

Financial Integration in South Asia; an Application of Feldstein Horioka Puzzle

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ABSTRACT

In this thesis, panel data is used to investigate the degree of financial integration of selected South Asian countries from 1981 to 2009 using the Feldstein–Horioka (1980) approach.

International macroeconomics is considered to be the economics of puzzles. There has been a range of 5 to 15 puzzles so far categorized in international macroeconomics. Feldstein Horioka is the most significant puzzle which looks into the savings and investment relationship and the issue of capital mobility. This study estimates Feldstein–Horioka equations by using the panel unit root and panel cointegration techniques. Investment and savings rates are found to be non stationary at level while stationary at first difference and to be cointegrated in panels.

In case of perfect capital mobility, people should be able to invest in those countries where the rates of returns are higher resulting in no relationship between domestic savings and investment. So the long run relationship between domestic savings and investments interpreted as an indicator of capital immobility and segmented capital markets in South Asian Countries. The findings of the study indicates that the Feldstein-Horioka puzzle remains a puzzle for South Asian countries and the vigorous result of positive saving–investment correlations has continued the debate on the subject of the degree of financial integration.

Acknowledgements

All the glories and praises to the Almighty Allah, who is the Lord of the universe, the most Benevolent, the most Courteous, the ever Merciful and the most Compassionate.

It is of utmost pleasure and honor for me to put forward, the bundle of sincere thanks to Prof. Xiang Lin (PhD Economics), who has been thoroughly helpful and assisted me via his keen attention, vivid vision, humble guidance and wonderfully professional attitude of optimum evaluation and betterment in my whole research work, which made me enabled to present my ideas in an invulnerable way. This research work would definitely not have been possible without his sheer guidance and assistance.

I would surely like to thank my mother for her priceless emotional support throughout my master session and her sincere advices, sweet prayers and emotional backups whenever I was fed up, absolutely kept me steadfast and enabled me to accomplish my dream in a honorable way. I would also love to mention about my sister and brothers, who has been thoroughly keen enough to my studies and always stood by with me.

Last but not the least; it is not at all possible to forget Ms Samia Rafiq, who has been absolutely the most significant pillar in this whole process. Words absolutely fell short while counting her paramount efforts in helping me from all the angles of the essay.

Salman Riaz

TABLE OF CONTENTS

CHAPTER 1: INTRODUCTION

| | |
|-------------------------------|----|
| Introduction | 09 |
| 1.1 Feldstein Horioka Puzzle | 11 |
| 1.2 Problem statement | 14 |
| 1.3 Objectives and aims | 15 |
| 1.4 Importance of the study | 15 |
| 1.5 Methodology | 16 |
| 1.5.1 Data collection | 16 |
| 1.5.2 Hypothesis | 16 |
| 1.6 Organization of the study | 17 |

CHAPTER 2: LITERATURE REVIEW

| | |
|--|----|
| 2.1 Introduction | 19 |
| 2.2 Literature Review | 19 |
| 2.2.1 Brief Review of Other Researches | 19 |
| 2.2.2 Cross sectional Approach | 20 |
| 2.2.3 Times series Approach | 26 |
| 2.2.4 Survey of the studies on the basis of econometric approach | 28 |
| 2.2.5 Panel data Approach | 33 |

CHAPTER 3: FINANCIAL INTEGRATION

| | |
|---|----|
| 3.1 Introduction | 37 |
| 3.2 What is financial integration | 39 |
| 3.2.1 Features of financial integration | 40 |
| 3.2.2 Characteristics of potential market participants | 41 |
| 3.2.3 Positive & negative aspects of financial integration | 41 |
| 3.3 Some macroeconomic variables for selected South Asian countries | 42 |
| 3.4 Countries | 48 |
| 3.4.1 Bangladesh | 48 |
| 3.4.2 India | 50 |
| 3.4.3 Nepal | 51 |
| 3.4.4 Pakistan | 53 |
| 3.4.5 Sri Lanka | 54 |

CHAPTER 4: THEORETICAL FRAMEWORK

| | |
|--|----|
| 4.1 Theoretical Framework Analysis | 57 |
| 4.1.1 The Feldstein–Horioka paradox | 57 |
| 4.1.2 Panel estimation | 58 |
| 4.1.3 Quintessence | 59 |
| 4.2 Data description | 59 |
| 4.2.1 Definition of developing economies | 60 |
| 4.2.2 Definition of variable | 60 |

CHAPTER 5: METHODOLOGY & EMPIRICAL RESULTS

| | |
|--|----|
| 5.1 Panel data model | 62 |
| 5.2 Advantages of using panel data | 63 |
| 5.3 Panel Unit Root Tests | 64 |
| 5.3.1 Levin, Lin and Chu (LLC) Test (2002) | 65 |

Financial Integration in South Asia: an application of Feldstein-Horioka Puzzle

| | |
|---|----|
| 5.3.2 Im, Pesaran and Shin (IPS) Test (2003) | 66 |
| 5.3.3 The Fisher's type test: Maddala and Wu (1999) and Choi (2001) | 68 |
| 5.3.4 Hadri (2000) test | 69 |
| 5.4 Comparison of unit root tests | 71 |
| 5.5 Panel cointegration tests | 73 |
| 5.5.1 Residual-Based Cointegration Tests | 73 |
| 5.5.2 Johansen Fisher Panel Cointegration Test | 79 |

CHAPTER 6: CONCLUSION

| | |
|-----------------|----|
| 6.1 Conclusion | 81 |
| 6.2 Suggestions | 82 |

| | |
|--------------------------|----|
| <u>REFERENCES</u> | 83 |
|--------------------------|----|

LIST OF TABLES

CHAPTER 1

| | |
|---|----|
| Table 1.1: The Different Ways of Converting Savings into Investment | 12 |
|---|----|

CHAPTER 2

| | |
|---|----|
| Table 2.1: Survey of the Studies on the basis of econometric approach (Cross section vs. time series analysis) | 29 |
|---|----|

CHAPTER 3

| | |
|---|----|
| Table 3.1: Comparison of macroeconomic variables for selected South Asian countries | 42 |
| Table 3.2: Net flows on external debt, long-term (NFL, current US\$), millions | 46 |
| Table 3.3: Net flows on external debt, short-term (NFL, current US\$), millions | 46 |
| Table 3.4: Net flows on external debt, total (NFL, current US\$), millions | 47 |
| Table 3.5: Workers' remittances, receipts (BoP, current US\$) | 47 |
| Table 3.6: Foreign direct investment, net (BoP, current US\$) | 48 |
| Table 3.7: Comparative Analysis of WR, NRF and FDI among South Asian Countries in 1970s, 1980s and 1990s respectively | 55 |

CHAPTER 4

| | |
|-----------------------------------|----|
| Table 4.1 categories of countries | 60 |
|-----------------------------------|----|

| | |
|---|----|
| Table 4.2 Investment and saving rates (% of GDP). Average on the period 1981–2009 | 61 |
|---|----|

CHAPTER 5

| | |
|--|----|
| Table 5.1: Unit root tests (Null & alternative hypothesis) | 64 |
| Table 5.2: The result of Levin, Lin and Chu (2002) test | 66 |
| Table 5.3: The result of Im, Pesaran and Shin | 67 |
| Table 5.4: The result of ADF Fisher Unit Root | 68 |
| Table 5.5: The result of PP Fisher Unit Root | 69 |
| Table 5.6: The result of Hadri test | 70 |
| Table 5.7: The result of Kao Residual Cointegration Test | 74 |
| Table 5.8: The result of Pedroni Residual Cointegration Test | 76 |
| Table 5.9: Properties of Residual-based Cointegration Tests | 78 |
| Table 5.10: Comparison of Residual-based Cointegration Tests | 79 |
| Table 5.11: The result of Johansen Fisher Panel Cointegration Test | 80 |

CHAPTER 1

Introduction

“With perfect capital mobility, an increase in the saving rate in country i would cause an increase in investment in all countries; the distribution of the incremental capital among countries would vary positively with each country’s initial capital stock and inversely with the elasticity of the country’s marginal product of capital schedule” (1980, p.318)

Feldstein Horioka (1980)

Financial integration is essential in both developed and developing economies as high capital mobility implies that saving-investment gap does not create a constraint to economic growth. Financial integration has significantly increased in recent decades. In the beginning, it manifested itself in growing capital flows between developed countries while in response to the elimination of capital controls, financial innovation and technological progress, financial integration has subsequently spread to emerging market economies. Conventionally, there has been various ways to measure the degree of financial integration for countries, but there has always been disparity among the methods, by which the financial integration is to be measured for various group of countries. Different methods match with different countries. A method to measure financial integration for a developed country like Norway might not be the suitable or viable for a country like Nepal. In broad terms, the degree of financial integration can be assessed in a number of ways, among which following are worth to be mentioned briefly:

- Covered and uncovered interest parity conditions
- Real interest parity (RIP)
- Saving and investment correlation technique

Financial Integration in South Asia: an application of Feldstein-Horioka Puzzle

The covered and uncovered interest rate parity conditions relate the price of foreign and domestic financial assets. In equilibrium both conditions hypothesize that the rate of return to these assets will be equalized across countries. Both parity conditions assume that sufficient funds are available for transactions, transaction costs are negligible, and there is free movement of capital. Uncovered interest rate parity makes the additional, rather strong assumption, that investors are risk neutral. The main difference between the two is that covered interest parity contains no risk as it requires the existence and accessibility of forward markets. Minimal empirical evidence exists in support of the parity conditions. The covered and uncovered interest parity conditions are used for the comparison between countries.

