sri Lanka, India and Pakistan are not significantly different from each other. All these economies in the 1990s experienced severe fiscal deficits and skyrocketing public debt. The chapter shows that taxes and spending as a share of GDP in Sri Lanka higher than in Pakistan or India. The public debt of these countries is at unsustainable level, especially in Sri Lanka. They have encountered difficulties because of their fiscal profligacy and because they failed to take in time some important decisions to synergize their current and future consumption with their current and future taxation.

And yet, these developing countries somehow have managed to keep their growth momentum, at least they did so in the beginning of present decade. They were successful in restructuring their public finances too. Especially, Pakistan got much needed fiscal space, though failed to adjust its taxation and expenditure policies to get long-term benefits. It seems that we have followed the historical path of haste and waste. The debt explosion coupled with higher fiscal and current account deficit resurfaced as major problem in our public policy debate in 2008, which is very alarming. To go forward Pakistan will need large resources to finance its development and support growth momentum. The case of India and Sri Lanka is not materially different that of Pakistan. Given the downward rigidity of the current expenditure,
and crucial importance of the development expenditure, the only way for these countries is to mobilize additional resources by generating a higher level of tax and non-tax revenue. They would have to bring under-taxed and un-taxed sectors in the tax net, and above all, they should try to plug loopholes in the revenue system.

The situation in Pakistan can best be explained by its political economy, which makes public spending to be the politically determined under the pork-barrel type of decisions for self and/or group interests rather than for overall general welfare. An indication of this is that axe invariably has fallen on development expenditure whenever current expenditure requirements increase. The situation of India and Sri Lanka is also not totally different from this pattern. Now this is not a desirable situation. These all are emerging economies and they require revenue for their development. For them the reduction in fiscal deficit would not be possible by decreasing expenditure only; nor is it possible to increase taxes too often. Eventually, these countries would have to shift towards efficient solutions which integrate the decisions taken with respect to expenditure, taxes and public debt to rectify fiscal imbalances. For this purpose tax and tariff reforms along with expenditure reforms should be initiated. In addition, before considering the revenue generation, an analysis should be done for the socially desired level of expenditures. When the optimal level of expenditure is recognized then required revenue can be generated under the tax smoothing scheme, among others.

---

90 Pork-barrel is a derogatory term referring to a situation when politicians or governments "unofficially" undertake projects that benefit a group of citizens in return for that group’s support. This spending mostly benefits the needs of a small select group, sometimes at the expense of more urgent social needs.
It need not be emphasized that there is an urgent need for well designed fiscal reforms to generate primary surpluses and reduce public debt burden. However, fiscal adjustment should not be achieved at the cost of the development expenditure; rather it should come from serious revenue mobilization efforts to increase domestic tax revenue. Tax smoothing behaviour should be adopted to finance the fiscal gap. *One of the main recommendations of the present study is that the government should finance all its permanent expenditure with taxes and contingent debt should be created only to finance the temporary expenditures.*

All the developing countries face the problem of low tax collections. There are many reasons but the most important of them is the very narrow base which leaves out large swathes of taxable territory. No less is the corruption in tax paying and collection activities. The revenue can also be increased by decentralizing and privatizing the tax collection and some rich counties of the world has done it. But in developing countries this route may not be available because the private sector is also driven by corruption and inefficiency, no less than the public sector. To improve the tax collections in developing countries tax laws should be made as simple as possible; the tax system should have few exemptions, credits, rebates or deductions; and the fiscal policy should not aim to achieve too many social and economic goals.

The tax smoothing hypothesis presented first by Barro (1979) and extended by others has been discussed in chapters 4 and 5, which set out the tax smoothing model in considerable detail. They also lay out empirically testable form of the model to solve a constrained optimization problem. These chapters conclude that, although the random walk test nicely captures the hypothesis of tax smoothing, yet the unit root tests in this case are inconsistent.
and deceptive because they do not properly adjust for fluctuations in the GDP and in government expenditures. However, it is shown that the tax smoothing hypothesis can be verified directly by co-integration analysis between the tax rate and permanent expenditure rate series. The ECM process was followed for this purpose which allows a joint short-run and long-run consideration to the tax and expenditure problem. Furthermore, it also provides opportunity to check the causality between the variables.

