Ricardian Equivalence, Twin Deficits and The Feldstein Horioka Puzzle in Pakistan

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By
Sumaira Saeed
MS Economics
Registration #196-FE/MS (Eco)/F08

Supervisor

Dr. Muhammad Arshad Khan
Senior Research Economist
Pakistan Institute of Development Economics (PIDE)

Co supervisor

Dr. Hafiz Muhammad Yasin
Assistant Professor (IIIE)
International Islamic University Islamabad

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International Islamic University Islamabad
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ECO

1 - Consumption (Economics) - Pakistan.

2 - Budget deficits.

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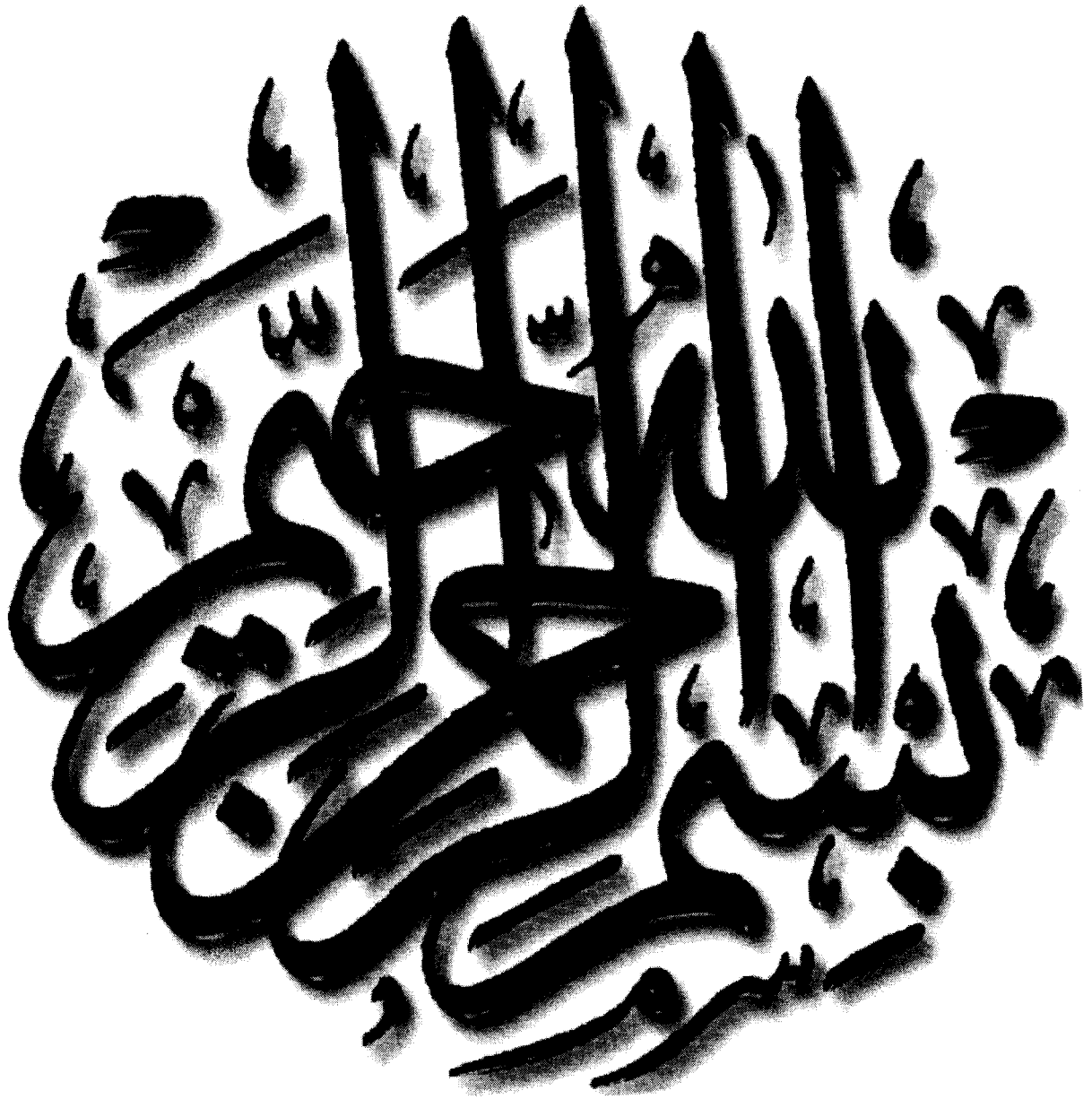
CERTIFICATE

It is to certify that this thesis submitted by Ms. Sumaira Saeed is accepted in its present form by the Department of Economics, International Islamic University Islamabad as satisfying for the requirement for partial fulfillment of the degree of Master of Philosophy in Economics.

Supervisor

Dr. M. Arshad Khan
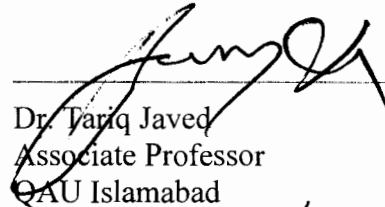Senior Research Economist
PIDE, Islamabad

Co-Supervisor

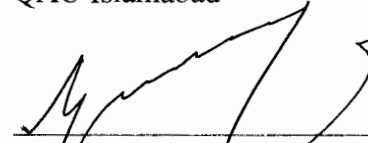25/5/2010

Dr. Hafiz M Yasin
Associate Professor
IIIE, IIU Islamabad

External Examiner

Dr. Tariq Javed
Associate Professor
QAU Islamabad

Internal Examiner

Mr. Atiq uz Zafar
Assistant Professor
IIIE, IIU Islamabad

Chairperson

Dr. Abdul Jabbar
Assistant Professor
IIIE, IIU Islamabad

Dedication

To My Beloved and Respected Father (late)

"ABU JEE"

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Abstracts

Pakistan represents a valuable case study for investigating the dynamics of steadily high rates of budget and current account deficits. In this study an attempt has been made to empirically test the validity of Ricardian equivalence hypothesis, Twin deficits hypothesis and the Feldstein –Horioka puzzle for Pakistan using annual time series data for the period 1972 to 2008. The cointegration results indicate the long run relationship between the budget deficit and current account deficit while the Granger causality running from current account to budget deficit. So the twin deficit hypothesis is accepted by rejecting Ricardian equivalence hypothesis and found evidence in favor of a high degree of capital mobility. Pakistan is anon Ricardian economy facing twin deficits but F-H puzzle not exists although Pakistan is not perfectly integrated in to the world economy.

CHAPTER 1

INTRODUCTION

1.1 About this study

The fiscal policy has a key role to play in stabilizing the economy both in developed and developing countries. This policy can be useful only if the fiscal decisions of the government are capable to affect household's consumption and saving behavior meaningfully. The governments often float debts by issuing bonds of different maturities and coupon rates. How the private sector (households) considers bonds, is a matter of debate among the economists. According to the Keynesians, the households consider government bonds as net wealth. It implies that the substitution of debt by the government for taxes has a positive impact on private consumption and thereby on aggregate demand. The resulting decrease in total savings causes higher real interest rate, which in turn leads to crowd out private investment, capital inflows with exchange rate to appreciate and eventually leading to an increase in the current account deficit (CAD).

In contrast, the Ricardian approach holds the view that households (with perfect foresight) do not take government debt as a net wealth. Thus for a given time path of government spending, the debt-for-tax replacement would have no effect on private consumption since the increased disposable income (due to tax

reduction) is likely to be saved by the households. So the total national savings, interest rate and marginal propensity to consume (MPC) remain unaffected and therefore no rationale for crowding out effect (Wronlowsky and Machacek, 2003).

The external deficit and budget deficit in the United States increased significantly during the 1980's for several reasons. Many economists considered this co-movement of the twin deficits to be meaningful and concluded that a considerable share of the deterioration in the external balance was due to the emergence of record level budget deficits. This phenomenon of mutual connection was later on known as the twin deficits hypothesis.

Theoretically speaking, the said hypothesis originates from the Mundell-Fleming open-economy model. According to this model (with the assumption of free capital mobility), an increase in the budget deficit (BDEF) exerts an upward pressure on the rate of interest to attract foreign capital, which leads to an appreciation of the exchange rate and ultimately to a deficit in the current account (CAD), Ali and Ilhan, (2008).

The twin deficit issue can also be linked to the degree of capital mobility across borders and to the Feldstein and Horioka (FH) (1980) puzzle. In fact, if domestic savings and investments are not highly related (due to free mobility) the BDEF and the CAD can be expected to move together. If the Ricardian equivalence does not hold, then an increase in public borrowing (due to budget deficit) is likely to decrease national saving (both domestic and foreign).

For a given amount of investment, this decrease in national saving leads to an increase in the current account deficit. Hence, the perfect capital mobility results into twin deficits in a non-Ricardian world. In other words, if the FH puzzle holds there is no possibility of twin deficits to coexist.

Many researches have dilated extensively on the Ricardian equivalence hypothesis, the Twin deficit problem and the Feldstein–Horioka puzzle[1]. However, the evidence suggests mixed results about these hypotheses. In some studies, Ricardian Equivalence and Twin deficits issue have connected and a few studies have made a link between Twin deficits and perfect capital mobility. But to best of our knowledge, there is only one study of Marinheiro (2008)[2], which has connected both hypotheses with reference to Egypt. So the present study examines the validity of Ricardian Equivalence Proposition, the Twin deficit hypothesis and the Feldstein –Horioka puzzle with reference to Pakistan economy.

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[1] See Chapter 2 of Literature Review for details.

[2] He found evidence in favor of Ricardian equivalence by rejecting Twin deficits hypothesis and evidence in favor of a high degree of capital mobility by using Johansen cointegration and error correction methodology.

1.2   Rationale of study

Keeping in view the severity of the problem, it seems important to investigate the dynamics of steadily growing budget and current account deficits in Pakistan as a case study. The debate and research conducted so far with reference to Pakistan economy in this regards is mostly incomplete and inconclusive. For instance, Zaidi (1995), Burney and Akhtar (1992); Burney and Yasmeen (1989) and Kazimi (1992) have used OLS techniques on annual data to relate the twin deficits with other macroeconomic variables. Similarly Aqeel and Nishat (2000) have tested the causality between fiscal and current account deficits by using annual data set and their methodology is similar to Vamvoukas (1997) adopted for Greece. Although, the studies under reference are extremely important in understanding the links between the twin deficits and other macro economic variables, however as noted by Hakro (2009), most studies have reached contrasting conclusions due to pre-specification of the structural relations used in their models. The present study examines the validity of Ricardian equivalence, twin deficits and F-H puzzle for Pakistan simultaneously by using annual data from 1972-2008. To best of our knowledge, no such study prevails at the moment in Pakistan.

It is expected that the findings of this study will provide useful insights into main connection among the three phenomena and help identify new areas of

exploration. As usual, every study has its potentials and limitations. This study is based on empirical analysis and relies heavily on the availability, competences and authenticity of the data. Every effort has been made to ensure access to reliable sources and to employ modern techniques of analysis. However the final results are presented as they are and interpreted accordingly.

1.3   Objectives of the Study

The main aims of this study are:

➤ To estimate whether fiscal deficit has any impact on current account deficit with reference to Pakistan economy.

➤ To examine the validity of Ricardian equivalence for Pakistan and find any evidence for or against the Feldstein- Horioka puzzle.

To the best of our knowledge this study is the first of its nature to investigate simultaneously and comprehensively the validity of Ricardian equivalence proposition, the twin deficit hypothesis and the Feldstein-Horioka puzzle in Pakistan. We have used the time series data for Pakistan over the period 1972-2008 for Consumption, Disposable income, Government Debt, Budget Deficit, Current Account Deficit, Investment, Budget Balance and Trade Balance. We have applied the econometric technique which is mostly used to check the long run relationship between variables; unit root test, Johansen Cointegration test and Error Correction Mechanism.

1.4   Organization of study

The organization of the study is follows: chapter 2 provides a brief review of the existing literature. Chapter 3 describes the detailed theoretical and analytical Framework of the Ricardian equivalence, the twin deficits and Feldstein Horioka puzzle. Chapter 4 explains econometric technique and methodology for estimation and describes the data and construction of variables used in the empirical model. Chapter 5 reports the estimation results and finally chapter 6 presents the conclusions and the policy recommendations for Pakistan.