The weight of Asia in world trade has been increasing for many years but the overall trade and portfolio capital flows among South Asian countries are quite negligible. Furthermore, these conditions require data on offshore financial assets denominated in domestic currency or data on forward exchange rate. Most of the developing countries including South Asia nations do not have these effective markets. The governments often regulate domestic interest rate and data on market interest rate (kerb ate) are often not available.

The failure of RIP is also highlighted by Lemmen and Eijffinger (1995). RIP requires not only perfect capital mobility but also the integration of goods markets and efficiency of exchange markets.

Understanding the saving-investment link is important for two reasons. First, it may hold the key to the positive correlation between saving and growth and second, Keynes' well-known **“paradox of thrift”** according to which, an ex-ante increase in saving may lead via multiplier to an ex-post decline in real output, investment and saving itself insists that policies to encourage savings by raising investment and growth might in fact prove to be futile. Nevertheless, in closed economy, national savings and domestic investment must be identical ex post but in an open economy that facilitates unrestricted capital mobility between countries, capital will flow where it may yield the highest return from. An increase in saving would be reflected in current account rather than in higher domestic investment and growth.

So it is appropriate to use the saving investment correlation technique to estimate the degree of financial market integration.

1.1 Feldstein Horioka Puzzle

The FH (Feldstein Horioka) puzzle—which Obstfeld and Rogoff (2000) identify as one of the six major puzzles (home bias in trade puzzle, the equity home bias puzzle, the consumption correlations puzzle, the purchasing power and exchange rate disconnect puzzle, and the Baxter-Stockman neutrality of exchange rate regime puzzle) in international macroeconomics. International macroeconomics is a field full of “puzzles”, the perplexing stylized facts that are inconsistent with theories. The number of puzzles may range from 5 to 15 depending on author. However, no matter what list is being looked at, the Feldstein-Horioka puzzle must certainly be included in there. This puzzle looks at savings and investment relationship and the issue of capital mobility.

Prior to 1980, international macroeconomics had suffered from the lack of proper yardstick to test for the perfect capital mobility hypothesis. All price measures such as the purchasing power parity and the uncovered interest parity, which seem to be sensible theoretically, have repeatedly failed in empirical studies. In their seminal paper, Martin Feldstein and Charles Horioka (1980) introduced a new measure of financial integration, based on a quantity criterion. They devised a simple model based on the goods market equilibrium condition in an attempt to explain the degree of capital mobility. They argue that if the capital is perfectly mobile, people should be able to invest in countries where the rates of returns are higher. As a result, there should be no relationship between domestic savings and investment. Numerous studies have attempted to tackle the FH puzzle. While they question whether the estimated saving-investment correlations are informative about international capital mobility, no one has challenged the stylized fact of a high savings-investment correlation.

Conditions

According to Frankel (1986), three conditions are essential if this assumption (no correlation between a country's saving rates and its investment rates) is to hold.

Financial Integration in South Asia: an application of Feldstein-Horioka Puzzle

- Investment should depend merely on the national rate of return.
- The domestic real rate of return of a country must be equal to the world real rate of return.
- The world rate of return is exogenous (independent of a specific country).

There are different methods of converting savings into investment that are gathered in table 1.1.

Table 1.1: The Different Ways of Converting Savings into Investment

| | | Are Savings converted into Physical Investment ¹ ? | |
|---|-----|--|---|
| | | Yes | No |
| Are the Savings converted into Investment abroad? | Yes | Foreign direct investment is carried out (maybe requiring acquisition of capital goods from abroad) | International bonds are acquired or international deposits are made |
| | No | National direct investment is carried out (maybe requiring the acquisition of capital goods from abroad) | National bonds are acquired or national deposits are made |

Source: Susanne Lapp (1996)

Table 1.1 explains with the reference of Physical Investment.

¹Capital can be referred by two forms of capital (Physical Capital & Financial Capital). This scheme is based on the design given by Sinn (1992).

Financial Integration in South Asia: an application of Feldstein-Horioka Puzzle

Susanne Lapp (1996) described the notion of Feldstein-Horioka as “Savings and investment will only be uncorrelated if savings at home can be turned unhindered into investment either at home or abroad and that savings abroad can be converted unhindered into investment either abroad or at home”.

The Feldstein-Horioka (henceforth FH) puzzle is one of the most robust empirical regularities in international finance. In their seminal article, Feldstein and Horioka (1980) present evidence of a high correlation between domestic saving and domestic investment rates for 16 OECD economies (1960-74). They interpreted this high correlation as implying segmented capital markets or low capital mobility. This vigorous result of positive saving–investment correlations has initiated a debate on the subject of the degree of financial integration. Global financial integration has significantly increased in recent decades. In the beginning, it manifested itself in growing capital flows between developed countries while in response to the elimination of capital controls, financial innovation and technological progress, financial integration has subsequently spread to emerging market countries.

In a closed economy, private investment can only be financed by domestic savings which subsequently resulting in correlation of investment and saving. While in an open economy, total investment becomes an aggregation of domestic investments as well as foreign direct investments. Therefore, in an open economy, national saving and investment may in principle diverge and move independently of each other. So the interpretation of Feldstein and Horioka (1980) about investment-saving comovement has been very controversial and a significant number of studies disagree with it as it is in contrast with the general deregulation of capital markets and increased integration of world financial markets.

Financial integration is essential in both developed and developing economies as high capital mobility implies that saving-investment gap does not create a constraint to economic growth. Capital inflows offer more scope for the home country to diversify risk and ensure high rate of investment. Cohen (1996, pp. 274–5) categorize the evolution of international financial integration into four types.

Financial Integration in South Asia: an application of Feldstein-Horioka Puzzle

- Technological innovation, including resulting increases in market competition;
- Policy competition among governments seeking to advance “state interest,” somehow defined;
- Domestic politics, including partisan rivalry and interest-group lobbying;
- Ideology and advances in economic knowledge.

Financial crisis of 2007 is deemed to be considered the worst ever financial crisis since the great depressions of 1930s. Financial integration has been considered as one of the triggering source of this financial crisis which evolved from the most developed economies like USA and rushed towards the developing and emerging economies. This was financial integration, which incorporated the impacts that started by liquidity shortfalls of the banking systems of USA and acted as the most triggering force, which in result disseminated the catastrophic collapses of the financial institutions, the bailout of banks by national governments, and downturns in the stock markets around the world. The increased financial integration resultantly impacted on the Asian Economies in an adverse way, which can be observed by the economic indicators figures of the South Asian Economies.

1.2 Problem Statement

The economic arguments are based on historical circumstances that influence capital mobility (Flandreau & Riviere, 1999; Obstfeld & Taylor, 2002). Therefore, financial integration can be high or low according to the precise periods and to the process of financial liberalization (Guillaumin, Cyriac). In South Asian countries the evolution of financial integration can be explained by financial liberalization of these economies in the 1980s and 1990s. It is well recognized that the capital account liberalization policies and progress in telecommunications and information technology have increased capital movement across countries in Asia.

So the research problem can be defined as “to investigate the degree of financial integration of South Asian countries from 1981 to 2009 using the Feldstein–Horioka (1980) approach but with the panel data econometric tools”.

1.3 Objectives and Aims

- To check the degree of financial integration of South Asian countries by Feldstein-Horioka (1980) approach.
- To develop a better understanding for the gross domestic saving and investment relationship.
- To review previous studies of Feldstein-Horioka Paradox so as to generate the empirical models to analyze the financial integration in South Asian countries during the years 1981-2009.
- To estimate the empirical models by employing appropriate econometric approach.

1.4 Importance of the study

This literature review has made significant contributions in understanding of the saving and investment relationship. But the present study is important due to following reasons.

- It is clear that the literature lacks satisfactory studies on financial integration in South Asian countries.
- The literature is silent about a study on this relationship that takes into account the period of recent global financial crisis.
- The inclusion of the period of recent global financial crisis may provide an ideal testing ground for further analysis on the relationship between gross domestic saving and investment.
- This paper is an effort to augment the literature by revisiting the gross domestic savings and investment relationship.

1.5 Methodology

1.5.1 Data collection

Quantitative approach has been applied during this study for the analysis of financial integration in South Asia for the period of 1981-2009. During this study, secondary data is used from World Development Indicators of the World Bank at an annual frequency.

1.5.2 Hypothesis

The research intends to test the following hypotheses to check that whether Investment and gross domestic savings are cointegrated or otherwise.