Yet another problem for any study of this kind is the lack of appropriate data. The model which was estimated requires permanent public expenditure for which data were not available. Hence, two techniques (Beveridge and Nelson decomposition and Wavelet Transformation) were used to decompose the total public expenditure into permanent and transitory parts. There are many techniques available for this purpose, which are however not completely free of imperfections (and which techniques are free from imperfections). Hence data were decomposed with both techniques and was used for econometric analysis separately.

The unit root in tax rate shows the presence of tax smoothing in all the three countries. The tax smoothing analysis was extended using Engle-Granger Error Correction Procedure. The analysis was conducted between tax rate and permanent expenditure rate series. Additional exogenous variables were also included in the analysis which could contribute to changes in the tax rate. The analysis shows that to achieve perfect tax smoothing additional taxation should finance only permanent expenditure, as noted above.
The estimates of ECMs presented in chapter 6, 7 and 8 demonstrate that there is a weak tax smoothing in Pakistan and Sri Lanka but not in India. This is so in Pakistan because permanent expenditure and taxes have both tended to cause each other. In Sri Lanka only permanent changes in expenditure have caused taxes, which is what the tax smoothing hypothesis demands. However, when additional variables are introduced in the ECM, temporary expenditure also has had significant impact on taxes which is an indication of a weak tax smoothing. However, for India, co-integration was not found between permanent expenditure and taxes which suggests that it has not presumably been minimizing the welfare cost of taxation.

9.2- Policy Implications:

The empirical findings of this study reveal that Pakistan and Sri Lanka have tried to minimize welfare cost of taxation but their fiscal behavior does not fully accord with the predictions of the tax smoothing theory. On the other hand, India has not been smoothing its tax rates to minimize the cost at all, whatever else it might be doing to serve the ends of fiscal probity. Moreover, fiscal policies of Pakistan are consistent with the fiscal synchronization hypothesis implying that tax-and-spend decisions have been, by and large, interdependent. For Sri Lanka the policies are in accordance with the spend-and-tax hypothesis, but for India institutional independence hypothesis seems to have been the guiding light. Not that these countries have consciously followed these policies or that the policy-makers were even aware

91 The results are similar to Cashin, Haque & Olekalns (2003) however, they have used indirect approach, and this study uses direct approach.
of what they are doing. It is only that as if guided by some invisible scribe, they have done it. Put it the other way, their fiscal behavior can only be accurately described in the way we have done in this study.

Keeping in view these findings a number of policy implications flow from them. Further, it stands to reason that, to some extent at least, the severe debt that Pakistan, Sri Lanka (and to some extent India) have faced can be attributed to their failure to do tax smoothing in a systematic fashion and their inability to synchronize their spending and taxing and borrowing decisions. It follows that the governments of these countries would probably be better off if they financed their permanent expenditure by increasing the tax rate; and if there are transitory shocks to the expenditures or output these should be financed through creating public debt. However, such debt should be contingent and retired when the ‘good days’ come in future. A countercyclical (debt falls in booms and rises in recessions) policy can be recommended in this respect. To this end, the nominal debt should grow in proportion to anticipated inflation; it should vary contra-cyclically with respect to real income cycles, and procyclically with respect to unanticipated cycles/ shocks. However, pro-cyclical tax rate can be volatile resulting in an increase in the welfare cost of taxation, and must be handled rather carefully.

Secondly, the desired tax rate should be decided in such a way that the government’s inter-temporal budget constraint is not violated. Thus, to finance the budget, government might use debt and tax instruments simultaneously. For example, in response to an unexpected increase in government expenditure and/or decrease in output the government should neither
produce debt mountains nor unduly push up tax rates --- as Pakistan and Sri Lanka seem to have done. Instead, it should analyze as to what part of this increase is going to become the permanent part of the government spending. Then it should finance the permanent part of the spending partially through an increase in tax rates and the remaining via a rise in public debt. In this way these governments can minimize the tax distortions by spreading required tax increases over time. However, expected increase in permanent expenditure should be financed by an increase in tax rate and there should be no change in public debt to meet such expenditures. This requires the creation of contingent government liabilities that provide a guard against shocks to the budget.