CHAPTER 2

LITERATURE REVIEW

A number of theoretical and empirical studies are available which examine the Ricardian equivalence hypothesis (REH), twin deficits and the Feldstein_ Horioka puzzle. This chapter contains three sections which give a number of empirical and theoretical studies. The theoretical and empirical literature reviewed on the Ricardian equivalence hypothesis (REH) in section 2.1. Section 2.2 attends to the existing literature on the Feldstein-Horioka puzzle and section 2.3 is devoted to most recent studies on the twin deficits issue

2.1 The Ricardian Equivalence Hypothesis

In this section, we have reviewed same existing empirical as well as theoretical literature on Ricardian Equivalence hypothesis.

The evaluation of the existing theory and evidence on Ricardian equivalence is investigated by Bernheim (1987) using a simple vector auto regressive (VAR) technique for annual data over the period 1956-1984. He argued that the long run neutrality is extremely weak. These studies are facing a number of problems when the economic impacts of deficits measured directly through aggregate data. Therefore this evidence by itself has proven uncertain. The overall

existing theory and evidence recognized a significant possibility that deficits have large effect on current consumption.

Kazmi (1991, 1992) tests Evans Model of intertemporal allocation of resources as affected by the perceptions of the consumers about debt accumulation using the macro economics data for the period 1960-88 of Pakistan. The results failed to confirm the Ricardian Equivalence hypothesis for Pakistan. Therefore, further research is essential to check the strength of this important hypothesis of public finance especially for developing countries like Pakistan.

The validity of the Ricardian equivalence (RE) hypothesis for India was analyzed by Ghatak and Ghatak (1996). Over the period 1950-1986 the cointegration analysis and the rational expectations model both invalidate the RE hypothesis. Ghatak and Ghatak suggest that there is crowding out having considerable effects on private consumption. However, similar effect on private investment is insignificant because it is estimated to be integrated in the effect of interest rates.

The literature on Ricardian equivalence is reviewed by Ricciuti (2001) and interpreted as an overview to the short and long run theories which put no control on the real effects of public policies on aggregate demand. Furthermore, he argued that the permanent income hypothesis and the fulfillment of the intertemporal government budget constraint is the very basis of this equivalence. There are several reasons for departure from this hypothesis in the theoretical literature. However, the empirical literature is indecisive when this hypothesis is

confronted to data. The Ricardian equivalence hypothesis is usually rejected when investigated in a life-cycle framework, and accepted when it is estimated through optimizing models.

Empirical evidence of Ricardian equivalence for Portuguese economy is examined using co integration technique, Error Correction Methodology (ECM) methodology and Pereleman and Pestieau approach for annual data over the period 1953-1993, Marinheiro (2001) found that there is only partial equivalence in the Portuguese economy which rejects the hypothesis Ricardian equivalence. He also focused on the consequences of the Ricardian equivalence to conduct of stabilizing fiscal policies if equivalence prevailed there is no scope for effective stabilizing fiscal policies. An empirical application is agreed out for the Portuguese economy. Reduced-form consumption functions and the Euler equation approach are followed in the analyses. So, overall results of the investigation are ambiguous.

Some empirical evidence on the validity of three hypotheses, namely the Keynesian approach, the Ricardian Equivalence proposition and the German view of Expansionary Fiscal Contraction (EFC) is required by testing the impact of a shock in government taxation upon private consumption, when the effect of the stock market is removed. Giorgioni and Holden (2003) used a vector error-correction model for the USA, Japan, Germany, France, the UK, Italy and Canada for 1950–1997. The empirical investigations suggest that the responses to an increase in government taxation appear to provide support to the EFC. In contrast,

the responses of private consumption to an increase in government spending seem to with the traditional Keynesian approach.

Furthermore, they argued that personal consumption is a function of public consumption even if consumers have not internalized the government's budget constraint. A permanent increase in government consumption raises taxes levied on firms and therefore reduces the net present value of their profits. The hypothesis tested by Frish (2003) that Ricardian equivalence operates in Israel through capital market using simple regression in the period 1974-2002 and found that change in firm's value bring a shift in public consumption through consumption. Furthermore, public consumption does not affect private consumption for a given value of shares.

The validity of the Ricardian Equivalence Proposition is tested by Giorgioni and Holden (2003) using Vector Autoregressive (VAR), Ordinary Least Square (OLS), fixed effect and random effect model and they used panel data 1975-1999 for ten developing countries including Burundi, El Salvador, Ethiopia, Honduras, India, Morocco, Nigeria, Pakistan, Sri Lanka and Zimbabwe. It seemed that the hypothesis concerned should not hold as the REP requires a number of assumptions that might not become visible to be satisfied in developing countries. But so far the given empirical evidence is mixed. The countries were chosen for the study were low-income countries. The results revealed some tentative conclusion in favor of the REP for these developing countries.

The validity of Ricardian equivalence for the Czech Republic is examined by Wroblowsky and Mac hacek by using quarterly data 1993-2002. Their results are based on the reduced form consumption function. The results suggest that Ricardian equivalence is likely invalid for Czech Republic due to the failure of private consumers in solving intertemporal optimization problem. On the contrary, it is further argued that if people behave as Ricardian agents, the consequences for policy-making are not as important in developed countries as for countries in transition. Therefore, a simple empirical relevance of Ricardian equivalence for the Czech Republic was carried out. The overall results were indefinite and showed the need for a deeper econometric analysis.

Nickel and Vansteenkiste (2008) analyzed the empirical relationship between fiscal policy and the current account of the balance of payments. They considered that how Ricardian equivalence transforms this relationship. They estimated a dynamic panel threshold model for 22 industrial countries by using OLS technique and Dicky Fuller test over the period 1981-2005. The results showed that the relationship between the government balance and the current account is positive for countries where debt to GDP ratios up to 90%, this relationship turns negative but insignificant for very highly indebt countries. This result implied that households in very high debt countries tend to become Ricardian. Same model when estimated for 11 largest Euro Area countries illustrated that the relationship between the government balance and the current account turns statistically insignificant when the debt to GDP ratio exceeds 80%.

The question of Ricardian equivalence in the context of local public finance is investigated by Hatfield (2009). Earlier work has suggested that for local public finance, this equivalence will valid. The result is significant if and only if sub national units use property taxes, however for other tax bases, a weaker result is shown. Further, the Ricardian equivalence does not hold for local public finance when districts do not use land taxation.

There are three different approaches to check the validity of the Ricardian proposition for the Spanish economy. Firstly, to analyze its theoretical proposition for the stability of national saving and the relationship between fiscal and current account balances, secondly to conduct a number of tests on different structural consumption equations and, thirdly to check this hypothesis in consumption functions stemming from the Euler equations derived from a consumer's maximization problem. Castro and Fernández (2009) used cointegration analysis and ECM technique to investigate this hypothesis over the period 1980-2007. The results lead toward rejection of the Ricardian proposition, although some degree of substitution between public and private saving is detected. These results supported the countercyclical role of fiscal policy in the case of Spain.

A flood of empirical research started since 1974 when Barro opened the inquiry about the consequences of debt-financed tax cuts. The objective of these studies was to verify the Ricardian equivalence theorem. The consequences of these studies are different from case to case. Wroblowsky (2009) examined empirically the evidence of a Meta analysis of Ricardian Equivalence proposition. His methodology is similar to that of Stanley, however he included the latest

empirical data to the sample and considered the changes in the meta-independent variables structure. Stanley (1998) gives a meta-analysis of 27 studies checking the Ricardian equivalence hypothesis. He finds strong evidence that this hypothesis is incorrect. These results are much related to those achieved by Stanley.

2.2   The Twin Deficits

This section reviews some existing theoretical and empirical literature on Twin deficits hypothesis.

Normandin (1994) estimated the fundamental relationship between the external and budget deficit by using Blanchard's overlapping generation model (BOLGM). The said model implies that the consumers forecast future budget deficits by keeping in view the past history of the twin deficits and their mutual relationship. This implication is used to derive the testable time series restrictions for a given consumers' planning horizons. He examined that the relevant Canadian consumer's horizons and the determination of the Canadian budget deficits produce reactions that are statistically positive. In contrast, the responses of the relevant U.S. consumers' horizons and the dynamic behavior of the U.S. budget deficits responses that are statistically insignificant.

The causality between trade and budget deficits for India, Pakistan and Mexico is tested by Kulkarni and Erickson (1998) based on simple regression and Granger Causality test by using the annual data for the period 1969_1996. In case of Mexico there is no evidence of twin deficits and there was no evidence of

causality running in either direction. However, there was a strong support for twin deficits in case of India and that budget deficits created trade deficits. So far as the case of Pakistan there was an evidence of trade deficits generating the budget deficits. The analysis shows that for three countries there are different evidences of twin deficits.

The validity and rationale of the Keynesian proposition and the Ricardian equivalence hypothesis is examined by Vamvoukas (1999) for a small open economy of (Greek) using annual data. He investigates the link between budget and trade deficits based on cointegration analysis, error correction modeling and Granger causality. The findings of this study suggest that budget deficit has positive and significant effects on trade deficit both in the short run and long run.

The relationship between budget and trade deficits in the Saudi Arabian economy is examined by Alkhatib (2000) using annual data (1970-1999). He discussed the theoretical basis of the Twin deficit. The results suggest that under the Ricardian equivalence framework there is absence of relationship between the deficits, while Keynesian proposition affirms that budget deficit leads to trade deficit. The econometric investigation exposed that budget and trade deficits have long run relationship and Granger causality test stated that trade deficit leads to budget deficit. Thus for an oil economy the two deficits are positively related but the direction of causality running from trade deficit to budget deficit.

The short and long run relationship between budget deficit and trade deficit is investigated by Aqeel and Nishat (2000) for Pakistan,with cointegration

analysis, error-correction methodology and Granger trivariate causality tests with the annual data from 1973-1998. They found that the budget deficit has positive and significant effect on the trade deficit in Pakistan. However, the causal effect between budget deficit and current account balances is negative in short run.

The moving average representation of the VAR model has been used to investigate historical relationships between trade and budget deficits for Turkey. Specially, Zengin (2000) examined the causal ordering between the variables within the connection is tested in a vector autoregressive (VAR) model and generate variance decompositions and impulse response function. The evidence supports the notion that budget deficits affect trade balance.

Kouassi et al. (2002) extended causality tests primarily developed by Toda and Yamamoto (1995) between budget and current account deficit using international data for a sample of twenty developed countries. They found evidence of causality between the twin deficits for some developing countries. However, the results for developed countries are less convincing.

Aristovnik (2003) investigate the link between the fiscal balance and the current account using pooled cross-sectional and time-series data across the selected groups of transition economies for the period 1990-2003. To draw some conclusions about the degree of integration with international capital markets, he mainly focused on the importance of the so-called F-H puzzle in transition economies. The transition economies which are according to their different characteristics divided into three major groups, i.e. Central and Eastern Europe

(CEE), Southern and Eastern Europe (SEE) and the Commonwealth of Independent States (CIS). The empirical results suggested that high budget deficits in transition economies confirm relatively low level of substitutability between private and public savings. These results are implying a relatively high correlation between fiscal and external imbalances.

Zubaidi et al. (2005) examined the twin deficits hypothesis in Indonesia, Malaysia, Philippines and Thailand (4 ASEAN countries). They confirmed the existence of a long run relationship between the two deficits. However, the Keynesian reasoning best suits only for Thailand due to the presence of a unidirectional relationship, running from budget deficit to current account deficit. In contrast, the reverse causation is found for Indonesia. So far as the case of Malaysia and the Philippines is concerned, there is bi-directional causality for the two deficits. The results also supported an indirect causal link running from budget deficit to widening of the current account deficits via the channels of interest rates and appreciation of the exchange rate. As indicated by variance decompositions, the consequences of large budget and current account deficits become obvious only over the long run.