1. H_0 = Domestic savings and investments are not cointegrated in South Asian Countries.

H_1 = Domestic saving and investments are cointegrated in South Asian Countries.

2. H_0 = Feldstein Horioka Puzzle does not hold for South Asian countries.

H_1 = Feldstein Horioka Puzzle holds for South Asian countries.

With the intention of testing the hypotheses, following tests will be employed.

• Panel Cointegration Tests:

Cointegration is the optimum best technique so far for the evaluation of Feldstein Horioka Puzzle. Coakley et al. (1996) describe that cointegration relationship in cross section is not an accurate measure of the degree of financial integration. So to resolve this problem, time series and panel data econometric techniques are used while some of the researches try to mix these two approaches (Banerjee & Zanghieri, 2003).

In this study, three panel cointegration tests are used to check the presence of a long term relationship between the saving and investment rates.

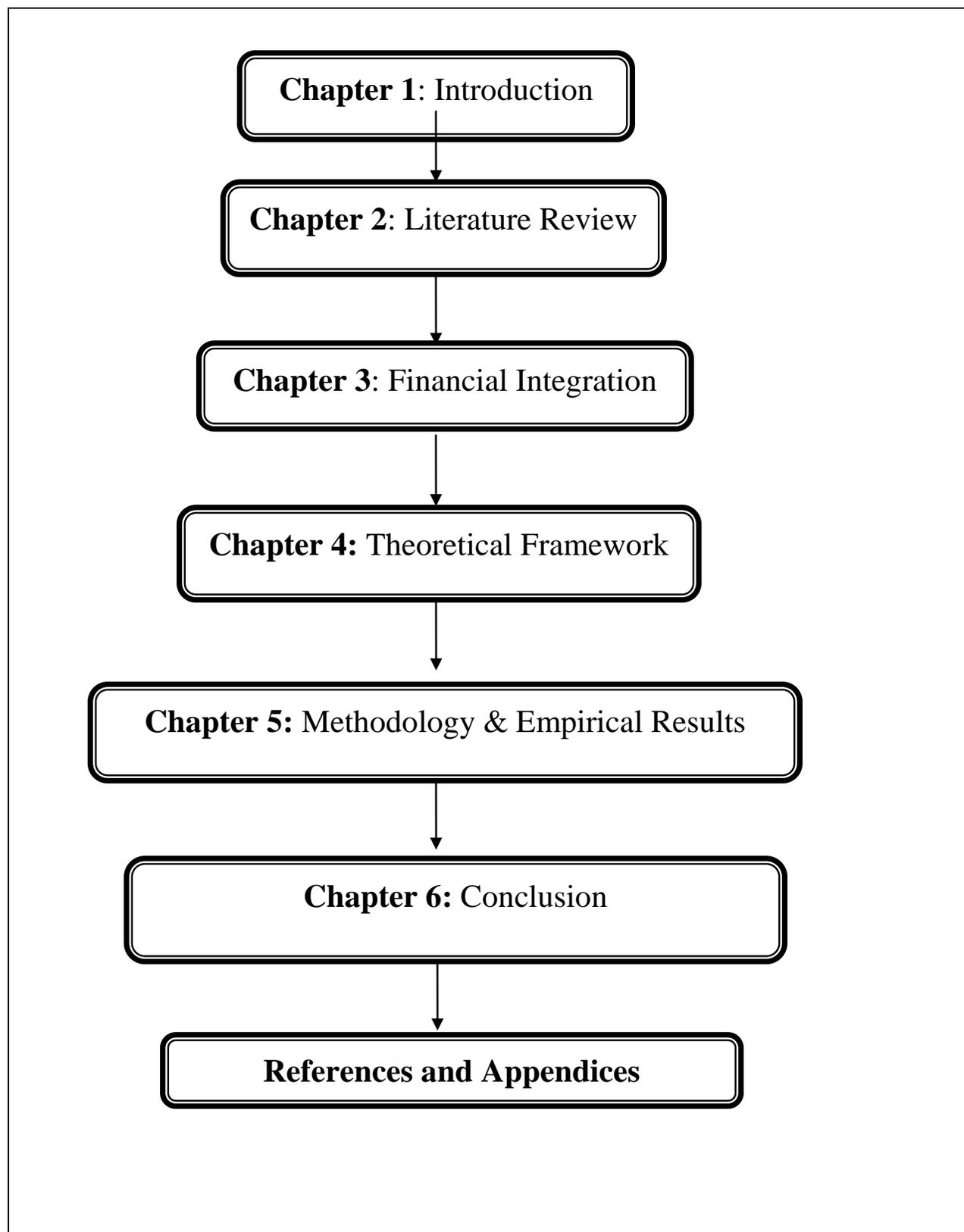
- The Kao Test
- The Pedroni Tests
- The Johansen Fisher Panel Cointegration Test

- **First Generation Panel Unit Root Tests:**

Four first generation panel unit root tests are used in this research. All tests will be based on the Augmented Dickey Fuller regressions.

1.6 Organization of the study

The organization of the study follows as; first, introduction will be presented in chapter 1 then it will present the literature review in chapter 2 that critically reviews the empirical literature on financial integration and Feldstein-Horioka Puzzle, followed by financial integration and countries analysis in chapter 3 that will describe the characteristics of countries while chapter 4 will explain the theoretical frame work of variables being used which are domestic investment and savings as percentage of GDP. The Chapter 5 describes the complete research design and methodology for econometric analysis with the detail of results and findings of econometric estimations. While, Chapter 6 concludes the study, presents the summary of findings and also suggestions for further study.



CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The literature review enables the researcher to be familiar with the dilemma and to choose appropriate framework for empirical analysis. This chapter is dedicated to investigate the earlier studies by looking at its history and assessing the theoretical and empirical literature.

2.2 Literature review

2.2.1 Brief Review of Other Researches

The original work of Feldstein and Horioka (1980) has sparked off a large, extensive and growing body of literature and debate of intense phenomenon, even though it contradicts with the general consensus of increased or increasing international capital mobility especially among developed countries. The volume of literature on how Feldstein Horioka became in to the category of an enigma, has rapidly grown and now there exists the abundance of relevant work and an extensive critical work (which can be found by various writers like Frankel (1992) and Coakley et al (1998). The extensive empirical literature on Feldstein and Horioka puzzle varies significantly in terms of methodology employed as well as data periods and data sets and group of countries being selected so far for the task.

In broad terms, FH results has been tried to replicate using cross section data sets by (Feldstein 1983, Tesar 1991, Feldstein and Bachetta 1991, Artis and Bayoumi 1992, Murphy 1984, Penati and Dooley 1984, Dooley et al 1987). Some of many researchers are (Feldstein 1983, Jansen 2000, Krol 1996, Coakley et al 1997, Kim 2001, Corbin 2001 and Ho 2002), who employed

panel data techniques for solving the FH enigma. In cross section and panel data techniques, somehow estimate turned out to be largely homogenous. Some of those who used time-series analysis (Obstfeld 1986, De Vitta and Abbott 2002, Apergis and Tsoulfidis 1997, Bajo-Rubio 1998, Alexakis and Apergis 1994, Pelagidis and Mastrogiannis 2003, Sinha and Sinha 2004, Caporale et al. 2005) found a wider dispersion of saving-investment coefficients in their studies.

According to data structure existing empirical studies on the savings-investment relationship can be divided into three broad categories.

- Cross sectional Approach
- Time series Approach
- Panel data Approach

2.2.2 Cross sectional Approach

Early studies often used simple cross-section regressions to estimate the correlation between investment and saving, where both investment and saving were used as ratios of the GDP. The major finding of most of the early studies confirmed that the original work of Feldstein and Horioka's (1980) is perfect and two ratios i.e. ratio of Investment to GDP and Savings to GDP, are highly correlated.

Original work of Feldstein and Horioka (1980)

The original work of Feldstein and Horioka (1980) tested the degree of financial integration for 16 OECD countries during 1960-74. They proposed an idea to establish a correlation of domestic savings with investments rates to measure the degree of financial integration. The relation of domestic savings with investments portrayed a measure of capital mobility. Their result shows a high correlation among savings and investment.

Nutshell

In nutshell they proposed the lower degree of financial integration despite a large volume of international capital flows

Financial Integration in South Asia: an application of Feldstein-Horioka Puzzle

Segregating these studies on broad basis, Feldstein (1983) indicated that there is a high degree of correlation among savings and investments across countries. They interpret their results as evidence of lack of perfect capital mobility. Feldstein, as one of the inventor of the Feldstein and Horioka Puzzle again demonstrated harmony with the absolute findings of their original work of (1980). The main findings of FH were combined by Feldstein (1983) and Feldstein and Bachetta (1991) by extending the sample period to 1960 to 1979 and 1960 to 1986 respectively.

Generally speaking, since 1970s it have been observed that capital mobility has shown a significant growing trend but still its measurement is quite an uphill task. Davanne (1998) and Obstfeld & Taylor (2002) presented that the volume of daily financial transactions in 1999 was equal to US\$ 1,500 billion, i.e. 50 times more than daily commercial trade. This figure of daily financial transactions was only in the nominal range of US\$ 10-20 billion.