Thirdly, in Pakistan, Sri Lanka, and India, and in other developing countries, demographic changes have moved up public expenditures over time. To meet such situation, tax smoothing arguments can be advanced by setting taxes so as to achieve an initial period of budget surpluses, followed by a period of deficits as expenditure rises. The analysis presented in this study shows that these developing countries have not shown much fiscal responsibility regarding public debt. They have not produced new resources to fulfill their increasing fiscal requirements. In addition, they are meeting their permanent expenditures also by bond financing. Such behavior will make their public debt unsustainable.

Fourthly, given the downward rigidity of the current expenditure, and crucial importance of the development expenditure, the only way out of the fiscal problem these countries face is to mobilize additional resources by generating a higher level of tax revenue. To this end, under-taxed and un-taxed sectors should be brought into the tax net; and, above all, they should make serious efforts to plug loopholes in the revenue system. This for sure
would generate immense resources. Primary surpluses should be generated in this way to reduce public debt burden as well. In this context, fiscal adjustment will be required but it should not be achieved at the cost of development expenditure rather; it should come from serious revenue mobilization efforts. In this context, the tax smoothing policies to finance the requirements of the fiscal gap can be immensely helpful beside theoretical and empirically robust.

**9.3- Future Research Directions:**

It may be of some interest to point out the new areas of research that the present study may have opened. Firstly, as a matter of methodology, those desirous of undertaking a systematic study of the practice of tax smoothing will have go beyond the rather mechanical exercise of computing unit root in the tax rate series, something that many studies have done in past. The present study shows that unit root tests establish the necessary conditions for the presence of tax smoothing; they are no means sufficient. Indeed, what the unit root (Random Walk) suggests may be overturned by further research. Thus, even though there is a unit root in the tax rate in India’s data but further graphical and co-integration analysis showed that the government of India has not been smoothing tax rates! Our study shows the need to do more sophisticated exercises, involving graphical and co-integration analysis between tax rate and permanent expenditure rate in order to satisfy the sufficiency requirement for the presence of tax smoothing.

Secondly, the present study in this context also establishes the ‘marginal utility’ of graphical analysis, such as we present (and which is really one of the methodological
contributions of this study) to supplement co-integration analysis to get a visual and detailed picture of the movements in the tax and expenditure (both permanent and transitory) series.

Thirdly, in addition to the methodological issues such studies also involve resolving the ever-present data problems to do empirical testing of the basic testable (refutable) hypotheses. In the end one has to settle for a second-best or even a third-best option. We also had to do this. Thus one of the main data we faced was the unavailability of disaggregated transitory and permanent government expenditure data. This problem was solved by decomposing the series with econometric techniques. However, if ‘actual’ government permanent and transitory expenditure data could be collected then a more comprehensive picture could be seen through empirical analysis. This is a promising line of research.

Fourthly, and this is a foundational issue, is that data collection procedures and variable definitions are different in different countries. Due to these reasons, a comprehensive panel data analysis was not possible for the present study. For more detailed analysis, data should be collected with same definition for all countries. Such variables should be used for panel data analysis for more comprehensive policy implication for developing countries. Other variables that can have impact on tax rate can also be included in the analysis if reliable data would be available for longer periods (e.g., political variable and unemployment etc.). Yet another extension of the present analysis would be to integrate the economics of optimal taxation with the empirics of the tax smoothing analysis of the present study. In this context it will be necessary to make the distinction between efficiency deadweight loss of direct and indirect
taxes. And so on. But we hope that whatever this study has achieved has also lighted some significant areas of fiscal policy.
Bibliography


Appendix: I

The Beveridge-Nelson Decomposition Theory:

We symbolize the observations on a non-stationary government expenditure rate series by \( g_t \) and its first difference by \( \Delta g_t \), so that \( \Delta g_t = g_t - g_{t-1} \).