The recent declines in the United States current account and fiscal deficits have spurred a renewed debate on the twin-deficit hypothesis. The main argument reveals that a larger fiscal deficit is the sole cause of an expanded current account deficit since it affects the national saving. Bartolini and Lahiri (2006) examined this hypothesis and found some empirical evidence in its support. However, the observed link between the two deficits is too weak to support the view that

declining fiscal deficit can play a major role in correcting the current account imbalance held by the United States with rest of the world.

The Keynesian view that a link exists between the current account, budget deficit and savings and investment gap is supported by Saleh and Chowdhury (2007). They examined the long-run and short-run relationships between the current account deficit, budget deficit, savings and investment gap and trade openness in Sri Lanka using the autoregressive distributive lagged (ARDL) approach. They found that trade openness has a positive effect on the current account deficit, although is statistically insignificant.

Fonseca (2007) tried to investigate whether public deficit had any consequences for the current account deficits in case of Egypt by considering the validity of the twin deficit hypothesis. He concluded that there is only a weak relationship between the two deficits. Therefore, he rejected the twin-deficit hypothesis as well as the validity of Ricardian equivalence in Egypt.

Corsetti and Muller (2007) investigated the parallel or co-movement of the government budget balance and the trade balance in the perspective of international business cycle theory. In a sample of 10 OECD countries the correlations of the two time series was found to be pessimistic, but less so in more open economies. Moreover, this correlation function was S-shaped for the US. They showed that a standard model deliver predictions broadly in favor of the evidence. They also showed that the model predicts a perfect correlation of the

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budget balance and the trade balance on the condition of spending shocks. So, the effect of spending shocks on the trade balance is containing in closed economy.

The conventional argument that current account deficit is significantly affected by budget deficit is examined by Mukhtar et al. (2007) in Pakistan. They used quarterly data of Pakistan for the period 1975 to 2005 based on cointegration analysis, ECM and Granger causality test. The results supported that budget deficit have optimistic and significant long run effect on current account deficit. Causality test showed that bidirectional causality run between the two variables. These findings have raised doubt on the use of single equation approach to analyze the twin deficits hypothesis. However, in the framework of a simultaneous equation model, more productive inquiry into relationship between two deficits should be achieved.

Acaravci and Ozturk (2008) were used the cointegration bounds and the ARDL model to estimate interaction between the twin deficits both in the short-run and long-run. They examined the general validity of twin deficits hypothesis for Turkey by using quarterly data 1987:1 to 2005:4. The empirical analysis rejected the Ricardian Equivalence Hypothesis by supporting the Keynesian view that there is a long-run relationship between both budget and current account deficits.

Neaime (2008) examined the relationship between current account and budget deficits in the small open developing economy of Lebanon. The existence of a unidirectional causal relationship between the budget and current account

deficits in the short run indicated that rising fiscal deficits have started to put even more strain on the current account deficits in Lebanon. The empirical results support the existence of a unidirectional causal relationship in short run. Further, the rising fiscal deficits put more strain on the current account balance

Arize and Malindretos (2008) explored new evidence on the long-run relationship between trade and budget deficit in Ten African countries using quarterly data over the period 1973- 2005. They found that there exist a positive long-run relationship between the trade deficit and the budget deficit in the long run. However, in the short run, there is weak evidence for this linkage. They found that bidirectional causality between the twin deficits received strong empirical support in the long run but a unidirectional relationship in short run there. The budget deficit adjustment is supposed to be the key to manipulate the speed of budget-trade deficit convergence. Moreover, they concluded that budget deficits converge much faster than trade deficits.

The relevance of twin deficit hypothesis (TDH) in five countries of Association of South East Asian Nations (ASEAN) is investigated by Baharumshah et al. (2009) for time period 1960-2003 by using vector error correction model (VECM). They examined the casual relation between current account deficit, budget deficit and investment. The empirical findings are as follows: first, TDH holds only for 3 countries Malaysia, the Philippines and Thailand. Second, the findings are in line with the view that government expenditure crowds out private investment. Third, investment showed an important impact on current account deficit. Finally, since a high portion of

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domestic investment is financed through international sources, which suggested that the F-H puzzle is less important in these economies.

Using multivariate time series on Pakistan's data, the causal link between twin deficits and other macroeconomic variables is estimated by Hakro (2009). The estimates of vector autoregressive model demonstrated that causality link of deficits is flowing from budget deficits to trade deficits via changes in prices, interest rate, capital flows, exchange rates. The evidence suggested that reduction in the budget deficits might help to control the level of prices. Minimum government intervention and a balanced budget policy could restore the imbalance and establish confidence in international trade.

Siddiqui (2009) investigated the twin deficit hypothesis in case of Pakistan for the period 1976-2008 using the VAR, Granger Causality and Johansen co-integration techniques. The results confirmed one way direction causal relationship showing trade deficit positively effecting budget deficit in the short run for Pakistan.

2.3   Feldstein-Horioka Puzzle

In this section, we have reviewed the some existing theoretical as well as empirical literature related to Feldstein-Horioka puzzle.

There would be little correlation between the saving and the domestic investment in that country with perfect capital mobility across border. In other words, domestic savings and investment will be independent of each other. In contrast, if portfolio preferences and institutional rigidities hinder the flow of

long-term capital across countries, then an increase in domestic saving would be reflected primarily in additional domestic investment. Feldstein and Horioka (1979) statistically investigated the two views of international capital mobility. The evidence on the relation between domestic investment and saving implied that the truth lies closer to the second view than to the first. The international differences in domestic saving rates among main industrial countries have effect into almost equal corresponding differences in domestic investment rates. Authors have discussed the compatibility of this evidence with the obvious international mobility of short-term liquid capital and with the existence of substantial international flows of long-term portfolio and direct investments.

An explicit analysis of the problems of identification and simultaneous equations bias suggests that the estimates provide merely a guideline to the long-run response of international capital flows rather than reflect the short-run behavior of variable. A portfolio model of international capital allocation indicates that a change in the rate of net foreign investment due to a constant increase in domestic saving is likely to be considerably greater than the ultimate steady state response. Feldstein (1982) retested and confirmed the earlier findings of Feldstein and Horioka (1980) that sustained increase in domestic saving rate induce approximately an equal increase in domestic rate of investment. New estimates for the post-OPEC period (1974-79) implied that each extra dollar of domestic saving increases domestic investment by approximately 85 cents in a sample of 17 OECD countries.

The FH result of a high cross-section association between saving and investment rates in OECD countries has remained remarkably strong. Jerry et al. (1998) investigated as to how economists responded to the Feldstein–Horioka (FH) view that a high saving-investment association across OECD countries concealed low capital mobility by using annual data 1960-1992. However, the debate whether saving-investment co movements are indication of capital mobility is still inconclusive.

Sachsida and Caetano (1999) corroborated the evidence that the real side of the economy Feldstein- Horioka test does not reflect capital mobility. A general explanation for the F-H puzzle was opened in terms of substitutability between external and domestic savings. The F-H coefficient does not mean capital mobility, but just a substitutability relation between external and domestic savings.

Cointegration tests using the post war period quarterly data revealed a variety of linkages between the variables across countries for post war quarterly data. A number of economies such as Canada, Germany, Netherlands, and increasingly the United Kingdom emerged to be small and open, while Japan and the United States were effectively closed. Fountas and Tsoukis (2000) examined empirically the interactions among the current account, budget balances and the real interest rate as it can provide more information about the effective degree of financial openness than simple saving-investment correlations. They found that in short run there is some evidence in favor of the twin deficits and current account targeting hypotheses.

Hysteresis (unit root) of the current account, fiscal balance, and investment shares is established for most of the industrial countries as well as selected emerging and transition economies by Fidrmuc (2003). He examined the evidence of twin deficits and the F–H puzzle for such economies between 1976 and 2001 and found a positive long-run relationship between the twin deficits in several countries. Investment in some EU countries is financed to a relatively high degree via the international financial markets involving that the F–H puzzle is less significant in the EU countries.

The FH puzzle is revisited by Caporalea et al. (2003) employing a variety of efficient cointegration estimators and using Monte Carlo simulations critical values. The objective was to test the hypothesis of a unit retention coefficient for annual data over the period 1948-1998. They concluded that despite evidence supporting the FH result, there appears to be considerable heterogeneity in terms of the savings-investment association. Furthermore, only 25% of the 23 OECD countries can be characterized as open economies in the FH sense.

Using the annual and quarterly post-war U.S. data and the framework of a dynamic inter temporal optimization model for an open economy, Levy (2004) found that long-run investment-saving correlation follows directly and this does not depend on the degree of international capital mobility. Therefore, the time series of investment and saving should be co integrated unless the budget constraint is despoiled, and this should be true for any degree of capital mobility. He found that investment and saving are cointegrated in levels as well as in rates, regardless of the time period considered

The relationship between saving and domestic investment in six countries such as Algeria, Egypt, Morocco, Saudi Arabia, Syria and Tunisia has been tested by following a cointegration analysis in panel data framework (1960-1998). Khedhiri and Hebiri (2005) found that the results of panel-data cointegration tests are different from those obtained in single-country data. This empirical study showed evidence of a significant correlation between savings and investment, and thus no solution to the F-H puzzle, despite the implications of international capital mobility.

Rao et al. (2008) estimated the F-H equation for 12 OECD countries over the period 1960-2007 and using a systems *GMM* approach. They found that the F-H puzzle exists in a weaker form with a reduced saving retention coefficient. The Bretton Woods agreement in particular has weakened the F-H puzzle by significantly improving international capital mobility. In contrast the Maastricht agreement seems to enhance capital mobility only by a small degree. The Blundell and Bond approach systems GMM method and the structural break tests of Mancini-Griffoli and Pauwels are examined.

Based on the above cited review of the literature, it may be concluded that the empirical and theoretical literature on Ricardian equivalence proposition (REP) is inconclusive. The theoretical literature emphasizes several reasons for weakness of this hypothesis. If equivalence prevails there is no scope for effective stabilizing fiscal policies. The empirical evidence provided so far shows a mixed response, both in favor and against. Since the REP requires a number of assumptions that might not be satisfied in developing countries, like Pakistan,

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and therefore, the REP might not hold. The overall results were indefinite and so rationalize the need for a deeper econometric analysis.

Many studies have focused on long run and short run relationship between budget deficit and current account deficit and to explore the way of causality. Most of these studies reveal evidence in favor of long run relationship between both deficits but show only a weak or no evidence in favor of short run relationship. Similarly, mixed results have been found regarding the direction of causality. In some studies the causality flows from budget deficit to current account deficit but in others a reverse causality is detected. Only very few studies reveal a bidirectional or no causality between the two variables. Developing countries like Pakistan also faced the problem of twin deficits and the causality between current account deficit and budget deficit needs to be checked properly.

The FH result of a high cross-section association between saving and investment rates in OECD countries has remained remarkably strong. The response of economists to the FH view regarding a high association between saving-investment and implicitly meaning low capital mobility across OECD countries is much discussed. The long-run investment-saving correlation follows directly and this does not depend on the degree of international capital mobility. Unless the budget constraint is removed, the time series of investment and saving show high cointegration. However, the debate over the point whether saving-investment co movements are indication of the degree of capital mobility is still unresolved.

The twin deficits issue is related both to the international capital mobility and to the F-H (1980) puzzle. The budget deficit and the current account deficit are expected to move together if savings and investments are not highly linked (perfect capital mobility). Hence, a twin deficit exists in the results of perfect capital mobility. In other words, the FH puzzle does not hold in non Ricardian economy. In this study we are trying to check the validity of Ricardian equivalence, twin deficit and Feldstein–Horioka puzzle for Pakistan's economy by using annual data from 1972-2008.

CHAPTER 3

THEORETICAL AND ANALYTICAL FRAMEWORK

This chapter presents the theoretical background and analytical framework for the Ricardian equivalence (RE) hypothesis, Twin deficits and Feldstein-Horioka puzzle.

3. 1   The Ricardian Equivalence Hypothesis

The Ricardian equivalence hypothesis, elaborated by Barro (1974), states that for a specified expenditure path, the substitution of debt for tax has no effect on aggregate demand and interest rates. The government's inter-temporal budget constraint implies that a tax cut at present means a tax increase in the future for the households. As government borrowing only postpones present taxation to the future, the prospective taxpayers/consumers fully anticipate this phenomenon. In other words, they do not consider the current tax relief and the resulting increase in disposable income to be meaningful. Consequently, the consumption path is also unaffected and the increase in disposable income is entirely saved (Marinheiro, 2007).