The increase in the financial transactions volume has been justified or supported due to various factors, among others, the emergence of financial markets at the end of 1970s is also supposed to be a significant factor. Problemes economiques (1997) stated that world stock market capitalization was of worth US\$ 1,400 billion in 1975 and US\$ 17000 billion in 1997.

Researches that followed Original (FH) Work

Sachs (1981) presents a modification in the F-H model by introducing external saving (current account deficit) in the place of domestic saving and including other variables like a trend and a product gap. He portrays that current account deficits are causing investment booms, implying that hikes in domestic investments are at least partly backed by capital inflows. He presents regression analyses of the relation between current account deficits and investment by using data from 14 OECD countries for the time period 1960-1979. He regressed the ratio of current account to GNP on two variables, i.e. GNP Gap and ratio of investment to GNP. He concludes the negative coefficient on the investment ratio of 12 to 14 countries and interpreted that international capital flows are with dominant short run influence on the current account.

Financial Integration in South Asia: an application of Feldstein-Horioka Puzzle

Fieleke (1982) studied the about financial integration for a period of ten years for 87 countries. He selected cross section data for these countries and his studies came very much in the founding studies of Feldstein and Horioka (1980). He approached to deal with country size in his study. He portrayed government involvement as explanation. His results portrayed that the values of β were proved to be far greater for developing countries in comparison with industrial countries.

Tobin (1983) demonstrate that if the government response to the commercial deficit, induct for an increase in investment, shortening down government expenses or hyping taxes, then domestic savings and investment will be highly correlated.

Robert G. Murphy (1984) demonstrates a cross section of 17 countries and concludes that savings-investments correlations are higher for large countries. He concludes that correlations are according to the size of the countries, large countries show higher correlations than small countries. Using the Feldstein Horioka Methodology, Murphy finds that the average coefficient on the savings ratio is only 0.59 for the ten smallest countries in his sample, compared with an average coefficient of 0.98 for large countries. He strongly argues that countries (e.g. US) can influence conditions in world capital market.

Caprio, Howard (1984) made a cross sectional data study for the period of 1963-81 for 23 OECD countries. This study was bit more special in this regard and more different from original work of Feldstein and Horioka (1980) due to the involvement of or taking impact of business cycles in to the study. Caprio, Howard (1984) portrayed their results in varied form and β value came as different from zero as well as different from one.

Penati and Dooley (1984) and Dooley *et al* (1987) suggest a significant relationship between domestic savings and rates of investment. Their findings are totally in harmony with the original work of Feldstein and Horioka (1980) in contrast with Sachs (1981). Dooley, Frankel and Mathieson (1987) interprets that savings-investment evidence is that the hypothesis of a high degree of substitutability for claims on physical capital located in different countries is not supported by the data.

Financial Integration in South Asia: an application of Feldstein-Horioka Puzzle

High international substitutability for bonds would imply the same for physical capital if capital is perfectly substitutable for bonds within each country, but there is no reason for this assumption to hold than for the assumption that all goods are perfect substitutes. They evidence a close relation between national savings and national investments are a robust empirical regularity. They state that positive correlations between levels and changes in national savings rates and investment rates- which are apparent both for industrial countries and developing countries, and which have been significantly higher in recent years compared with earlier periods- stand up to a variety of econometric objections.

Frankel, Dooley and Mathiesen (1986) worked on cross sectional data for 14 industrial and 50 developing countries. The period for their study roamed around a 1960-84. The basis of their study was to divide the developing countries according to the basis of market borrowers and market receivers respectively. Their results portrayed that value of β was proved to be greater for industrial countries as and when compared with the value of β in developing countries.

Vos (1988) made a cross sectional study for 18 industrial countries and 87 developing countries. He presented his results in a different way in which he purported that the value of β was lower in 1980s as compared with the earlier dates. Summers (1988) also made a cross sectional study for 23 OECD countries for the period of 1961-86. Summers presented that result of β were not statistically significantly different from one, but from zero.

Feldstein, Bacchetta (1989), in their cross sectional study of 23 OECD countries, for a period of 1961-86. In their work, they divided the 23 OECD countries into two categories of EEC and Non-EEC countries. Their findings were too much coherent with the earlier study of Vos (1988). They concluded that the value of β proved to be lower in the 1980s as compared with the earlier decades of 1960s and 1970s respectively.

Bayoumi (1989) elaborates the strong relationship between investment and savings due to monetary and fiscal policies of the countries. In case of a shortage in savings, the government can modify its fiscal policy by decrease in taxes or increase in interest rates and can bridge up the gap between investment and saving. Actually, *l'effect taille* can change the relationship between

Financial Integration in South Asia: an application of Feldstein-Horioka Puzzle

investment and saving: a large country, economically, can influence the world interest rates. So in nutshell, an increase in domestic savings can lead towards a decline in interest rates and to an increase in investment finally. Bayoumi (1989) named savings and investment as procyclical variables. So, their correlation can result from a common response to permanent shocks.

Wong (1990) made a cross sectional study for 45 countries for the period of 1975-81. He made his theory and tests for the non-traded sector. The value of β in his study proved to be not statistically significantly different from one, but from zero.

Linda L. Tesar (1991) has provided additional evidence on cross sectional savings investment correlations. She concludes that large and small countries show a significant correlation between domestic savings and investments and this correlation exists in short run as well as long run. She argues that correlation among domestic savings and investment is an important empirical regularity, but it feebly evidences about capital mobility.

She provides analyses which portray that it is possible to elaborate high savings-investment correlations within a well specified equilibrium model with capital mobility. She demonstrates that the high coefficient on the savings ratio in the Feldstein-Horioka regressions is robust to changes in the length of the interval over which the average is taken. She includes sample of 24 OECD countries, for data averaged over 25 years (1960-1984). The coefficient on the savings ratio showed a hyping trend and figured as 0.93. For data averaged over five-year intervals, the coefficient is in range of 0.76 to 0.95, and for one year averaged intervals, the coefficient secured a range of 0.67 to 0.97.

Frankel (1992) interpreted that variables like interest rate or risk premium can influence the degree of financial integration. Only the country premium has been eliminated; this means that only covered interest differentials are small. Real and nominal exchange-rate variability remains. The result is that a currency premium remains, consisting of an exchange risk premium plus expected real currency depreciation. This means that, even with the equalization of covered interest rates, large differentials in real interest rates remain (Frankel 1992). Before 1980s, America was supposed to have a near-unit correlation between national saving and investment. But in 1980s, America started borrowing on such a massive scale internationally that the

Financial Integration in South Asia: an application of Feldstein-Horioka Puzzle

traditional Feldstein-Horioka coefficient of near-unit broke down. So in the way or so, interest rate or country risk premium impacted the degree of financial integration.

Montiel (1993), in his study for 62 developing countries, for period of 1970-90, selected cross sectional data and resultantly proved that value of β were significantly different from unity and zero. Argimon Roldan (1994), in their study for European Community, adopted cross sectional approach and applied cointegration tests. He concluded that values of β were significantly different between European Countries.

Adolfo Sachisida and Marcelo Abi-Ramia (2000) basically tested the original Feldstein and Horioka work of 1980 and they corroborated the evidence that the Feldstein-Horioka test do not reflect the capital mobility in the real terms of economics. Instead Feldstein and Horioka just reflect the variability between the external and domestic savings. The basic idea which was used by the original Feldstein-Horioka (1980) was that in a country with a lower degree of capital mobility, like a closed economy, domestic investments will be totally financed by the domestic savings and for country with a higher degree of capital mobility, domestic savings will be used globally, looking for a better stabilized return on their savings. Adolfo and Marcelo (2000) tried to elaborate that coefficient of the original Feldstein and Horioka (1980) do not measure the degree of capital mobility, rather a substitutability relation between domestic and external savings. They interpreted that F-H regression presents the inability of use of the F-H coefficient to portray the current account solvency.

On the other hand Obstfeld and Rogoff (2000) has main finding that there has been a continued regularity of the original results of Feldstein and Horioka. So due to these very regular results of FH correlation (i.e. correlation between investment and saving), Feldstein Horioka puzzle has been stated as one of the significant most puzzle in international finance. Before Murphy and Dooley et al. (1987) found a higher degree of correlation between saving and investment for lesser industrialized and developing economies. Saving and investment is a very closely related issue and this thought is investigated by various economists and various levels and many found robust relationship between saving and investment.

Financial Integration in South Asia: an application of Feldstein-Horioka Puzzle

Domenico Giannone, Michele Lenza (2004) elaborated that general equilibrium can somehow to some extent rationalize the higher degree of correlation between savings and investment being observed in OECD countries. Rather being contrary to previous studies in this regard, their approach allowed heterogeneous after effects of saving and investment to global shocks. Their main finding was that correlation between saving and investment was higher in the 1970s but then afterwards for following two decades it became very small. This finding of them somehow can be interpreted as well by the increased capital mobility in international financial capital markets. As when the original study was made over OECD countries then it was seen that higher correlation between saving and investment induced the lower level of capital mobility but D Giannone and M Lenza (2004) results showed that with the passage of time the correlation tunes to be on the decreasing flow which in an other form strengthening the degree of capital mobility in the international capital markets.