The \( g_t \) can be represented as the form of autoregressive integrated moving average (ARIMA) time series model as

\[
g_t = \alpha_0 + \alpha_1 g_{t-1} + \ldots + \alpha_p g_{t-p} + \beta_1 e_{t-1} + \ldots + \beta_q e_{t-q} + \epsilon_t \tag{A.1}
\]

We can write (A.1) in the following form

\[
g_t = \alpha_0 + \sum_{i=0}^{p} \alpha_i g_{t-i} + \sum_{j=0}^{q} \beta_j e_{t-j} \quad \beta_0 = 1 \tag{A.2}
\]

If the characteristics roots of expression (A.2) are in the unit circle, \( g_t \) is called an ARMA model and if AR part of the (A.2) have \( p \) lags and MA part has \( q \) lags then the model is called ARMA \((p, q)\) model. On the other hand, if one or more characteristic units are greater than or equal to unity then it is called autoregressive integrated moving average (ARIMA) process.

Expression (A.2) can be converted into an indefinite moving average model as follows

---

The concept of decomposition of a time series is motivated by considering the relation of the current value of time series to the forecast profile for future g’s. In Beveridge & Nelson (1981) framework the forecast profile takes the place of a deterministic trend as the benchmark for the location of this series.

The forecast profile of \( g_t \) is given as

\[
g_{t+s} = g_t + \Delta g_{t+1} + \Delta g_{t+2} + ... + \Delta g_{t+s}
\]  

(A.4)

Taking expectations of expression (A.4) conditional on the data of g through t is given by

\[
E_t[ g_{t+s} ] = g_t + E_t[ \Delta g_{t+1} + \Delta g_{t+2} + ... + \Delta g_{t+s} ]
\]  

(A.5)

\[
=> E_t[ g_{t+s} ] = g_t + E_t[ \Delta g_{t+1} ] + E_t[ \Delta g_{t+2} ] + ... + E_t[ \Delta g_{t+s} ]
\]  

(A.6)

Substituting the values of \( \Delta g_s \) in (A.6) from (A.3) we get

\[
E_t[ g_{t+s} ] = g_t + a_0 s + E_t[ \sum_{j=1}^{\infty} b_j \epsilon_{t+1-j} ] + ... + E_t[ \sum_{j=2}^{\infty} b_j \epsilon_{t+s-j} ]
\]  

(A.7)

Now if \( E_t[ \epsilon_i ] = 0 \) expression (A.7) implies that

\[
E_t[ g_{t+s} ] = g_t + a_0 s + (b_1 \epsilon_t + b_2 \epsilon_{t-1} + b_3 \epsilon_{t-2} + ...) + (b_2 \epsilon_t + b_3 \epsilon_{t-1} + b_4 \epsilon_{t-2} + ...) + ...
\]
\[ E_t[g_{t+s}] = g_t + a_0 s + \left( \sum_{j=1}^{s} b_j \right) \varepsilon_t + \left( \sum_{j=2}^{s+1} b_j \right) \varepsilon_{t-1} + \ldots \]  

(A.8)

For a long run forecast horizon say up to infinite time, we have

\[ \text{Limit}_{s \to \infty} E_t[g_{t+s}] = g_t + a_0 s + \left( \sum_{j=1}^{\infty} b_j \right) \varepsilon_t + \left( \sum_{j=2}^{\infty} b_j \right) \varepsilon_{t-1} + \ldots \]  

(A.9)

It is found that the forecast profile approaches a linear path as it is extended into the indefinite future. The permanent component is then the long run forecast of the series adjusted for its mean rate of change and follows a random walk. The stochastic level of the series is the excess of the forecasted level over the deterministic or mean trend.