According to the Ricardian equivalence hypothesis, the consumers respond to the tax cuts by saving the enhancements in disposable income rather than increasing consumption expenditure. This increase in private saving may be used in

purchasing the newly issued government bonds thereby enabling the households to pay for the expected increased taxes in future out of the profits generated overtime from bonds/investment. Therefore, if private savings increase by the same proportion as does the budget deficit, the net national savings remain unaffected and this in turn leaves the interest rate unaltered. In the same line of reasoning, the current budget deficits financed through borrowing (rather than taxation) will have no effect on current account balance since the resultant increase in private saving will be sufficient to avoid the need for external borrowing (Marinheiro 2001).

When the agents are forward looking fully aware of the government's inter-temporal budget constraint, they will anticipate that tax cuts today or government resorting to borrowing will result in higher taxes being imposed on their future generation. Hence the agents are not likely to increase their present consumption based on increased disposable income. With the assumption of free access to credit market, the agents are likely to decide their consumption on the basis of permanent income which is not affected by the timing of taxes (Barro, 1974). This behavioral phenomenon is called Ricardian equivalence between taxes and debt.

3.1.1 Analytical Framework

The consequences of RE theorem may be put another way; a decrease in the government's saving (CAD) leads to an offsetting increase in desired private saving, thus there is no change in desired national saving.

According to Barro (1974, 1978), some theoretical assumptions are necessary for Ricardian equivalence to hold, given as under:

(a)   No borrowing constraints are faced by consumers as capital markets are perfectly competitive.

(b)   The same planning period applies to both private and public sectors.

(c)   All taxes are in the nature of lump sum. Future income flows and future tax burdens are certain.

(d)   The individuals fully anticipate the future tax liabilities that are implicit in the debt/bonds issue.

(e)   Economic agents are rational, forward-looking and planning over infinite horizon.

If the RE hypothesis is invalidated on the basis of the non-fulfillment of the very assumptions, then increasing government deficit financed by issuing bonds as a substitute for extra taxation will tend to increase private consumption owing to the wealth effect. This will be classified as investment or other interest-sensitive forms of private spending. In other words, termination of the RE theorem may imply crowding out of private expenditures. All these assumptions are very strong and restrictive for developing countries. However, the empirical evidence and results in favour or against the RE hypothesis provided so far are mixed[3] (Wroblowsky, 2003; Ghatak, 1996; Holden, 2003).

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[3] They have discussed very briefly about Ricardian Equivalence theorem and test this theorem for different developing countries.

The empirical literature on the RE hypothesis is vast and ever expanding. Most studies usually estimate reduced-form consumption functions or Euler equations. A simple specification is proposed by Perelman and Pestieau (1993). The authors estimate the following consumption function:

$$C_t = \alpha_0 + \alpha_1(Y_t - TX_t) + \alpha_2 BDEF_t + \alpha_3 W_t + \alpha_4 GB_t + \varepsilon_t \qquad (3.1)$$

In the above relation, C stands for consumption, Y-TX for disposable income, BDEF for the fiscal budget deficit, W for private wealth and GB for government debt. Holding public expenditure unaltered, the sum of both coefficients of disposable income and budget deficit gives the effect of a tax-for-deficit substitution on current consumption. Hence, the Ricardian equivalence hypothesis is interpreted as implying $\alpha_1 + \alpha_2 = 0$ and $\alpha_4 = 0$, the pure Keynesian view implies that $\alpha_2 = 0$[4].

The policy implications of the Ricardian hypothesis are very important but unpleasant for the governments. The present tax cuts and the resultant deficit financed by floating new bonds/raising debt may not increase private consumption as assumed/intended by the government. Thus, it may not be a useful fiscal instrument for stabilizing the economy.

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[4]Marinheiro (2008), if the results for the proxy of wealth are not reasonable, it would be possible to estimate the consumption function excluding wealth and debt from the list of independent variables.

3.2 The Issue of Twin deficits

Both the external and the budget deficits in United States increased extensively during the 1980's. This co-movement led several researchers to reach the conclusion that a major portion of the worsening in external balance was due to the emergence of record budget deficits. This mutual relationship is recognized as the twin deficits hypothesis. However, the causality of relationship between the two deficits is not always observed in any specific direction. As noted by Aqeel and Nishat (2000), the probability of the relationship between them increases significantly when the volumes of the two deficits are large.

The theoretical explanation for the said hypothesis based on the Mundell-Fleming open-economy model. According to this model (with the assumption of free capital mobility and under flexible exchange rate), an increase in the budget deficit (BDEF) puts an upward pressure on the rate of interest to attract foreign capital, which leads to an appreciation of the exchange rate and ultimately to a current account deficit (CAD).

The Keynesian school of thought views the budget deficit to have a considerable impact on the current account deficit. According to the simple Keynesians approach, an increase in the budget deficit will increase domestic absorption by import expansion thereby, causing a current account deficit. Some

researchers have examined the Keynesian proposition of twin deficits with reference to trade openness[5].

There is a significantly voluminous body of literature (e.g. Fleming, 1962; Mundell, 1963; Kearney and Monadjemi, 1990; among others) which suggests that government budget deficits may cause trade deficits all the way through different channels. However, four hypotheses are important, which concern the twin deficits phenomenon.

The first hypothesis is based on the preposition that constitutes a key ingredient of the twin-deficit hypothesis. According to Keynesian view , a tax cut lowers national saving by rising private disposable income and hence private consumption (an increase in imports) causing a worsening of the CAD.

The second hypothesis is presented by Barro (1974), often known as the Ricardian Equivalence Hypothesis (REH). According to this approach, any meaningful relationship between current account and budget deficit is refuted. As explained above, this hypothesis holds the view that substitution of debt for taxes has no effect on aggregate demand or on interest rates for a particular expenditure path. Consequently, a tax change would not change the external deficit but change the volume of budget deficit. This implies that the tax-financed expenditures do not affect private spending or national saving.

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[5] For instance, see the analysis of Saleh and Chowdhry (2007) in case of Sri Lanka.

The third hypothesis, known as 'current account targeting' due to Summers (1988), claims a reverse causality running from current account to budget deficit. This claim can be rationalized on the grounds that deterioration in current account leads to a slower rate of economic growth that in turn may lead to increases in the budget deficit. There is one another channel; an increase in current account deficit put a pressure on government to expand more and these government expenditures leads to an increase in budget deficit.

The fourth hypothesis suggests a possibility of a two-way causality between the two deficits. In other words, a budget deficit causes current account to deteriorate and vice versa[6] (Ali and Ilhan, 2008).

3.2.1 Analytical Framework

The analytical framework is based on the national income identity in the context of an open economy. The aggregate demand or expenditure on GDP is given below, where the symbols carry their usual meaning:

$$Y = C + I + G + (X - M) \qquad (3.2)$$

On the other hand, income is allocated for different purposes like consumption, saving, taxes and transfer payment, as shown below:

$$Y = C + S + T + R \qquad (3.3)$$

Equating the two sides, ignoring the transfers and rearranging the terms yields:

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[6] Acarvci *et al.*(2008) have discussed all four possible hypothesis related to correlation of budget deficit and current account deficit and have tested twin deficits phenomenon by using ARDL bound approach for Turkey.

$$(S-I)+(T-G)=(X-M) \;\rightarrow\; (I-S)+(G-T)=(M-X) \qquad (3.4)$$

The terms on the left hand side denote the domestic savings and investment imbalance (I-S) and the budget deficit (G-T), both of which join hands to determine the current account deficit (M-X). Any imbalance in the current account is attributable to either savings–investment gap and/or fiscal imbalance.

This relation implies that the current account balance is directly related to saving-investment gap and the tax-expenditure gap. National savings can be decomposed further into private (S_p) and government (S_g) savings

$$S = S_P + S_g \qquad (3.5)$$

where $S_P = Y - T - C$ and $S_g = T - G$

On necessary substitutions, equation (3.4) may be re-written as:

$$(X-M) = (S_P - I) + S_g \;\rightarrow\; CAD = IS_p + BD_g \qquad (3.6)$$

The government budget deficit (BD=G-T) and the private deficit (given by I-S or the investment-saving gap) are collectively reflected in the current account deficit (M-X). If private saving equals investment at the margin, then external account balance and public budget are directly interlinked. In other words, both the variables will move in the same direction and in the same proportion.

The assumption that a particular deficit is the explanatory variable for the other deficits does not seem to be reasonable since there is a two-way causality among the variables. The most important of them is the analysis of the relationship

between trade deficit and budget deficit, named as twin deficit (Saleh and Chowdhry, 2007; Alkhatib, 2000).

The empirical literature often suggests a log-linear functional specification of the relationship between the external and the fiscal balance.

It may be expressed in this simple form:

$$CAD_t = \alpha_0 + \alpha_1 \, BD_t + \varepsilon_t \qquad\qquad\qquad (3.9)$$

The symbols carry their usual meaning; CAD is the current account deficit and BD stands for budget deficit, where ε is the error term. The coefficient of budget deficit (beta) is expected to be positive, ranging between zero and unity.

The necessary condition for twin deficits to emerge is the absence of Ricardian equivalence and financial openness. Any findings of twin deficits must be interpret as an indirect sign of financial openness.

3.2.2 Issue of Twin deficits for Pakistan

As discussed in the introductory chapter, Pakistan constitutes an important case study for investigation of the dynamics of persistently high rates of deficits in fiscal budget and international trade. So far as the budget deficit is concerned, it remained around an average of nearly 6 percent of GDP during 1980's, where it reached the peak of 8.5 percent of GDP in 1987-88. The budget deficit fell to the lowest bound of 5 percent of GDP in 2000-01, but started rising again and remained somehow again around 5 percent of GDP in 2005-06. The trade deficits followed a trend of 5 percent of GDP during 1980's and its peak during the last decade was

7.17 percent in 1995-96. For 2005-06, the figure of trade deficit is reported as 6.6 percent of GDP[7].

. Like most developing countries, a steady budget deficit in Pakistan is the primary reason of all major ills of the economy. It has varied between 5.4 to 8.7 percent during last two decades. On the other hand the current account deficit varied between 2.7 to 7.2 percent during the same period. The growing fiscal deficit and deteriorating current account balance have been an important matter of concern for the nation and policy-makers.

The following tables reflect the severity of the twin deficit problem in Pakistan. During the fiscal year 2008-09, trade deficit was at highest level of Rs.1304.15 billions, which is 108% of total exports (Rs.1208.12 billion). Same is the case with overall fiscal deficit which stands at a level of Rs. 6834.00 billions.

Table 4.1 Trade Deficit and Budget Deficit as percentage of GDP

Year	Trade Deficit	Budget Deficit
1981-85	9.74	3.82
1986-90	5.78	4
1991-95	4.26	4.54
1995-00	3.64	4.44
2001-05	2.78	1.86
2006-09	10	5.8

Source: Pakistan Economics Survey (2008-09)

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[7] See Economic Survey (2005-06).

3.3 Twin Deficits and the Feldstein-Horioka puzzle

With perfect capital mobility worldwide, domestic saving is not necessarily related to domestic investment. However, there is strong empirical evidence that domestic investment and national saving are correlated. Much of the evidence is based on cross-section regressions of 16 OECD countries for the 1960–74 periods. This empirical finding is known as the Feldstein-Horioka (1980) puzzle. According to this puzzle, the relationship between national savings and domestic investment can be used as a measure of international capital mobility.

Under perfect mobility, the investment is not controlled by domestic saving but only by the accessibility of funds in the international fully integrated capital market. Saving in each country should react to the worldwide opportunities for investment while investment in that country should be financed by the international pool of funds. The important factor of concern for investors should be the rate of return. In a closed economy, domestic saving must finance investment but in case of open economy some of the investment may be financed by foreign saving. Therefore, saving and investment could move independently of each other. Alternatively, the high *I-S* correlation suggests that capital might not be fully mobile across borders. However, this implication stands in stark contrast with the deregulation of domestic capital markets and increased integration of world financial markets over the past 30 years (Levy 2004)[8].