Georgopoulos and Hejazi (2005) concluded that Feldstein and Horioka's outcome are just the replication of a fact that a large country will more likely rely on its domestic sources of investment and a smaller country's domestic investment sources will more likely to be at the shorter side as compared with the larger country, so a smaller country will have to rely more upon external sources of investment rather on domestic reliance. Georgopoulos and Hejazi (2005) found a stronger degree of saving and investment correlation for large countries and this rate of correlation was pretty small for small countries.

2.2.3 Times series Approach

Those studies which were based on time series approach emphasize the potential spurious regression problems caused by the non-stationarity of savings and investments.

Maurice Obstfeld (1986) claims that there is devastating support for the notion that the major long run changes in the degree of global capital mobility have taken the form of changes in the obstacles to capital flows, rather than any encouragement or discouragement to flows arising from structural volatilities within the economies themselves. His work provides analysis which illustrates that it is possible to explain high savings investment correlations within a well

Financial Integration in South Asia: an application of Feldstein-Horioka Puzzle

specified equilibrium model with capital mobility. He computes time-series correlations between changes in saving and investment rates using quarterly data from seven OECD countries and finds correlations ranging from 0.13 to 0.91. He notes that the national income accounts (NIA) measure of saving can differ distinctly from true saving. The difference arises when foreigners own shares in domestic firms and when firms finance expenditure from retained earnings.

Frankel (1986) made a time series study for USA in which he took a period of 1870-1984, which is supposed to be the longest period in this regard. His results portrayed that the value of β was not statistically significantly different from one, but from zero. In his conclusion, he made a special feature which implied that observation was not due to financial markets but for imperfect goods market.

According to Miller (1988) US savings and investment rates series are I(1) processes. He noticed cointegration between national savings and investment rates prior to 1971, but not in the post 1971 period. Miller (1988) reports that series are cointegrated during fixed exchange rate period but such series are not cointegrated during flexible exchange rate periods. Miller (1988) deploying the time series data for tenure of 1946 to 1987, mainly concludes that savings and investments were I(1) and shared a cointegrating relationship prior to the second world war. But that long run relationship between savings and investments did not exist in the post second world war period.

Sinn (1992) and Jansen (1996) used time series econometrics to solve the Feldstein-Horioka Puzzle. They integrated the nonstationary data but also some plausible cointegration relationships. Both of the authors in their work introduced the current account data (CA). Economically, a cointegration relationship between savings and investment leads towards long-term solvability constraint of the current account. CA can be defined as a difference of Savings and Investment. With this long term solvability constraint, the current account is equilibrated. Their methodology let them know that investment and savings are cointegrated. VAR or VECM (in case of cointegration) were basically used to measure the degree of financial integration. Moreover, using the same technique as of Miller (1988), Jansen (1996) also demonstrates that there is a positive long-run equilibrium relationship between saving and investment in OECD

countries. Jansen (1996) demonstrates that the Feldstein Horioka Puzzle should be interpreted as a direct reflection of the fact that savings and investment are cointegrated in time dimension, irrespective of the degree of international capital mobility. Jansen (1996) employs an error correction model for data of OECD countries and concludes that the savings and investments are cointegrated. Bayoumi, Rose (1993), in their time series study for UK, for a period of 1971-85, conducted a benchmark test for the UK. They purported that the value of β was not statistically significantly different from zero.

Another sophisticated statistical argument was stressed upon by Coakley, Kulasi and Smith (1996). They made a study for 23 OECD countries and proved that investment and domestic saving rates are integrated for order $I(1)$, but the non-ponzi condition infer upon that the current account must be integrated for order $I(0)$. Above all, investment and domestic saving should co-integrate with unit coefficient, irrespectively of the degree of capital mobility.

Coakley and Kulasi (1997) also portrayed that there is a positive long-run equilibrium relationship between saving and investment for OECD countries.

2.2.4 Survey of the studies on the basis of econometric approach

Table 2.1 demonstrates the survey of those studies which estimates the Saving-Investment correlation (Cross section vs. time series analysis). However, the table consists of five parts. The first part comprise of the name of author with the year of article. The second column indicates the econometric approach that is followed by sample and time period. After that the table shows the value of β , followed by the final part which explains the special feature of the particular study.

Financial Integration in South Asia: an application of Feldstein-Horioka Puzzle

Table 2.1: Survey of the Studies on the basis of econometric approach:

(Cross section vs. time series analysis)

| Author/ Year | Econometric Approach | Sample & time period | Values of β | Special features |
|------------------------------|-----------------------------|-----------------------------------|--|---|
| Feldstein Horioka 1980 | Cross section | 16 OECD countries 1960-1974 | Not statistically significantly different from one, but from zero | <ul style="list-style-type: none"> • First ones to work out savings & investment correlations |
| Fieleke 1982 | Cross section | 87 countries 1968-1977 | Values of β are greater for developing countries in comparison with industrial countries | <ul style="list-style-type: none"> • Approach to deal with country size • Government involvement as explanation |
| Murphy 1984 | Cross section | OECD countries 1960-1980 | Not statistically significantly different from one, but from zero | <ul style="list-style-type: none"> • Analysis of the function of country size • Benchmark test |

Financial Integration in South Asia: an application of Feldstein-Horioka Puzzle

| | | | | |
|---|------------------------------|--|---|---|
| Caprio, Howard 1984 | Cross section | 23 OECD countries 1963-1981 | Different from one and from zero | <ul style="list-style-type: none"> • Taking into account the potential influence of business cycles |
| Penati, Dooley 1984 | Cross section Time series | 19 Industrial countries 1960-1980 | Not statistically significantly different from one, but from zero | <ul style="list-style-type: none"> • First ones to work out with time series analysis |
| Frankel, Dooley Mathiesen 1986 | Cross section | 14 Industrial countries 50 developing countries 1960-1984 | Values of β are greater for Industrial countries in comparison with developing countries | <ul style="list-style-type: none"> • Dividing developing countries on the basis of market borrowers & aid receiver |
| Obstfeld 1986 | Time series | 7 OECD countries 1959-1984 | significantly different from unity & zero | <ul style="list-style-type: none"> • Theoretical framework to support time series analysis • Quarterly data |

Financial Integration in South Asia: an application of Feldstein-Horioka Puzzle

| | | | | |
|------------------|---------------|---|---|---|
| Obstfeld 1986 | Time series | OECD countries 1950-1984 | Not statistically significantly different from one, but from zero | <ul style="list-style-type: none"> • Time series for the annual data |
| Frankel 1986 | Time series | USA 1870-1984 | Not statistically significantly different from one, but from zero | <ul style="list-style-type: none"> • Conclusion is the special feature as he found that observation is not due to financial markets but for imperfect good markets |
| Vos 1988 | Cross section | 18 Industrial countries 87 developing countries | β is lower in the eighties in comparison with earlier decades | <ul style="list-style-type: none"> • Data source & Calculation |
| Summers 1988 | Cross section | 23 OECD countries 1961-1986 | Not statistically significantly different from one, but from zero | --- |

Financial Integration in South Asia: an application of Feldstein-Horioka Puzzle

| | | | | |
|---------------------------------|------------------------------|--|---|---|
| Feldstein, Bacchetta 1989 | Cross section | 23 OECD countries 1961-1986 | β is lower in the eighties in comparison with earlier decades | <ul style="list-style-type: none"> • They divide countries into EC & Non-EEC countries |
| Wong 1990 | Cross section | 45 countries 1975-1981 | Not statistically significantly different from one, but from zero | <ul style="list-style-type: none"> • Theory and test for the non-traded sector |
| Bayoumi 1990 | Cross section Time series | 10 Industrial countries 1960-1986 | β is lower in the eighties in comparison with earlier decades | <ul style="list-style-type: none"> • Investment is divided into fixed and inventories • Contrasting with gold standard time period • Ricardian equivalence |
| Sinn 1992 | Time series | 23 OECD countries 1960-1988 | Significantly different from unity & zero | <ul style="list-style-type: none"> • Benchmark empirical test for the USA |

Financial Integration in South Asia: an application of Feldstein-Horioka Puzzle

| | | | | |
|---------------------------|---------------|--|--|---|
| Bayoumi, Rose 1993 | Time series | UK 1971-1985 | Not statistically significantly different from zero | <ul style="list-style-type: none"> • Benchmark empirical test for the UK |
| Montiel 1993 | Cross section | 62 developing countries 1970-1990 | significantly different from unity & zero | ----- |
| Argimon Roldan 1994 | Cross section | European Community countries | Values for β are Significantly different between countries | <ul style="list-style-type: none"> • Cointegration Test |

2.2.5 Panel data Approach

Krol (1996), being the first author, who used panel data² to study the degree of financial integration for the same OECD countries as, studied originally by Feldstein and Horioka (1980). His coefficient estimate is 0.2, which is significantly smaller than the cross sectional estimates reported in earlier studies. He examines the relationship between savings and investment using annual data pooled for 21 OECD countries over the period 1962-1990 and concludes that estimated impact of saving on investment is considerably smaller than the results of the earlier researchers.