The permanent component may be interpreted as the sum of the current observed value of the time series \( g_t \) and all forecastable future changes in the series beyond the mean rate of drift. For this purpose we can write permanent component denoted by \( P_t \) by using (A.3) and (A.9) as under

\[ P_t = \text{Limit}_{s \to \infty} E_t[g_{t+s}] - a_0 s \]  

(A.10)

Solving (A.9) and (A.10) we get

\[ P_t = g_t + \left( \sum_{j=1}^{\infty} b_j \right) \varepsilon_t + \left( \sum_{j=2}^{\infty} b_j \right) \varepsilon_{t-1} + \ldots \]  

(A.11)

The above expression can also be written as
\[ P_t = g_t + \lim_{s \to \infty} \left\{ E_t(\Delta g_{t+1}) + E_t(\Delta g_{t+2}) + \ldots + E_t(\Delta g_{t+s}) \right\} - a_0 \sigma \]  
(A.12)

Therefore, in view of this expression we can define the permanent component as the sum of all forecasted future changes minus the drift portion. Second term on the right hand side of the expression is difference between \( g_t^{s} \) permanent and current value. Hence, if cyclical portion of the series is represented by \( C_t \), we can write the cyclical component as under

\[ C_t = \lim_{s \to \infty} \left\{ E_t(\Delta g_{t+1}) + E_t(\Delta g_{t+2}) + \ldots + E_t(\Delta g_{t+s}) \right\} - a_0 \sigma \]  
(A.13)

Cyclical portion of the series can also be found by subtracting the estimated permanent component from the actual series.
Appendix: II

Wavelet Transformation Theory: ⁹³

The wavelets are particular type of functions that are used to decompose a series into more elementary functions named as the father and the mother wavelets carrying information about the series. The mother wavelet (permanent part) is low frequency part integrates to 1 while the father wavelet is (transitory part) high frequency part integrates to zero.

As we are considering time series function which is discrete hence, we limit our analysis to discrete transformation analysis. In the discrete wavelet transformation the high pass (wavelet) filter $\theta_m$ which is also used as basis for father wavelet matrix to obtain the transitory part of the series. This filter must satisfy following conditions;

- $\sum_{m=0}^{M-1} \theta_m = 0$; having zero mean,  \hspace{1cm} (A.14)
- $\sum_{m=0}^{M-1} \theta_m^2 = 1$; unit energy, and  \hspace{1cm} (A.15)
- $\sum_{m=0}^{M-1} \theta_m \theta_{m+2n} = 0$; orthogonal to their even shifts.  \hspace{1cm} (A.16)

Where $M$ is the even integer width of the filter, $n$ is a natural number and $m = 0, 1, 2...M-1$.

Similarly, the filter used as basis for mother wavelet matrix to obtain the low frequency component of the series is denoted by $\omega_m$. This filter is called scale filter. The relationship between these two types of filters is given below.

$\omega_m = (-1)^m \omega_{M-m-1}$

\[ \omega_m = (-1)^{m+1} \omega_{M-m-1} \]  
(A.17)

In the DWT the wavelet filter \( (\omega_m) \) and the scaling filter \( (\omega_m) \) are employed in a pyramid algorithm to obtain the wavelet and the scaling coefficients \( W_{j,t} \) and \( V_{j,t} \) at each level \( j = 1,2,3,...,J \).

The DWT wavelet and scaling coefficients are be defined as;

\[ W_{j,t} = \sum_{m=0}^{M-1} \omega_{j,m} X_{t-1}, \]  
(A.18)

and  
\[ V_{j,t} = \sum_{m=0}^{M-1} \omega_{j,m} X_{t-1}, \]  
(A.19)

Where, \( W_{j,t} \) and \( V_{j,t} \) are \( t \times 1 \) column vector of wavelet and scale coefficients, \( t \in \mathbb{R} \), when \( t<0 \), \( \omega_{j,m} \) and \( \omega_{j,m} \) are the wavelet and scaling filters respectively, with \( \frac{N}{2^j} \) coefficients.

So for we have discussed the wavelet DWT which have at least a major drawback i.e. it uses only that sample size which is divisible by \( 2^j \). Due to this drawback in the DWT, we will utilize maximal overlap discrete wavelet transformation (MODWT) instead of the DWT because the MODWT, with other advantages, can handle any sample size.