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[8] See levy (2004) for further details.

3.3.1   Analytical framework for Twin Deficits and F-H puzzle

Feldstein and Horioka (1980) proposed an assessment of the degree of capital mobility by measuring the correlation between investments and saving. They estimated cross section regressions of the form:

$$(I/Y)_i = a + b\,(S/Y)_i + u_i \qquad\qquad (3.12)$$

In the above relation, I/Y is the ratio of gross domestic investment to gross national product (GNP) and S/Y is the ratio of national saving to GNP. For small countries, the value of slope parameter 'b' should be close to zero if the international capital mobility is perfect. In contrast, the parameter should be large if capital is immobile. Such relationships between national investment and saving shares of GDP, or their variants such as first differences have been essential for many countries. These are called *FH regressions* where 'b' is the *FH coefficient representing* the *saving-investment association*. The results for 16 OECD countries for the 1960–74 periods indicated a very high saving-investment association although the capital mobility is near to perfect. This cointegration exists under fixed exchange rate and this relation is an indictor of economic solvency (Rocha and Zerbini, 1998).

3.3.2   Importance of F-H puzzle

It is very critical to know the degree of capital mobility for financial decisions. Its importance can be seen in following perspectives:

1.   The effect of fiscal policy crucially depends on the extent of capital mobility.

2.   The cost of adjustment to external shocks gets reduced via the access of an economy to capital markets.

3.   Capital mobility determines the rate at which incomes converge to equilibria.

4.   Perfect mobility is often assumed to hold in macroeconomic models (Levy, 2004).

The twin deficit hypothesis has a clear link with the so-called F-H puzzle since the later is concerned with the source of financing the external (current account) deficit. The causality between external and fiscal balance also stresses the role of private investment. Therefore, gross capital formation denoted by Investment as share of GDP, is included into the relationship between the current account (*X-M*) and the fiscal balance (*T-G*),

$$X_t - M_t = \beta_1 + \beta_2(T_t - G_t) - \beta_3(I/Y)_t + u_t \qquad (3.13)$$

Here, the expected sign of the coefficient for fiscal balance is positive and that of investment is negative. It implies that the current account balance is worsened by budget deficit and high investment If an economy is perfectly integrated into the world market, then the coefficients of both the variables should equal to unity. In this case, the budgetary as well as investment expenditures are financed by the world financial market. However, it is shown in the study by Feldstein and Horioka (1980) that a large portion of domestic investment is still

financed from domestic sources (savings). This is demonstrated by the magnitude of the coefficient β_3, which is significantly lower than one.

The above result, generally referred to as the Feldstein–Horioka puzzle, has been widely confirmed by subsequent intensive research. Fidrmuc (2003) presented a regression model that encompasses both the twin deficit hypothesis and the Feldstein-Horioka puzzle. The model makes no difference between net exports and current account balance. Rearranging the macro identity, one obtains the relation:

$$X_t - M_t = Y_t - (C_t + G_t) - I_t = S_t - I_t \tag{3.4}$$

This identity implies that the trade balance must equal the difference between national savings (defined as output less total consumption) and investment (gross capital formation). It provides a link between the external balance and saving-investment decisions. Hence, an increase in investment has a negative impact on the external trade balance. On the other hand, policies that reduce (public or private) consumption are expected to have a positive impact on the external balance via increased national savings.

National savings can be subdivided into private (Sp) and public savings (Sg). The latter corresponds to the budget balance and given by the difference between tax revenues and government expenditures. Private savings are defined as the disposable income less private consumption. Thus the macro identity may be rewritten as under:

$$X_t - M_t = (Y_t - T_t - C_t) + (T_t - G_t) - I_t = S_{p,t} + S_{g,t} - I_t \tag{3.4}$$

This identity motivates the testing of a long run relationship among the current account, the budget deficit and total investment.

Following Fidrmuc (2003), we may specify the following regression model; with variables (in small caps) expressed as a share of GDP:

$$x_t - m_t = \beta_1 + \beta_2 (t_t - g_t) - \beta_3 \, inv_t + \varepsilon_t \qquad (3.14)$$

Keeping in view the identity, a positive coefficient is expected for private savings and the budget surplus (β_2, $\beta_3 > 0$), and a negative coefficient investment ($\beta_4 < 0$). Hence, both the budget deficit and high investment are expected to be translated into current account deficit. Moreover, the coefficients of both the variables should approach unity if a country is perfectly integrated into the world economy, implying that both the budget deficit and investment are financed through the world capital market. However, if the Feldstein-Horioka puzzle is there, the β_4 coefficient is significantly lower than unity. Likewise, a negative β_3 coefficient leads to the rejection of the twin deficit hypothesis.[9]

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[9] These specifications are used for Pakistani data and resemble those adopted by Marinheiro (2008) for analysis of Egypt data. Only the proxy variable of wealth is excluded from model.

CHAPTER 4

METHODOLOGY AND DATA

In this chapter, we discuss the methodology of research and the data used in the analysis with reference to Pakistan.

4.1 Econometric Methodology

In this study, we employ the unit root tests, Johansen co- integration technique and the Error Correction Model to attain our objectives. The main purpose of co-integration analysis is to verify the nature of long run relationship between a set of time series variables. However, it is essential to check each time-series for stationarity before starting the co-integration tests. In case the time-series at hand is non stationary, then the regression analysis carried out in the usual manner may produce spurious results. So the unit root tests are conducted first to examine this property of the time-series.

4.1.1 Unit root tests

A time-series variable is said to be stationary if it is time independent, in other words, if the mean, variance and covariance remain constant overtime:

    i. $E(y_t) =$ constant for all t.

    ii. $Var(y_t) =$ constant for all t.

    iii. $Cov(y_t, y_{t+k}) =$ constant for all t while $k \neq 0$

On the other hand, the time series is said to be non-stationary if its mean and variance are changing over time, implying the existence of unit root. To make the concept of stationarity clearer, let us suppose that the present value of a variable is related to the past according to the following relation:

$$X_t = \rho X_{t-1} + \varepsilon_t \tag{4.1}$$

$$X_t - X_{t-1} = \rho X_{t-1} - X_{t-1} + \varepsilon_t \tag{4.2}$$

$$\Delta X_t = \delta X_{t-1} + \varepsilon_t \tag{4.3}$$

where $\delta = \rho-1$ and ε_t is a white noise term

In practice, equation (4.3) is estimated to test the null hypothesis that $\delta=0$. If the coefficient 'δ' approaches zero implying $\rho=1$, the series has a unit root and it is non- stationary. If $\delta=0$, then equation (4.3) reduces to $\Delta X_t = \varepsilon_t$, which means that changes in the variable are exogenous /due to the error term (white noise or random walk). In contrast, if the null hypothesis is rejected, then the first difference of a random walk time-series is stationary.

A non-stationary time series can be converted into stationary time series by successive differencing. If the time series is differenced once with respect to time and the resultant series becomes stationary, then the series is said to be integrated of order one and denoted by I(1). Generalizing the rationale, if a non-stationary time series has to be differenced 'd' times to make it stationary, the concerned time series is said to be integrated of order 'd' or I(d).

The unit root test for stationarity has become widely popular over the past several years. There are several methods available for the unit root tests but the DF test, due to Dickey and Fuller (1979) is often used. If the error term ε_t is serially correlated, then this can be eliminated by modifying Equation 4.3. The new specification is known as the Augmented Dickey-Fuller (ADF) model, given as under:

$$\Delta X_t = \mu + \delta \; X_{t-1} + \beta_i \sum_{i=1}^{k} \Delta X_{t-i} + \varepsilon_t \tag{4.4}$$

In the above relation, $\delta = \rho-1$, and the null hypothesis to be tested is H_0: $\delta \geq 0$ against the alternative hypothesis is H_1: $\delta < 0$. After estimating the coefficient of X_{t-1}, its standard error is used to compute the τ-statistics (in parallel with the usual t-statistics). If the computed absolute value of the τ-statistics exceeds the MacKinnon absolute critical values, the null hypothesis is rejected in favor of the alternative hypothesis that the given time series is stationary. The process of differencing continues till the time series becomes stationary[10].

4.1.2 Co integration Analysis

If the variables of interest share a common stochastic trend, they are said to co-integrated in the long run (Christensen, Nielsen 200). The concept of co-integration was firstly introduced by Granger (1981) and further formalized by Engel and Granger (1987) by introducing a very simple method to check the existence of long run relationship between the variables. For quite some time, the

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[10] See Gujarati 3rd edition chap 21,p-718

EG procedure had been the state of the art methodology in testing the causality among the endogenous variables. Although the EG test is very simple and convenient to implement, yet it suffers from certain shortcomings as well. The test does not intimate as to which of the variable should be used as regressor and why. Another problem arises when more that two variables are used in the regression and obviously there are chances of more than one co-integration relationships. Thus the test may lead to contradictory results, especially when there are more than two I(1) variables under consideration (Pesaran and Pesaran, 1997). Therefore Johansen (1988; 1991) and Johansen and Juselius (1992) tests are employed in multivariate analysis. We discuss the Johansen co-integration procedure briefly:

Lets assume that we have three variables Y_t, X_t and W_t which can all be endogenous. Each time series variable has links with its past values. The variables can written in the matrix notation as $Z_t = [Y_t, X_t, W_t]$, where the vector may be expressed as:

$$Z_t = \alpha_0 + \alpha_1 Z_{t-1} + \alpha_2 Z_{t-2} + \ldots\ldots\ldots + \alpha_k Z_{t-k} + \mu_t \qquad (4.5)$$

Defining $\Delta = 1-L$, where L is the lag operator, the above can be formulated in a vector error correction model (VECM) as follows:

$$\Delta Z_t = \Pi_1 \Delta Z_{t-1} + \Pi_2 \Delta Z_{t-2} + \ldots\ldots\ldots + \Pi_k \Delta Z_{t-k-1} + \alpha_k Z_{t-k} + \mu_t$$
$$= \alpha_0 + \sum_{i=1}^{k-1} \Pi_i \Delta Z_{t-1} + \alpha_k Z_{t-k} + \mu_t \qquad (4.6)$$

where $\Pi_i = -(1 - \alpha_1 - \alpha_2 - \ldots\ldots\ldots - \alpha_k)$, $i = 1, 2, \ldots\ldots, k-1$

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The Π matrix is 3×3 due to the fact that we assume three variables in Z_t. The matrix contains the information regarding the long run relationships among the variables concerned. If the matrix has a full rank, all the elements in the vector Z are stationary. On the other hand, a zero rank indicates the absence of any co-integration and the model reduces to VAR in the first difference. In case the rank is positive but less than full, there exists co-integration. This can be summarized as under:

Case 1: when Π has a full rank(r =n), then the variables in Z_t are I (0).

Case 2: when the rank of Π is zero, then there are no co-integrating relationships.

Case 3: when Π has a reduced rank (r≤ n-1), then there are co-integrating relationships equal to the rank. In this case, there exist (px r) sub-matrices such that α will include the coefficients showing the speed of adjustment and β will be the matrix of long run coefficients.

To test whether there exists co-integration among the variables or otherwise, two methods (test statistics) are used that determine the rank of co-integration space, due to Johansen (1988) and Johansen and Juselius (1990). The procedures are based on the propositions about eigenvalues.

a.   This method tests the null hypothesis that rank of the matrix Π is 'r' against the alternative hypothesis that the rank is r+1. Thus, according to the null hypothesis, there are 'r' co-integrating vectors. The test statistics is based on the characteristic root (Eigenvalues).

To test how many of the numbers of the characteristics roots are significantly zero this test uses the following statistics:

$$\lambda_{max}\ (r, r+1) = -T \ln (1 - \lambda_{r+1})$$ (4.7)

The test statistic is based on the maximum eigenvalue (maximum eigenvalue statistic)

b.   The second method is based on a likelihood ratio test about the trace of the matrix (trace statistic). This statistic is considers whether the trace is increased by adding more eigenvalues beyond the rth eigenvalue. The null hypothesis in this case is that the number of cointgrating vectors is less than or equal to r. This statistic is calculated by:

$$\lambda_{trace}\ (r) = -T \sum_{i=r+1}^{n} \ln (1 - \lambda_{r+1})$$ (4.8)

The usual procedure is to work downwards and stop at the value of r which is associated with a test statistic that exceeds the displayed critical value.[11]

Another important aspect is to select the appropriate model regarding the deterministic components in the multivariate system. It means that whether an intercept and/or a trend should enter either the short run and long run model, or both models.