² Panel data are denoted by the use of both i and t subscripts as it have both cross sectional and time series dimensions.

Financial Integration in South Asia: an application of Feldstein-Horioka Puzzle

W. Jos Jansen (2000) argues that Krol's unusual findings are largely due to his inclusion of Luxembourg in the model. Krol (1996) reported estimates of the savings investment correlation, based on panel regressions, which are much lower than commonly found in previous studies. So it claims that low estimate of Krol's are not related to the panel estimation technique but largely to the inclusion of Luxembourg in the sample.

Jansen (2000) concludes that Savings-Investment correlation has declined and has become more volatile after 1973 is consistent with the view that (relatively) low capital mobility and/or long-run current account targeting are in part responsible for the correlation's high value in the past. He finds that correlation is still 0.55 in the 1990s and has always been well above zero, is consistent with the view that the intertemporal budget constraint is an important force behind the correlation.

Kim (2001) applied co-integrated panel techniques to control the possible impacts of various variables upon the degree of relation between saving and investment. Aggregate shocks as terms of trade, productivity, country specifications and global shocks were used and found the persistence of high, strong and robust correlation between savings and investment.

He basically tested the significance of shocks (i.e. productivity, terms of trade and fiscal shocks) in elaborating a strong time series correlation between saving and investment. He runs panel regression for saving and investment data controlled for cyclical shocks. His estimation basically concluded with a line that business cycles or country specifications or differences cannot explain the higher degree of saving-investment correlation.

Kim (2001) contradicted with some of the previous studies which claimed that a high time-series saving-investment correlation is due to trade cycle shocks. According to Kim, results could not depict the business cycle impact on high saving-investment correlation. Saving-Investment correlation dropped only from 0.69 to 0.64, after eradicating the impact of productivity shocks from saving and investment data. Kim's result basic contradiction was with Baxter and Crucini (1993), who claimed that strong saving-investment correlation is due to persistent productivity shocks.

Financial Integration in South Asia: an application of Feldstein-Horioka Puzzle

Tsung-Wu Ho (2002) used the panel unit root and panel cointegration technique to measure the degree of financial integration. As Krol (1996) argued that the Feldstein Horioka Puzzle is the result of the estimation method that used fixed effect panel regression, low saving retention coefficients were found. But the major criticism to the Krol (1996) was mainly due to his major covering around Luxembourg. Ho (2002) reexamined the Luxembourg problem by applying DOLS and FMOLS estimators to non-stationary panel data of 20 OECD countries. DOLS and FMOLS estimators were also used previously by Kao and Ching (2001).

Ho (2002) concluded in nutshell that inclusion or exclusion of Luxembourg does not affect the estimated outcomes. Ho (2002) used two-stage least squares approach proposed by Kao and Chiang (2001) for proving that Luxembourg does not affect the results sought for investigating the degree of financial integration among countries. What matters is the power of the estimation technique and of the hypothesis test matters. Its final interpretation can also be taken as high power of cointegration analysis in panel data.

Coakley, AM Fuertes and F Spagnolo (2003) observed Feldstein Horioka puzzle in a non-stationary panel framework for a sample of 12 OECD countries 1980 – 2000. Their results show that despite of a higher degree of financial liberalization in recent times, Feldstein Horioka regressions have sustained a high degree of saving-investment correlation indicating low long run capital mobility. The significant cross section slope estimate for 12 OECD economies for the selected period of 21 years still conforms that there is low capital mobility. But the mean group slope estimate turned out to be 0.33 and more importantly different from zero. This is a particular support of the hypothesis of long run capital mobility. Their basic conclusion was towards the support that FH Puzzle is not as bad as you think because of the contemporary results, which somehow have indicated long run capital mobility.

Kim, Oh and Jeong (2005) applied panel unit root and panel cointegration technique to measure financial integration rate. Their major difference from the TW Ho (2002) was the difference in the economies and their nature.

Ho (2002) applied DOLS and FMOLS for 20 OECD countries, but Kim, Oh and Jeong (2005) selected 11 Asian Economies, for which they investigated Feldstein-Horioka coefficients, using the newly developed, “between-group” FMOLS and DOLS panel cointegration techniques.

Financial Integration in South Asia: an application of Feldstein-Horioka Puzzle

Savings and investments rates were found as non-stationary and therefore to be cointegrated in panels. The estimated coefficients using the FMOLS and DOLS were 0.39 and 0.42, respectively, for the period 1980-1998. These values turned out to be rather much smaller than the estimates of 0.58 and 0.76 for 1960-1979, where 0.58 stats for FMOLS and 0.76 stats for DOLS coefficients. As the coefficients became smaller, so they interpreted that capital mobility has been increased in Asian countries in the 1980s and 1990s. The countries being chosen by Kim (2005) were Korea, Indonesia, Japan, Malaysia, Myanmar, Pakistan, Philippines, Singapore, Sir Lanka and Thailand.

As they reported that capital mobility has been increased in 1980s and 1990s, which refers increase in the degree of financial integration. The evolution of financial integration in these economies can be elaborated with the concept of financial liberalization which took place for these economies in 1980s and 1990s. Kim (2005) used second-generation panel unit root tests based on the hypothesis of interdependence between individuals, and these tests were never used before any of the earlier studies.

Bereau (2007) also used panel unit root and panel cointegration technique to measure the degree of financial integration. Bereau (2007) concluded with a higher degree of financial integration in the EU-15 and in particular in the Euro Area. The introduction of the Euro has not significantly paced up the process of financial integration among European Union Economies.

CHAPTER 3

FINANCIAL INTEGRATION

3.1 Introduction

Global financial integration has been continuously mushrooming over last decades, not only among developed countries but it has also penetrated towards the emerging economies as well as many of such countries who are even pathetically striving for development. Initially, it took the forms of simple enhanced capital flows among developed countries. With the passage of time and by removal of capital controls, technological progress and financial innovation, financial integration has gradually disseminated to all parts of the globe almost.

There has been an increased volume of grossed and net capital flows among developed and developing or emerging economies. A strong argument over the stimulated fact that increased integration with global financial markets acted as a key in imposing market discipline on policymakers, and has also improved the quality of macroeconomic management. Another strong evidence for the support of financial integration for developing economies has been prevailing in a form that it will help to increase in growth and reduction in volatility impacts. There has been theories portraying that strong evolution of financial integration would tend to pool risks across borders.

Over the years, Asian economies have depended largely on regional and global trade. In past two decades, Asian trade growth has outperformed the regional GDP as well as global trade in all broad forums – goods, services, exports, or imports – averaging over 10.5% a year (in US Dollars terms). The share of the region's trade has been raised substantially over a period of time. Rest of the world really has deep eyes over Asia's performance and there is no doubt to say that Asia is supposed to be the future of the globe.

Financial Integration in South Asia: an application of Feldstein-Horioka Puzzle

Global level financial integration and liberalization has shown a significant level of increase in the late 1980s and 1990s. The inciting factor in this phenomenon has been categorized as a fact that investor always wants bigger return on his investment and for the said purpose it is better to sum up that this integration and liberalization process has been due to increased level of investment around the globe seeking higher rates of returns and the opportunity to diversify the risk internationally.

At the same time, many countries have encouraged inflows of capital by dismantling impediments and controls on capital outflows, deregulating domestic financial markets, liberalizing restrictions on foreign direct investment, and improving their economic environment and prospects through the introduction of market-oriented reforms. Indeed, many developing and transition economies in East Asia, Latin America, and Eastern Europe extinguished restrictions on international financial transactions, at the same time that they relaxed regulations on the operation of domestic financial markets and moving away from regimes of financial repression.

The increase in the degree of integration of world capital markets has been accompanied by a significant rise in private capital flows to developing countries. Financial openness is often regarded as providing important potential benefits. Access to world capital markets expands investors' opportunities for portfolio diversification and provides a potential for achieving and maintaining higher risk-adjusted rates of return.

From the point of view of the recipient country, there are potentially large benefits as well. It has been argued that access to world capital markets allows countries to borrow to smooth consumption in the face of adverse shocks, and that the potential growth and welfare gains resulting from such international risk sharing can be large and permanent (Obstfeld, 1994). At the same time, however, it has been ascertained that the risk of volatility and sudden reversals in capital flows in the context of a highly open capital account may represent a significant cost.

There are quite a significant number of ways in which financial integration can be achieved. It may materialize as a consequence of formal efforts to integrate or correlate financial markets with particular partners, typically those that share membership in a regional integration

agreement (RIA). Integration in this sense may engage exterminating precincts to cross-border financial operations by firms from countries in the same RIA, as well as balancing rules, taxes and regulations between the member countries. Financial integration can also be emerged in the absence of explicit agreements. Such structures of integration as foreign bank entry into domestic markets, foreign participation in insurance markets and pension funds, securities trading abroad, and direct borrowing of domestic firms in international markets. Mostly in the developing world, this de facto integration in the region has basically been with the developed world.