The MODWT is an alternate to the orthonormal DWT and is also known as stationary-DWT. The MODWT coefficients can be produced by the simple modification in the pyramid algorithm of the DWT coefficients construction. The DWT coefficients are related to the non-overlapping difference of weighted averages from original observations that are concentrated in space however, the MODWT considers all possible overlap differences for this purpose, due
to which orthogonality of the transform vanishes and the number of scaling and wavelet filters remain equal to the original number of observations in the sample. The MODWT scaling ($\tilde{e}_{j,m}$) and wavelet (non-orthonormal) ($\tilde{\omega}_{j,m}$) filters are obtained by the following expression;

$$
\tilde{e}_{j,m} = \frac{\omega_{j,m}}{2^{j/2}},
$$

(A.20)

and

$$
\tilde{\omega}_{j,m} = \frac{\omega_{j,m}}{2^{j/2}}.
$$

(A.21)

Where $\omega_{j,m}$ and $\omega_{j,m}$ are the DWT orthonormal (wavelet) and the scaling filters.

Hence the MODWT non-orthonormal (wavelet) and scaling coefficients are given by

$$
\hat{w}_{j,t} = \frac{1}{2^{j/2}} \sum_{m=0}^{M-1} \tilde{e}_{j,m} X_{t-m},
$$

(A.22)

and

$$
\hat{v}_{j,t} = \frac{1}{2^{j/2}} \sum_{m=0}^{M-1} \tilde{\omega}_{j,m} X_{t-m}
$$

(A.23)

Various wavelet filters are available for the MODWT decomposition, such as Haar, Daubechies, dabulets, symmlets & coiflets, etc. However we will use Daubechies (D4) wavelet filter.
Appendix: III

Table A. 1

ARIMA Specification for Beveridge-Nelson Decomposition

<table>
<thead>
<tr>
<th>Country</th>
<th>ARIMA</th>
<th>DW Test statistic</th>
<th>Serial Correlation Test</th>
<th>ARCH Test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>F-statistic (Prob. F)</td>
<td>F-statistic (Prob. F)</td>
</tr>
<tr>
<td>Pakistan</td>
<td>(1,1,0)</td>
<td>1.754307</td>
<td>0.487476 (0.618282)</td>
<td>0.812526 (0.373366)</td>
</tr>
<tr>
<td>India</td>
<td>(0,1,1)</td>
<td>2.099540</td>
<td>0.676821 (0.514755)</td>
<td>0.002197 (0.962877)</td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>(1,1,0)</td>
<td>1.946708</td>
<td>0.433264 (0.651819)</td>
<td>0.154188 (0.696881)</td>
</tr>
</tbody>
</table>

1. The Durbin-Watson Statistic (DW statistic) measures the linear association between adjacent residuals from a regression model. If there is no serial correlation, the DW statistic will be around 2. As the DW statistics for all countries is around 2 indicating no evidence of serial correlation in the residuals.

2. The Breusch-Godfrey serial correlation test F-statistic is the LM test statistic for the null hypothesis of no serial correlation. The non-zero probability values for all countries indicate no serial correlation in the residuals. The Breusch-Godfrey serial correlation test provides a more general testing framework than the Durbin-Watson test.

3. The ARCH test F-statistic is the test statistics for the null hypothesis of no autoregressive conditional heteroskedasticity. The non-zero probability values for all countries indicate no autoregressive conditional heteroskedasticity in the residuals.
Appendix: IV

Table A-2

Error Correction Test (Pakistan)