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[11] See Asterious Revised Edition 2006, chap 17, p 319-326.

4.1.3 The Short Run Analysis

The short run dynamics are examined using the Error Correction Model (ECM). It explains changes in the dependent variable in term of changes in the explanatory variables as well as deviations from the long run relationship between the variables and its determinants.

The ECM is important for many reasons. It is a convenient model which is formulated in terms of the first differences that eliminate trend from the variables and resolves the problem of spurious regression. The model follows from general to specific approach in econometric modeling which best fits the given data set. The co-integration of any two variables implies that there is some adjustment process which prevents the error term to enter in the long run relationship. Therefore, the concepts of co-integration and the error correction mechanism (ECM) are closely related.

The methodology followed in most of the studies involving time series variables is to see if the series concerned are stationary or otherwise. If the series is non-stationary, as is the usual case, then it is appropriate to test for co-integration between the variables. In case the co-integration is missing, the system simply reduces to a first difference model. However, if the variables are co-integrated over time, then an Error Correction Model (ECM) is appropriate. According to Engle and Granger (1987), the co-integrated variables have an ECM representation, which has the advantage of incorporating both the short-run and long run relationship between the variables in the same regression.

While studying the behavior of current account deficit (CAD) and the budget deficit (BDEF) overtime, we have to check if the twin deficits are co-integrated. To focus on the causality between the budget deficit (BDEF) and the current account deficit (CAD), it is possible to estimate the following Error Correction Model:

$$\Delta BDEF_t = \alpha_0 + \sum_{i=1}^{P} \alpha_{1,i} \Delta BDEF_{t-i} + \sum_{i=1}^{Q} \alpha_{2,i} \Delta CAD_{t-i} + \beta_1 ECM_{t-1} + \varepsilon_{1t} \qquad (4.9)$$

$$\Delta CAD_t = \delta_0 + \sum_{i=1}^{p} \delta_{1,i} BDEF_{t-i} + \sum_{i=1}^{q} \delta_{2,i} \Delta CAD_{t-i} + \beta_2 ECM_{t-1} + \varepsilon_{2t} \qquad (4.10)$$

The symbol Δ denotes the difference operator, α's and δ's are the short-term time-invariant coefficients, β's are the coefficients of the lagged error-correction terms derived from the long-run relationships. The ε's are serially uncorrelated white-noise (error) terms.

According to Kouassi (2004), the relevant testing hypotheses in Granger sense are:

- H1: BDEF does not cause CAD- if and only if $\delta_1 = 0$, for all i and $\beta_2 = 0$

- H2: CAD does not cause BDEF- if and only if $\alpha_2 = 0$, for all i and $\beta_1 = 0$

- H3: there is no feedback between CAD and BDEF if $\alpha_2 = \delta_1 = 0$, and $\beta_1 = \beta_2 = 0$.

And to check the validity of RE hypothesis and the validity of F-H puzzle in case of Pakistan. We have to test these model specifications whish have already been discussed in chapter 3 briefly.

$$C_t = \alpha_0 + \alpha_1(Y_t - TX_t) + \alpha_2 BDEF_t + \alpha_3 W_t + \alpha_4 GB_T + \varepsilon_t \qquad (3.1)$$

$$x_t - m_t = \beta_1 + \beta_2 (t_t - g_t) - \beta_3 \, inv_t + \varepsilon_t \qquad (3.14)$$

4.2   Data and Variables

Availability of adequate and reliable data is very important for consequential analysis. The validity of results depends on sufficient and consistent data. Problems in adequate data result into to conclusions that may be misleading. Therefore, data must be collected and checked properly before conducting empirical analysis. We have done our utmost effort for the collection of reliable and consistent data set for our research.

We have used annual data set of Pakistan for the period 1972-2008. This data set is retrieved from different data sources. Most of the data is collected from Federal Bureau of Statistic, Annual Reports of the State Bank and the Hand Book of Pakistan Economy. Data on some variables is collected Pakistan Economic Survey and Yearbook of International Financial Statistic (IFS) published by the IMF. The detail is given in the appendix.

4.2.1   Variable Description

After collecting the data from different sources, we have constructed some variables used in this study. The variables required for testing the Ricardian

Equivalence hypothesis include Consumption, Disposable Income, Budget Deficit and Public Debt. Likewise, the Budget Deficit and Current Account Deficit are used for checking the validity of Twin Deficit hypothesis. In addition, we need the variables like Budget Balance, Trade Balance and Investment to examine the Feldstein-Horioka puzzle. We discuss these variables briefly.

➢ **Private Consumption(C)**

Consumption expenditure may be private, public and the aggregate. However, we have taken only per capita household real consumption expenditure in our analysis. Real values are obtained from dividing the variable by Consumer Price Index.

➢ **Disposable Income (DI)**

It is the amount of national income which we get after deducting direct taxes. So, Disposable Income is the difference between national income and taxes $DI=Y-T$, where Y is national income and T is the income tax.

➢ **Budget Deficit (BDEF)**

Budget Deficit refers to the situation when government expenditures (development and current expenditure) exceed government revenues (tax and non tax revenue) for a particular year. The main source of government revenue is taxes. So BDEF is $T-G<0$, where T is taxes and G is government expenditures. We have used the absolute value of deficit as well as the ratio of BDEF to GDP in our analysis.

> ➤ **Government Debt (GB)**

Three imbalances, namely saving/investment gap, fiscal deficit and balance of payment deficit, lead to accumulation of debt problem overtime. Government debt occurs when expenditures exceeds revenue and gap filled by borrowings[12]. So it is an external debt which is faced by government of Pakistan. We take real value of Public Debt (expressed in dollars?).

> ➤ **Current Account Deficit (CAD)**

The Current Account Deficit has persisted due to large imports as compared to exports. It is a gap that occurs between external receipts and payments. So CAD is X-M<0. We have used its absolute value and the ratio with GDP in our analysis.

> ➤ **Investment (invt)**

Investment is the main factor leading to capital accumulation and growth. It determines the rate at which productive capacity of the economy enhances. Investment is denoted by the share of gross capital formation in GDP. Estimates of gross fixed capital formation in Pakistan are prepared separately, for private and public sector as well as by nature of the economic activity and by capital assets.

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[12] See Pakistan's Economic Journey 2006.

Appendix of Chapter 4

Table 4.2 Data Source (1972-2008)

Variables	Definition	Data source
Consumption(C)	Real Consumption at Household level	International Financial Statistics 2008
Disposable Income(DI)	Take Home Income: Income Net of direct taxes: Y-T	Federal Bureau of Statistics
Government debt (GB)	Amount of debt faced by Government of Pakistan	Annual reports of State Bank of Pakistan
Budget Deficit (BDEF)	Difference between revenues and expenditure of the Govt. Rev-Exp<0	Federal Bureau of Statistics
Current Account Deficit (CAD)	Difference in receipts and payments an economy with rest of the world X-M<0	Annual reports of State Bank of Pakistan
Investment (invt)	Gross fixed capital formation	International Financial Statistics 2008
Current Account Balance(CA)	X-M=0	Annual reports of State Bank of Pakistan
Budget Balance(BB)	G.Exp-Revenues=0	Federal Bureau of Statistics

Table-4.3: Consolidated Fiscal Position (Rs. million) – Historical trend.

Fiscal Year	Current Expend.	Develp. Expend.	Total Expend.	Tax Revenues	Total Revenues	Deficit (Overall)
1972-73	7096	385	7481	5659	7533	-52
1973-74	11039	686	11725	7946	11048	677
1974-75	11463	1594	16057	9496	12980	3077
1975-76	14230	2346	165756	9952	14971	1650
1976-77	16112	2433	18545	11613	17880	665
1977-78	20154	3239	23393	20041	21969	1424
1978-79	29852	19293	49145	23475	29862	19283
1979-80	34844	23744	58588	30722	37949	20639
1980-81	39216	21882	61098	36509	46349	14749
1981-82	43104	26980	70084	39934	51167	18917
1982-83	56185	32924	89109	44351	59080	30029
1983-84	68947	34886	103833	50644	72309	31524
1984-85	82533	37299	119832	52665	77971	41861
1985-86	96600	49253	145853	59568	91420	54433
1986-87	123614	36175	159789	65702	106324	53465
1987-88	147540	51147	198687	75893	106627	92060
1988-89	167093	47573	214666	91020	128581	86085
1989-90	165240	57179	222419	114004	153785	68634
1990-91	195676	65293	260970	129640	171777	89193
1991-92	230120	91354	321474	164308	231503	89971
1992-93	272457	76196	348653	178391	241128	107525
1993-94	293460	71453	364913	208410	272734	92179
1994-95	345941	82343	428284	257892	322932	105352
1995-96	423866	94233	518099	305580	380260	137839
1996-97	455411	85508	540919	324641	384331	156588
1997-98	529919	104095	634014	354754	429454	204560
1998-99	547279	100499	647778	390726	468601	179177
1999-00	642935	100697	743632	405824	536832	206800
2000-01	645700	72200	717900	441600	553000	180500
2001-02	700200	126050	826250	478100	624100	202150
2002-03	791700	106500	898200	555800	720800	177400
2003-04	775000	181000	956000	611000	794000	162000
2004-05	864500	252481	1116981	659410	900014	216967
2005-06	1034700	367200	1401900	803700	1076600	325300
2006-07	1375345	424623	1799968	889685	1297957	502011
2007-08	1857600	63110	1920700	1077782	1398900	521800

Source: Yasin (2008)- derived from Economic Surveys and Annual Reports of SBP- various issues.

Table-4.4: Current Account Balance ($ Million)- Historical trend.

Fiscal Year	Exports	Imports	Trade Balance
1972-73	639	662	-23
1973-74	804	790	14
1974-75	1026	1362	-336
1975-76	1039	2114	-1075
1976-77	1137	2067	-930
1977-78	1141	2325	-1184
1978-79	1311	2810	-1499
1979-80	1710	3676	-1966
1980-81	2365	4740	-2375
1981-82	2958	5408	-2450
1982-83	2489	5636	-3147
1983-84	2711	5364	-2653
1984-85	2769	5689	-2920
1985-86	2504	5919	-3415
1986-87	3073	5635	-2562
1987-88	3688	5380	-1692
1988-89	4457	6395	-1938
1989-90	4693	7069	-2376
1990-91	4965	6941	-1976
1991-92	6167	7631	-1464
1992-93	6912	9253	-2341
1993-94	6819	9963	-3144
1994-95	6813	8562	-1749
1995-96	8137	10394	-2257
1996-97	8707	11805	-3098
1997-98	8320	11894	-3574
1998-99	8628	10118	-1490
1999-00	7779	9432	-1653
2000-01	8569	10309	-1740
2001-02	9202	10729	-1527
2002-03	6135	10340	-1205
2003-04	11160	12220	-1060
2004-05	12313	15592	-3279
2005-06	14391	20598	-6207
2006-07	16451	28581	-12130
2007-08	16976	30540	-13564

Source: Yasin (2008)- Compiled from SBP Annual Reports.

Table-4.5: Components of Balance of payments (as percentage of GDP)

Year	Trade Deficit	Budget Deficit
1981	8.7	3.7
1982	10.3	5
1983	9.3	1.8
1984	9.4	3.2
1985	11	5.4
1986	8	3.9
1987	5.1	2.2
1988	5	4.4
1989	5.9	4.8
1990	4.9	4.7
1991	3.3	4.8
1992	4.8	2.8
1993	6.1	7.2
1994	3.4	3.8
1995	3.7	4.1
1996	4.9	7.2
1997	5.7	6.2
1998	2.4	3.1
1999	2.8	4.1
2000	2.4	1.6
2001	2.1	0.7
2002	1.7	1.9
2003	1.3	3.8
2004	3.3	1.3
2005	5.5	1.6
2006	9.5	4.5
2007	9.4	5.1
2008	12.6	8.5
2009	8.5	5.1

Source: Economics Survey of Pakistan 2008-09

CHAPTER 5

RESULTS AND ANALYSIS

As discussed in the previous chapter, we have adopted a three-step procedure in testing the three hypotheses under consideration. First we apply the Augmented Dickey Fuller (ADF) unit root test to check the stationarity and order of integration of different economic variables used in this study. Next we resort to the Johansen's Maximum Likehood procedure to test for the long run co-integration among the variables. Finally, the Error Correction Model is employed to see the causality between the crucial variables. In the following lines, we discuss the findings and analyze the relevant results.