3.2 What is financial integration?

Financial integration has been defined in significant ways by the various schools of thoughts. The process of financial integration has been associated with an increase in domestic financial deepening as well as removal of barriers to capital mobility. Financial integration affects the structure and mechanism of financial system, which in turn may have implications for financial stability.

Financial integration has always been strongly monitored by regulators and central banks. Beside all that, it has been a general consensus that deepening financial integration is beneficial on the whole for the economy.

“Financial integration is a process, driven by market forces, in which separate national financial markets gradually enter into competition with each other and eventually become one financial market, characterized by converging prices, product supply and converging efficiency/profitability among the financial services providers. Several distinct and parallel channels can further financial integration, namely: cross border ownership, establishment or cross-border service provision.”

(European Commission, Internal Market and Services DG)

According to Tahari et al., 2007 “It is the process through which financial markets of several countries remove restrictions on cross-border financial flows and on foreign entry into the domestic financial system so that all potential participants, local and foreign, in a market are subject to the same rules and have equal access”

3.2.1 Features of financial integration

Financial integration has been defined by Baele et al (2004) which contains three significant features as follows:

➤ **Independence**

It is independent of the financial structures within regions. Financial structures include all financial intermediaries – institutions or markets – and how they relate to each other with respect to the flow of funds to and from households, governments and corporations.

➤ **Frictions in the process of intermediation**

It means that investment of capital either through institutions or markets – can persist after financial integration is accomplished. This incites that financial integration is not about removing frictions that hamper the optimal allocation of capital. Rather, financial integration is concerned with the symmetric or asymmetric effects of existing frictions on different areas. Even in the presence of frictions, several areas can be financially integrated as long as frictions affect these areas symmetrically.

➤ **Requirement of full Integration**

Financial integration defined by Baele et al. (2004) distinguishes the two ingredients of a financial market, namely the supply of and the demand for investment opportunities. Full integration requires the same access to banks or trading, clearing and settlement platforms for both investors (demand for investment opportunities) and firms (supply of investment opportunities, e.g. listings), regardless of their region of origin.

In addition, once access has been granted, full integration requires that there is no discrimination among comparable market participants based solely on their location of origin. When a structure systematically discriminates against foreign investment opportunities due to, say, national legal restrictions, then the area is not financially integrated.

3.2.2 Characteristics of potential market participants

A market is said to be fully integrated for its given set of financial instruments and services if the potential market participants face the following characteristics:

- Confront with same set of rules with which financial instruments and/or services are to be dealt with;
- Equal and fair access to a set of financial instruments and/or services, and
- Equal and fair treatment whenever they are in the market.

Financial integration represents a condensed procedure through which a country's financial markets become more closely integrated or connected with those in other countries or with those in the rest of the world. It entails the extermination of impediments for exotic financial institutions from some or all countries to operate or offer cross-border financial services in others. This may be corroborated as linking banks, equity and all other types of financial markets.

3.2.3 Positive & negative aspects of Financial Integration

There might have been certain negatives and positives ascertained from the fact of financial integration.

Positive aspects

- Countries have started to make or made efforts to reduce their vulnerability to external shocks.
- International financial integration has encouraged central banks to shift towards the market based instruments that enhance their ability to respond to shocks.
- There has been a gradual deepening of and improved resilience in domestic financial markets in emerging economies, often called with pension reforms that have helped to increase the base of potential investors.
- International investors are now better able to differentiate between countries, thus reducing the risk or contagion. (P Andersson, R Moreno)

Financial Integration in South Asia: an application of Feldstein-Horioka Puzzle

Negative aspects

- The extent of de jure financial integration, as gauged by measures of financial liberalization has been proved so far as uneven.
- The pace of financial integration, as measured by gross capital flows, has also proved to be uneven.
- Net capital flow has portrayed an adverse picture evidencing flow from poor to rich countries.
- In large parts of Asia, the rise in saving relative to investment has manifested itself in growing foreign exchange reserves.
- External shocks could have dominated consumption smoothing effects.
- Exchange rates could also have played adversely character for emerging economies.

3.3 Some macroeconomic variables for selected South Asian countries

Table 3.1: Comparison of macroeconomic variables for selected South Asian countries

| <u>1981</u> | Bangladesh | India | Nepal | Pakistan | Sri Lanka |
|----------------------------|------------|--------|-------|----------|-----------|
| Nominal GDP | 17.9 | 173.0 | 2.2 | 28.1 | 4.4 |
| FX reserves | 118.8 | 3233.8 | 167.8 | 571.3 | 260.8 |
| Exports/GDP | 4.4 | 5.0 | 5.9 | 10.3 | 24.6 |
| Net exports/GDP | -10.7 | 3.6 | -10.3 | -9.8 | -17.2 |
| CA/GDP | -5.7 | -1.0 | -0.9 | -3.3 | -10.1 |
| Inflation | - | 13.1 | 11.1 | 11.9 | 18.0 |
| Depreciation | 16.4 | 10.1 | 2.8 | 0.0 | 16.4 |
| Interest rates: Short term | 12.0 | 8.6 | 12.0 | 9.3 | 19.0 |
| Interest rates: Long term | 12.0 | 16.5 | 5.0 | 9.4 | 15.6 |

Financial Integration in South Asia: an application of Feldstein-Horioka Puzzle

Table 3.1(continued): Comparison of macroeconomic variables for selected South Asian countries

| <u>1990</u> | Bangladesh | India | Nepal | Pakistan | Sri Lanka |
|-----------------------------------|-------------------|--------------|--------------|------------------|------------------|
| Nominal GDP | 29.0 | 324.9 | 3.5 | 39.3 | 8.0 |
| FX reserves | 423.8 | 847.0 | 201.7 | 207.4 | 296.9 |
| Exports/GDP | 5.8 | 5.5 | 5.0 | 14.2 | 23.8 |
| Net exports/GDP | -6.7 | -1.7 | -12.7 | -4.5 | -9.6 |
| CA/GDP | -1.4 | -2.2 | -8.2 | -4.2 | -3.7 |
| Inflation | 6.1 | 9.0 | 8.2 | 9.1 | 21.5 |
| Depreciation | 7.1 | 7.9 | 8.0 | 5.7 | 11.1 |
| Interest rates: Short term | 12.0 | 15.6 | 11.0 | 7.3 | 21.6 |
| Interest rates: Long term | 16.0 | 16.5 | 7.9 | 8.1 | 14.1 |
| <u>2000</u> | | | | | |
| Nominal GDP | 45.5 | 467.8 | 5.3 | 71.3 | 16.3 |
| FX reserves | 1140.0 | 28600.6 | 719.9 | 1150.5 | 749.4 |
| Exports/GDP | 10.5 | 9.1 | 13.1 | 12.7 | 33.2 |
| Net exports/GDP | -7.9 | -2 | -15.5 | -2.6 | -5.2 |
| CA/GDP | -0.7 | -1 | -5.6 | -0.1 | -6.4 |
| Inflation | 2.2 | 4.0 | 2.5 | 4.4 | -6.2 |
| Depreciation | 6.2 | 4.4 | 4.2 | 8.4 | 9.0 |
| Interest rates: Short term | 8.6 | 9.3 | 7.5 | 8.6 | 17.3 |
| Interest rates: Long term | 15.5 | 12.3 | 5.3 | 4.2 ^a | 14.0 |

Financial Integration in South Asia: an application of Feldstein-Horioka Puzzle

Table 3.1(continued): Comparison of macroeconomic variables for selected South Asian countries

| <u>2009</u> | Bangladesh | India | Nepal | Pakistan | Sri Lanka |
|-----------------------------------|-------------------|--------------|---------------------|-------------------|-------------------|
| Nominal GDP | 89.1 | 62311.7 | 7.9 ^b | 155.9 | 42.0 |
| FX reserves | 6059.8 | 164945.0 | 1042.6 ^c | 6339.0 | 2883.8 |
| Exports/GDP | 14.0 | 12.7 | 11.4 ^b | 11.2 | 17.5 |
| Net exports/GDP | -9.2 | -6.9 | -25.9 ^b | -9.1 | -6.0 |
| CA/GDP | 3.8 | -2.8 | -1.7 ^b | -1.1 ^d | -0.7 |
| Inflation | 5.4 | 10.9 | 11.6 | 13.6 | 3.4 |
| Depreciation | 0.6 | 11.3 | 11.2 | 16.1 | 6.1 |
| Interest rates: Short term | 8.2 | 3.5 | 6.5 | 12.0 | 21.2 ^d |
| Interest rates: Long term | 14.6 | 12.2 | 6.4 | 11.7 ^d | 18.9 ^d |

Source: IMF, IFS statistics, various issues.

Notes: GDP in USD billions; FX Reserves in SDR millions;

a (Figures for 1999);

b (Figures for 2007);

c (Figures for 2005);

d (Figures for 2008).