<table>
<thead>
<tr>
<th>Variable</th>
<th>ECM</th>
<th>ECM with Additional I(0) Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependent</td>
<td>( \Delta \tau_t )</td>
<td>( \Delta g_t^p )</td>
</tr>
<tr>
<td>( C )</td>
<td>0.000631 [(0.413165)]</td>
<td>0.000654 [(1.23108)]</td>
</tr>
<tr>
<td>( EC_{t-1} )</td>
<td>-0.29195* [(-2.09576)]</td>
<td>0.103653* [(2.139955)]</td>
</tr>
<tr>
<td>( \Delta g_{t-1}^p )</td>
<td>0.863931* [(2.223016)]</td>
<td>0.905727* [(6.702593)]</td>
</tr>
<tr>
<td>( \Delta g_{t-2}^p )</td>
<td>-0.69319** [(-1.771166)]</td>
<td>-0.387749* [(-2.849325)]</td>
</tr>
<tr>
<td>( \Delta \tau_{t-1} )</td>
<td>-0.08787 [(-0.490736)]</td>
<td>-0.206822* [(-3.322063)]</td>
</tr>
<tr>
<td>( m_{t-1} )</td>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>( g_{t-1}^t )</td>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.257961</td>
<td>0.608323</td>
</tr>
<tr>
<td>Adj. R-squared</td>
<td>0.165206</td>
<td>0.559364</td>
</tr>
<tr>
<td>AIC</td>
<td>-6.43501</td>
<td>-8.54778</td>
</tr>
<tr>
<td>SIC</td>
<td>-6.21732</td>
<td>-8.33009</td>
</tr>
<tr>
<td>F-statistic</td>
<td>2.781104</td>
<td>12.42501</td>
</tr>
<tr>
<td>DW stat</td>
<td>1.672272</td>
<td>1.524766</td>
</tr>
<tr>
<td>Normality test (Jarque-Bera)</td>
<td>0.126977 [(0.938485)]</td>
<td>0.743242 [(0.689616)]</td>
</tr>
<tr>
<td>Serial Corr. LM F Test</td>
<td>3.514130 [(0.055748)]</td>
<td>2.619412 [(0.056188)]</td>
</tr>
<tr>
<td>ARCH F Test</td>
<td>0.012489 [(0.911677)]</td>
<td>0.012314 [(9.12293)]</td>
</tr>
<tr>
<td>Heteroskedasticity F Test</td>
<td>0.542085 [(0.883898)]</td>
<td>0.266996 [(0.971530)]</td>
</tr>
<tr>
<td>Ramsey RESET F Test</td>
<td>0.944070 [(0.338754)]</td>
<td>1.735284 [(0.197392)]</td>
</tr>
</tbody>
</table>

Note: The coefficient t values are given in brackets and diagnostic p-values are given in parentheses. * Indicates significance at 5% level. **Denotes significance at 10% level.
1. The Durbin-Watson Statistic (DW statistic) measures the linear association between adjacent residuals from a regression model. If there is no serial correlation, the DW statistic will be around 2.

2. The Breusch-Godfrey serial correlation test F-statistic is the LM test statistic for the null hypothesis of no serial correlation. The non-zero probability values indicate no serial correlation in the residuals. The test provides a more general testing framework than the Durbin-Watson test.

3. The ARCH test F-statistic is the test statistics for the null hypothesis of no autoregressive conditional hetero-skedasticity. The non-zero probability values indicate no autoregressive conditional hetero-skedasticity in the residuals.

4. Jarque-Bera is test with the null hypothesis of residuals are normally distributed. The non-zero probability values indicate that the residuals are normally distributed.

5. White’s test is test with the null hypothesis of no hetero-skedasticity. The non-zero probability values indicate no hetero-skedasticity.

6. Ramsey RESET stands for Regression Specification Error Test with null of model is stable with no specification error. The non-zero probability value indicates that the model is model is stable with no specification error.