5.1   Unit root tests

At the outset, we test for the staionarity of all the time series variables involved with all the three hypotheses of this study. The model used in all cases assumes the following general format:

$$\Delta \, y_t = \mu + \delta \, y_{t=1} + \sum_{i=1}^{k} \beta_i \Delta \, y_{t-i} + \varepsilon_t \qquad\qquad (5.1)$$

To tests for the validity of Ricardian equivalence, all variables are expressed in real per capita terms. Likewise, we have used the variables in level and also in term of their ratios to GDP for testing of the Twin Deficit Hypothesis and the F-H puzzle. We use the ADF model to check for the stationarity and the order of integration. The results are projected in Table 5.1 below.

Table 5.1: The ADF Test

Variable	Levels	First Difference	Conclusion
	ADF T-test	ADF T-test	I(1)
Level values			
External Debt	-1.73027	-7.703914*	I(1)
Budget deficit	-2.70288	-5.81575*	I(1)
Consumption	-1.55237	-4.97451*	I(1)
Disposable Income	-0.358871	-2.86985***	I(1)
GDP ratios			
Current Account deficit	-1.43423	-5.259725*	I(1)
Budget balance	-3.09269	-9.20222*	I(1)
Budget Deficit	-3.60052	-7.607254*	I(1)
Current Account balance	-2.97252	-4.71215*	I(1)
Investment	-0.66064	-3.59167**	I(1)

Note: the Mackinnon critical values of significance at the 1%, 5% and 10% are -3.69987, - 2.97626 and -2.62742 respectively. The superscripts *, **, *** show significance at 1%, 5% and 10% respectively.

It is evident from the test that the series have become stationary by taking the first difference, which implies the presence of unit roots in the original data. In other words, all the variables are non-stationary at level and stationary at first difference or they are integrated of same order I (1). This validates our propositions that the variables concerned are indeed co-integrated and a long run relationship holds among them. With this information at hand, we proceed further to examine the nature of long run and short run relationships among the variable.

5.2 The Ricardian Equivalence Hypothesis

As discussed earlier, the validity of Ricardian Equivalence hypothesis has rarely been tested in case of Pakistan. Therefore, further research is required to explore this hypothesis which has important implications in the area of public finance. After determining the stationarity properties and order of integration, the next step is to examine the long run relationships among the variables concerned. The multivariate co-integration method due to Johansen (1988) and Johansen & Juselius (1990) has been followed. We follow the specification proposed by Perelman and Pestieau (1993)[13] given by equation (3.1) and reproduced below with slight modification. In particular, we have incorporated external debt as an argument and excluded wealth from the analysis[14].

$$C_t = \alpha_0 + \alpha_1(Y_t - TX_t) + \alpha_2 BDEF_t + \alpha_3 GB_t + \varepsilon_t \tag{3.1}$$

$$C_t = 46.4936 - 0.0463(Y_t - TX_t) + 0.0009 BDEF_t + 1.0904 GB_t$$

In the above specification, the aggregate private consumption depends on disposable income of the households, the fiscal (budget deficit and the outstanding public debt.

The results of co-integration are shown in Table 5.2.

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[13] We have excluded the proxy variable of wealth that is not stationary at level as well at 1st and 2nd difference when we applied ADF unit root test.

[14] For detail, see Kazmi, 1992&1991.

Table 5.2 Johansen's Maximum Likelihood Test for Consumption function

Λ-Trace					*Λ –Max*			
Eigen-value	H_0	H_1	Trace	5% Critical Value	H_0	H_1	Max	5% Critical Value
0.61393	r≤0	r>0	62.9806	54.0790	r≤0	r>0	32.3590	28.5880
0.43404	r≤1	r>1	30.6215	35.1927	r≤1	r>1	19.3538	22.2996
0.16885	r≤2	r>2	11.2676	11.2676	r≤2	r>2	6.2882	15.8921
0.13623	r≤3	r>3	4.9793	4.9793	r≤3	r>3	4.9793	9.16454

Note: A single lag length is used in the VAR. Critical values for trace and maximum likelihood tests are due to Osterwald-Lenum (1992). The model was estimated by assuming only an intercept and no trend in the equation.

Looking at the empirical results, both the test statistics (trace and the maximum eigen-values) show that a single co-integrating vector exists at the 5% significance level. The long run results are obtained by imposing additional restrictions. Table 5.3 reports the results with two restrictions; due to different schools of thoughts regarding the consumption function (Ricardian and Keynesians):

Table 5.3 Vector with Restrictions on the Coefficients of Consumption function

Coefficient	*Y-TX*	*BDEF*	*GB*	*Restrictions*	*LR test*	*Conclusion*
Basic Model	-0.0463	0.0009	1.0904	-		
Recardian Restrictions	0.0007	-0.0007	0.0000	BDEF=(Y-TX), GB=0	10.7140 (0.0047)	Rejected
Keynesian restrictions	-0.0194	0.0000	0.1758	BDEF=0	0.1137 (0.7358)	Not rejected

Note: test results are shown in the last column, with p-value in parenthesis. BDEF is the Government budget deficit; Y-TX is disposable income; and, GB is government debt.

With regards to the findings shown above, the LR test rejects the Ricardian Equivalence restrictions: the hypothesis that BDEF=-(Y-TX), GB=0. In contrast, the restriction imposed due to Keynesian hypothesis (that budget deficit financed through borrowing has no significant impact on consumption behavior or (BDEF=0), is not rejected by the LR test in case of Pakistan's economy. This restriction presents the very high p-value.

Keeping in view these results, the validity of Ricardian Equivalence hypothesis cannot be favored in case of Pakistan. This implies that an increase in the deficit is not fully accommodated by an increase in private saving for a certain expenditure path. As a result, an increase in budget deficit is likely to motivate the need for external financing, which in turn leads to the twin deficit phenomenon.

The above results confirm the conclusions reached to by Kazmi (1991, 1992) in which case the Ricardian Equivalence hypothesis was rejected for Pakistan's economy. Our results are also in line with those obtained by Ghatak and Ghatak (1994) for India. The rationale is straight forward. Since both India and Pakistan are developing countries and have more or less similar structures, characteristics and behaviors of the economic agents.

5.3   The Twin Deficits Phenomenon

Next we examine the issue of twin deficits for Pakistan's economy. As both variables (current account deficit and the fiscal deficit) are integrated of the order I(1), the next step is to examine the long run relationship between the two variables. The results of Johansen's Maximum Likelihood test are reported in Table 5.4.

Table 5.4 Johansen's Maximum Likelihood Test for Twin Deficits

(both the budget deficit and current account deficit are expressed as %GDP)

Λ-Trace					*Λ-Max*			
Eigen-value	H_0	H_1	Trace	5% Critical Value	H_0	H_1	Max	5% Critical Value
0.37450	$r \leq 0$	$r > 0$	16.1252	12.3209	$r \leq 0$	$r > 0$	15.9529	11.2248
0.00505	$r \leq 1$	$r > 1$	0.17230	4.12990	$r \leq 1$	$r > 1$	0.17236	4.1299

Note: The lag length of one is used in the VAR. The critical values for trace and maximum likelihood tests are due to Osterwald-Lenum (1992). The estimation was obtained assuming only an intercept and no trend in the cointegration equation.

Keeping in view the above, the hypothesis of no co-integration is rejected by the trace and maximum eigen-value statistics at 5 % level. This suggests that there is long run relationship between both CAD and BDEF. The estimation was carried out by using one lag length. The estimated long run equation is given by:

$$CAD = 0.993 BDEF^{\,15} \qquad\qquad (5.3)$$

The above estimations suggest a positive correlation between the budget deficit and the current account balance in the long run. The results support the earlier findings of Kulkani and Erickson (1998), Aqeel and Nishat (2000), Mukhtar et al. (2007), Hakro, (2009) and Siddiqui (2009)[16]. All these studies have concluded that there has been a stable long run relationship between the twin deficits over the past two and half decades in Pakistan.

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[15] This long run relation has been estimated assuming no trend and no intercept

[16] They have used different econometric techniques for examining the relationship between the budget deficit and the current account deficit but found same results (twin deficits).

However these findings of positive correlation between the two variables do not indicate the direction of causality; whether it could be the BDEF that causes CAD or the other way around. We take up this question by estimating the Vector Error Correction Model (VECM). In particular, we employed the model given by equations 4.9 and 4.10, reproduced as under:

$$\Delta BDEF_t = \alpha_0 + \sum_{i=1}^{P} \alpha_{1,i} \Delta BDEF_{t-i} + \sum_{i=1}^{q} \alpha_{2,i} \Delta CAD_{t-i} + \beta_1 ECM_{t-1} + \varepsilon_{1t} \qquad (4.9)$$

$$\Delta CAD_t = \delta_0 + \sum_{i=1}^{p} \delta_{1,i} \Delta BDEF_{t-i} + \sum_{i=1}^{q} \delta_{2,i} \Delta CAD_{t-i} + \beta_2 ECM_{t-1} + \varepsilon_{2t} \qquad (4.10)$$

Both the variables are expressed as ratios to the GDP and the data corresponds for a fairly long period: 1972-2008. The results are reported in the Table 5.5 below.

Table 5.5 Causality between the Budget and Trade Deficits (%GDP)

Dependent		Regressors			R^2	F-tests	
	Constant	ΔBDEF-1	ΔCAD-1	ECM-1		BDEF	CAD
ΔBDEF	221.37	0.49	-0.40	-1.23	0.54		11.54
	(0.68)	(3.50)	(2.34)	(5.84)			[0.00003]
ΔCAD	71.45	0.04	-0.33	0.17	0.04	0.45	
	(0.20)	(0.37)	(0.55)	(0.26)		[0.72]	

Note: t-values are in parenthesis and [.] are the p-values.

The F-test results suggest a single unidirectional causality relationship operating from the current account deficit to the budget deficit. This result supports our earlier findings. The negative value of ECM is indicative of the long run convergence. The ECM estimate reveals that the disequilibrium in BDEF produced

by CAD would be adjusted. This implies that changes in current account deficit adjust to remove past period's deviations.

The Johansen and Juselius cointegration test is not informative relative to the stability of the parameters in the system. For stability test, we have also utilized the CUSUM and CUSUMSQ procedures (Brown, Durbin and Evans, 1975) to check for structural change in the budget and current account deficits. The CUSUM test is based on the cumulative recursive sum of recursive residuals. The CUSUMSQ test, on the hand, is based on the cumulative sum of squares of recursive residuals. Both the CUSUM and the CUSUMSQ procedures are updated recursively and are plotted against the break points. Parameter stability is indicated when the plots of the CUSUM and the CUSUMSQ stay within the 5 percent significance level. However, the parameters and hence the variance are unstable if the plots of the CUSUM and the CUSUMSQ move outside the 5 percent critical lines.[17]

The results of multivariate analysis are reported in Table5.6

Table 5.6 Granger Causality Test

DEPENDENT VARAIBLE	INDEPENDENT VARIABLE		
	ΔBD	ΔCAD	ECM
ΔBD	-	2.75 [0.08]	-1.23 (5.84)
ΔCAD	5.39 [0.01]	-	0.17 (0.26)

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[17] CUSUM and CUSUMQ plots for stability tests are given in appendix of this chapter. These tests are used to check the long run stability of the variable.

The null hypothesis that CAD does not cause BDEF is rejected. In contrast, the null hypothesis that the BDEF does not cause CAD is not rejected. This means that there is a one way causality that operates from CAD to BDEF, which is supports the earlier findings of Kulkarni and Erickson (1998), Mukhtar et al. (2007), Hakro (2009) and Siddiqui (2009).[18] Therefore, we conclude that: CAD → BDEF.