7. The lag selection in the model criteria are maximum Adjusted R-square and minimum AIC and SIC.
### Table A-3

**Error Correction Test**  
(Sri Lanka)

<table>
<thead>
<tr>
<th>Variable</th>
<th>ECM</th>
<th>ECM with Additional I(0) Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\Delta \tau_t$</td>
<td>$\Delta g^p_t$</td>
</tr>
<tr>
<td><strong>Dependent</strong></td>
<td>Coefficient [t-Statistic]</td>
<td>Coefficient [t-Statistic]</td>
</tr>
<tr>
<td>$C$</td>
<td>-0.00342 [-1.435633]</td>
<td>-0.00113 [-0.56868]</td>
</tr>
<tr>
<td>$EC_{t-1}$</td>
<td>-0.72397* [-4.588281]</td>
<td>0.068789 [0.589415]</td>
</tr>
<tr>
<td>$\Delta g^p_{t-1}$</td>
<td>0.997207* [4.040469]</td>
<td>1.278663* [6.142566]</td>
</tr>
<tr>
<td>$\Delta g^p_{t-2}$</td>
<td>-1.54267* [-4.060171]</td>
<td>-0.84302* [-2.908262]</td>
</tr>
<tr>
<td>$\Delta g^p_{t-3}$</td>
<td>0.981204* [2.624466]</td>
<td>0.193118 [0.932295]</td>
</tr>
<tr>
<td>$\Delta g^p_{t-4}$</td>
<td>-1.08099* [-3.969337]</td>
<td>-----------</td>
</tr>
<tr>
<td>$\Delta \tau_{t-1}$</td>
<td>-0.2995 [-1.814392]</td>
<td>-0.12595 [-0.899777]</td>
</tr>
<tr>
<td>$\Delta \tau_{t-2}$</td>
<td>-0.28362 [-1.666578]</td>
<td>-0.11966 [-0.842291]</td>
</tr>
<tr>
<td>$\Delta \tau_{t-3}$</td>
<td>-0.341202* [-2.219347]</td>
<td>-0.00662 [-0.056287]</td>
</tr>
<tr>
<td>$\Delta \tau_{t-4}$</td>
<td>-----------</td>
<td>-----------</td>
</tr>
<tr>
<td>$m_{t-1}$</td>
<td>-----------</td>
<td>-----------</td>
</tr>
<tr>
<td>$g^p_{t-1}$</td>
<td>-----------</td>
<td>-----------</td>
</tr>
<tr>
<td><strong>R-squared</strong></td>
<td>0.70173</td>
<td>0.689251</td>
</tr>
<tr>
<td><strong>Adj. R-squared</strong></td>
<td>0.609554</td>
<td>0.611563</td>
</tr>
<tr>
<td><strong>AIC</strong></td>
<td>-5.52742</td>
<td>-5.87082</td>
</tr>
<tr>
<td><strong>SIC</strong></td>
<td>-5.12748</td>
<td>-5.51893</td>
</tr>
<tr>
<td><strong>F-statistic</strong></td>
<td>7.646156</td>
<td>8.87211</td>
</tr>
<tr>
<td><strong>DW stat</strong></td>
<td>2.028314</td>
<td>1.749563</td>
</tr>
<tr>
<td><strong>Normality test (Jarque-Bera)</strong></td>
<td>1.065770 (0.586909)</td>
<td>5.233168 (0.073052)</td>
</tr>
<tr>
<td><strong>Serial Corr. LM F Test</strong></td>
<td>0.319671 (0.729433)</td>
<td>1.395828 (0.269677)</td>
</tr>
<tr>
<td><strong>ARCH F Test</strong></td>
<td>0.013639 (0.907759)</td>
<td>2.082958 (0.160454)</td>
</tr>
<tr>
<td></td>
<td>F Test</td>
<td>F Test</td>
</tr>
<tr>
<td>--------------------------</td>
<td>--------</td>
<td>--------</td>
</tr>
<tr>
<td><strong>Heteroskedasticity F</strong></td>
<td>1.648126 (0.153251)</td>
<td>2.033416 (0.068684)</td>
</tr>
<tr>
<td><strong>Ramsey RESET F</strong></td>
<td>22.04050 (0.000082)</td>
<td>2.082958 (0.160454)</td>
</tr>
</tbody>
</table>

**Note:** The coefficient t values are given in brackets and diagnostic p-values are given in parentheses. * Indicates significance at 5% level. ** Denotes significance at 10% level. Also see note under table A.3 for details.