5.4   The Feldstein and Horioka Puzzle

Finally, we concentrate on exploration of the F-H puzzle with reference to Pakistan economy by following the model proposed by Fidrmuc (2003). The model tackles the twin deficit issue and Feldstien–Horioka puzzle simultaneously. To be specific, we are going to estimate the model as discussed earlier and given in equation 3.14, reproduced below:

$$x_t - m_t = \beta_1 + \beta_2 (t_t - g_t) - \beta_3 \, inv_t + \varepsilon_t \qquad (3.14)$$

Estimated results of Fidrmuc's (2003) model specification are given below:

$$x_t - m_t = -17496.1 + 0.921(t_t - g_t) + 223.02 invt_t$$

The TD hypothesis implies a positive coefficient for the budget balance. The empirical results also reveal a positive coefficient which leads to acceptance of the

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[18]   They have found a causality running from current account deficit to budget deficit. See Erickson(1998), Mukhtar et al., 2007; Hakro, 2009, for detail.

TD hypothesis. These results indicate no rejection of the TD hypothesis and rejection of F H puzzle for Pakistan. The coefficient of (invt) is not equal to one (unity) so this implies that there is perfect capital mobility which means that there is no F-H puzzle present in Pakistan.

The co-integration results are reported in Table 5.7.

Table 5.7 Johansen's Maximum Likelihood Test for Twin Deficits & F-H Puzzle
(The budget deficit, current account deficit and investment are expressed as %GDP)

Λ-Trace					*Λ- Max*			
Eigen-value	**H_0**	**H_1**	**Trace**	**5% Critical Value**	**H_0**	**H_1**	**Max**	**5% Critical Value**
0.4814	R≤0	r>0	35.36	35.19	R≤0	r>0	22.33	22.3
0.3015	R≤1	r>1	13.03	20.26	R≤1	r>1	12.2	15.89
0.024	R≤2	r>2	0.83	9.1614	R≤2	r>2	0.8271	9.16

Note: The lag length of one is used in the VAR. Critical values for trace and maximum likelihood tests are due to Osterwald-Lenum (1992). The estimation is carried by assuming only an intercept and no trend in the co-integration equation.

The above results reveal that the null hypothesis of no co-integration among the time series variables is rejected at 5% level of significance by the eigen-value max and trace statistics. The results speak of the existence of one co-integrating vector and confirm the long run relationship among trade balance, budget deficit and capital formation in the economy.

All in all, RE is not found to hold for Pakistan and there is strong evidence in favor of the existence of twin deficit hypothesis with causality runs from current account deficit to budget deficit. These results are similar to the early work on twin deficit in Pakistan. There is a large degree of capital mobility as FH puzzle does not hold in Pakistan. But Pakistan is not perfectly integrated into the world economy. Since increase in the government's net borrowing requirements could be financed by the external financing.
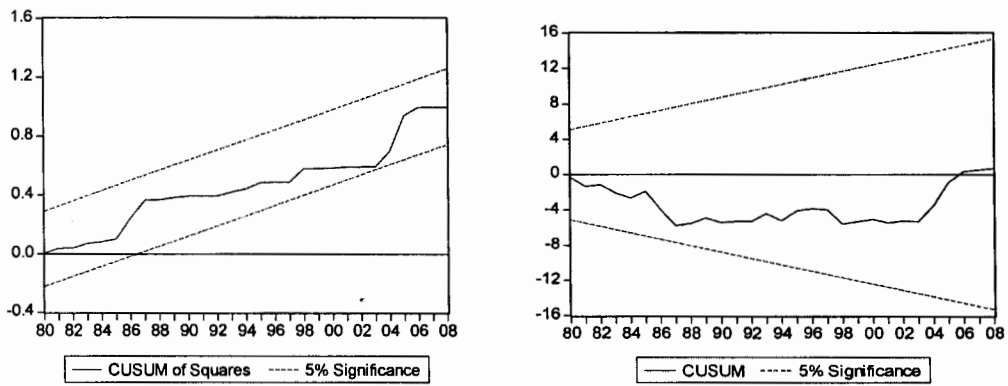
Appendix of Chapter 5

Figure 1 CUSUM and CUSUMQ Plots for stability Tests

Budget Deficit
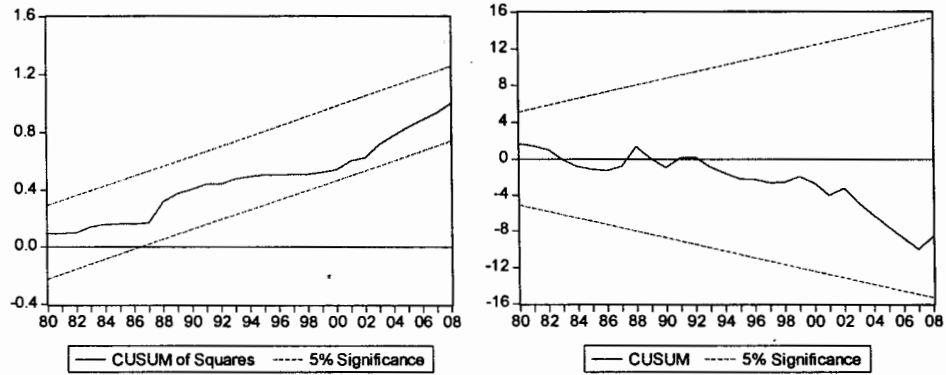
Current Account Deficit

CHAPTER 6

CONCLUSIONS AND POLICY IMPLICATIONS

6.1   SUMMARY

As discussed earlier, there is every rationale for an in-depth study of the dynamics of persistently high rates of deficits in fiscal budget and current account of the BOP of Pakistan. So far as the budget deficit is concerned, it has been varying around an average of nearly 6 to 8.5 percent of the GDP during past three decades from 1980-81 onwards. Likewise, the trade deficits have also followed a trend of 5 to 7 percent of GDP during the same period. Prior to 1970's, there used to be some surplus, although meager, on the revenue account of the budget. This could be diverted towards the capital budget and used for development purposes with further support of foreign aid. However, the things went on deteriorating thereafter and the efforts made by various governments to control the situation seem to be fruitless. For the past several years, the budgetary as well as the current account position of Pakistan has been constantly under pressure. Like most developing countries, a steady budget deficit is the primary reason of all major ills of the Pakistan economy. The country is heavily indebted and always looking outwards for assistance and relief. The growing twin deficits have been an important matter of concern for the nation and policy-makers.

The main objective of this study was to investigate the pros and cons of the twin deficits issue in the context of Pakistan economy and to explore its links with the Ricardian equivalence hypothesis and the Feldstein-Horioka puzzle simultaneously. For this purpose, we have used the annual data of Pakistan for a fairly long period from 1972-2008. The main variables used were the private Consumption and Investment, Disposable income, Government Debt, Budget Deficit, Current Account Deficit etc. We have applied the econometric techniques commonly used in time series analysis like the Unit Root tests, Johansen Co-integration method and the Error Correction Model. As pointed out in the introductory chapter, no such study exits that tackles the three phenomena in integrated manner and over the same scale of data frame. The findings of this endeavor are summarized as under.

6.2   CONCLUSIONS

➢   The estimated empirical results reveal no evidence in favor of the Ricardian equivalence hypothesis in Pakistan. However, this result should be taken with caution. The usual practice in vogue is that the governments resort to all the three sources of financing the budget deficits simultaneously, namely, taxation, internal and external borrowing as well as bank borrowing. In very rare cases, the governments have relied only on borrowing, that is to say, no increase in taxation. Further, the disposable incomes of the common masses are already at the subsistence level. The majority of the common masses don't see any relief in the budgets presented by the governments, year after year, and therefore least interested in statistical juggleries. Therefore, it is very difficult to bring evidence in favor of

the highly sophisticated Ricardian equivalence hypothesis in countries like Pakistan. Consequently, our results suggest that budget deficits have no impact on private consumption. People generally follow a particular path/pattern of expenditure and therefore the substitution of debt for taxes has little impact on the household's consumption level. This means that fiscal policy might be playing an effective role to stabilize the economy to some extent, which in turn leads to the validity of twin deficit hypothesis. The imposition of Keynesian restriction on consumption level is not rejected while imposition of the RE restriction is rejected for Pakistan.

➢ The estimated empirical results confirm the strong evidence in favor of long run relationship between the budget deficit and current account deficit for Pakistan. The Granger causality test points out to one way causation, that is, from current account deficit to the budget deficit. Again however, this result warrants caution. Economic theory suggests that an increase in budget deficit, with partial financing through borrowing, induces an upward pressure on the rate of interest rate. This invites an inflow of foreign capital in an environment of free mobility. The exchange rate appreciates due to higher demand for domestic currency, which in turn leads to a fall in exports and thereby to an increase in the current account deficit. However, the case of Pakistan, and majority of developing countries of the third word, is different. The twin deficits are surely inter-linked. However, the underlying rationale is not the movements of the interest rates. Pakistan has to borrow most often directly from the donor agencies to finance its development and defence needs. Only recently, the government has floated bonds in the international

markets to attract foreign capital. Further, the country is in practice of inviting direct foreign investment to carry out heavy development projects in the public sector. All these factors, along with population pressure and consumption demand, have led to an ever increasing demand for imports. On the other hand, the exports of Pakistan are low and more or less stagnant because of structural problems rather than variations in the exchanges rates. In fact, the Pakistani currency is constantly depreciating since 1970's in the international market but exports are not increasing due to several restrictions and non-access to the markets concerned. Naturally, the country is facing a persistent deficit on the current account of the balance of payments.

➢   The empirical results of this study show no evidence in favor of the Feldstein-Horioka puzzle for Pakistan. This is because our economy is not perfectly integrated into the world economy. Moreover the degree of international capital mobility has never been perfect. Despite these factors, the domestic investment in Pakistan (particularly in the public sector) has never depended on domestic saving or internal borrowing only. Foreign assistance has always played an important role in financing the national development programs. Thus the historical relationship between domestic investment and saving is very poor in Pakistan. As such, the empirical results do support the validity of twin deficit hypothesis but reject the F-H puzzle in case of Pakistan.

Keeping in view the above discussion, it can be concluded that Pakistan is a non Ricardian economy and has no scope for the F-H puzzle to prevail. Despite the fact that capital mobility is not perfect and that the economy of Pakistan is not

perfectly integrated into the world capital market, yet there is a strong link between the budget and current account deficits. The increasing development and defence needs of the country and inefficient taxation structure have constantly resulted into budget deficits over time. In the second round, the budget deficits along with structural problems in the export sector have joined hands in shaping the current accounts with persistent deficits year after year. It is beyond the scope of this study to explore the structural problems referred to above and/or to suggest specific remedial measures to solve the issues under reference.

6.3 POLICY IMPLICATIONS

The key policy implications in terms of the twin deficit problem that can be derived from this study are discussed briefly:

➤ The usual policy option suggested for correction of the current account deficit is the devaluation of national currency. This option has been applied time and again in the past but in vein. It has brought little good but high cost for the nation in terms of inflation. The only solution lies there in structural reformation of the export sector as well as strict control on luxurious import. There is dire need to render our exports more competitive in the international markets. However, even these efforts shall not be successful unless the West opens its borders and allow our exports an access to penetrate in the relevant markets. However, this is more a political matter and the government should emphasize on this point.

➤ The twin deficits in case Pakistan are closely interlinked. The budget deficit is one of the major determinants of the current account deficit. Therefore, every

effort should be made to contain the evil of budget deficit at source. We should find ways and means to increase the revenues and increase the scope of direct taxation. Likewise, there is dire need to reduce the un-necessary current expenditure, failing which the nation is likely to default in the near future. After all, for how long it is possible to get foreign assistance. This trend of borrowing has to be put to an end some how and there is no alternative. So the authorities ought to pay more attention to export promotion and budget balancing policies. However, only a stable, democratic and serious government can formulate adequate fiscal and monetary policies and implement these policies efficiently. Political and Economic stability are the twin engines essential for a successful flight of the plane of government.

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