Table 3.1 provides a relative macroeconomic depiction of the countries and illustrates the changes at ten-year intervals from (1981 to 2009). The data is taken from the IFS (IMF). The purpose of using data from IFS is that the definitions used are reliable & consistent for comparison.

Financial Integration in South Asia: an application of Feldstein-Horioka Puzzle

The table given above indicates that India has the largest foreign exchange reserves with comparison to other countries in the region while Sri Lanka has the highest exports to GDP ratio. The higher export to GDP ratios shows that countries are more open. As for as net exports (exports – imports) are concerned, it indicates the negative figures while the current account has also been in deficit for most of the countries of the South Asia.

Due to consistent unrest in Sri Lanka, its inflation was very high in the start of period but in 2009 Pakistan has the highest inflation rate. Most of the countries under discussion had flexible exchange rate regimes in the later years that are used for compensating inflation. Interest rates have downward trend in the reform period but in these countries exchange rate cannot determined by market due to thin FX markets and substantial interference

Conclusion

International financial integration can be summed up as by adding all international financial transactions, where integration exemplifies the easiness, comparability and homogeneity to conduct these financial transactions across countries. Basic and foremost common financial instruments are bank accounts, government bonds, company stocks and mortgages.

Perfect financial integration can be elaborated as phenomenon when the parity of real interest rates is guaranteed. For the fulfillment of this scenario, the country's capital account must be opened, and other barriers to achieving parity should not exist. In a small open economy, where the domestic interest rate is exogenous because of perfect financial integration, households choices between consumption/saving and investment will be completely separate (production consumption separation).

Financial Integration in South Asia: an application of Feldstein-Horioka Puzzle

Table 3.2: Net flows on external debt, long-term (NFL, current US\$), millions

| | Bangladesh | India | Nepal | Pakistan | Sri Lanka |
|------|-------------------|--------------|--------------|-----------------|------------------|
| 2001 | 408 | -1080 | 50 | 168 | 94 |
| 2002 | 205 | -3106 | -1 | 227 | 197 |
| 2003 | 465 | -1520 | 61 | -656 | 542 |
| 2004 | 459 | 3352 | 29 | -530 | 352 |
| 2005 | 312 | -3 | 107 | 1342 | 701 |
| 2006 | 579 | 20014 | 58 | 2054 | 542 |
| 2007 | 344 | 32359 | 29 | 2330 | 1163 |
| 2008 | 1100 | 13899 | -23 | 1872 | 432 |
| 2009 | 794 | 12050 | -14 | 1900 | 1241 |

Table 3.3: Net flows on external debt, short -term (NFL, current US\$), millions

| | Bangladesh | India | Nepal | Pakistan | Sri Lanka |
|------|-------------------|--------------|--------------|-----------------|------------------|
| 2001 | 6 | -720 | 25 | -205 | -39 |
| 2002 | 205 | 1351 | -14 | 226 | 68 |
| 2003 | 72 | 2234 | -27 | -295 | 19 |
| 2004 | 95 | 537 | 23 | 0 | 27 |
| 2005 | -40 | 1952 | 11 | -15 | 344 |
| 2006 | 506 | 16281 | 34 | 92 | -137 |
| 2007 | 188 | 10996 | -26 | 906 | 777 |
| 2008 | 527 | 7728 | 2 | -858 | 455 |
| 2009 | 46 | -871 | -13 | 96 | -238 |

Financial Integration in South Asia: an application of Feldstein-Horioka Puzzle

Table 3.4: Net flows on external debt, total (NFL, current US\$), millions

| | Bangladesh | India | Nepal | Pakistan | Sri Lanka |
|------|-------------------|--------------|--------------|-----------------|------------------|
| 2001 | 354 | -1800 | 70 | 298 | 115 |
| 2002 | 322 | -1755 | -20 | 529 | 339 |
| 2003 | 534 | 714 | 42 | -1058 | 613 |
| 2004 | 702 | 3889 | 61 | -843 | 267 |
| 2005 | 370 | 1949 | 118 | 1090 | 1160 |
| 2006 | 1235 | 36295 | 113 | 2039 | 251 |
| 2007 | 532 | 43355 | 36 | 3084 | 1934 |
| 2008 | 1826 | 21628 | -21 | 4034 | 808 |
| 2009 | 817 | 11129 | -29 | 5080 | 1544 |

Table 3.5: Workers' remittances, receipts (BoP, current US\$)

| | Bangladesh | India | Nepal | Pakistan | Sri Lanka |
|------|-------------------|--------------|--------------|-----------------|------------------|
| 2001 | 2094 | 14144 | 147 | 1461 | 1155 |
| 2002 | 2848 | 15629 | 655 | 3554 | 1287 |
| 2003 | 3180 | 20884 | 744 | 3963 | 1414 |
| 2004 | 3572 | 18397 | 793 | 3943 | 1564 |
| 2005 | 4302 | 21859 | 1126 | 4277 | 1968 |
| 2006 | 5418 | 28025 | 1373 | 5113 | 2161 |
| 2007 | 6553 | 36770 | 1647 | 5992 | 2502 |
| 2008 | 8925 | 49180 | 2581 | 7025 | 2918 |
| 2009 | 10508 | 48596 | 2858 | 8701 | 3330 |

Foreign direct investment, net (BoP, current US\$)

Foreign direct investment is net inflows of investment to acquire a lasting management interest (10 percent or more of voting stock) in an enterprise operating in an economy other than that of the investor. It is the sum of equity capital, reinvestment of earnings, other long-term capital, and short-term capital as shown in the balance of payments. This series shows total net, that is, net FDI in the reporting economy from foreign sources less net FDI by the reporting economy to the rest of the world. Data are in current U.S. dollars.

Table 3.6: Foreign direct investment, net (BoP, current US\$)

| | Bangladesh | India | Nepal | Pakistan | Sri Lanka |
|------|-------------------|--------------|--------------|-----------------|------------------|
| 2001 | 79 | 5472 | 21 | 383 | 172 |
| 2002 | 52 | 5626 | -6 | 823 | 197 |
| 2003 | 268 | 4323 | 15 | 534 | 229 |
| 2004 | 449 | 5771 | 0 | 1118 | 233 |
| 2005 | 813 | 7606 | 2 | 2201 | 272 |
| 2006 | 697 | 20336 | -7 | 4273 | 480 |
| 2007 | 653 | 25483 | 6 | 5590 | 603 |
| 2008 | 1010 | 43406 | 1 | 5438 | 752 |
| 2009 | 713 | 35596 | 38 | 2338 | 404 |

3.4 Countries

3.4.1 Bangladesh

Bangladesh is the place, where European began to set up trading posts in 16th century. Bangladesh economy has shown a significant trend of 5-6% per year since 1996 despite major curbs out of which followings are worth to be mentioned, like:

Financial Integration in South Asia: an application of Feldstein-Horioka Puzzle

- poor infrastructure
- political instability
- corruption
- insufficient power supplies, and
- slow implementation of economic reforms.

Bangladesh has been stagnated as poor, overpopulated, and inefficiently-governed nation.

The major employing sector for Bangladesh has been its agricultural sector which constitutes 45% of its employed work force, and dominant and prominent single commodity, as rice, although more than 50% of its GDP is derived through services sector. Bangladesh's growth was resilient during the 2008-09 global financial crisis and recession. \$12.3 billion was derived from garments export in 2009 and \$11 billion was derived by remittances from overseas Bangladeshis in 2010, which constituted more than 25% of its GDP.

After Bangladesh came into being in 1971, attracting Foreign Direct Investment was supposed to be an uphill task in 1970s. That decade of 1970s was not supposed to be that bad as it could be. Yet it encountered \$82 million workers remittances. Net flow of debt was majorly encountered with long term debt. In total of \$474 million debt, only \$53 million were attributed for the short term debt, while rest of the money attributed to the long term debts.

For the coming decades of 1980s and 1990s, Bangladesh was lucky enough to account for huge volumes of workers remittances. In 1980s, workers remittances increased more than 6 times of the 1970s figure and this trend sustained in 1990s as well. In the debt portion, long term debt prevailed itself in the major position in 1980s and 1990s as well. There have been two main sources of capital inflows in Bangladesh over years which were workers remittances and Foreign Direct Investment. FDI was sixty times more in 1990s as compared with 1980s and mushrooming trend of workers remittances has always supported the Bangladesh foreign exchange position to a greater extent.

Comparing the last decade of 2000, these two main sources of Bangladesh foreign exchange have shown significant growth. Worker remittances accounted for \$2,094 millions in 2001 has

been mushroomed to \$10,508 millions, which significantly portrays that in this decade, there has been almost more than five times increase in the workers remittances which is one of the pillars of capital inflows. Similarly, there has been almost ten times increase in Foreign Direct Investment in the decade lasting 2009, which portrays that capital inflows position has been strengthened to greater extent beside large flow of long term debts.

3.4.2 INDIA

India has quietly developed itself as an open-market economy, but thorough analysis can portray the traces of its past autarkic policies. Since 1997, India has been blessed up with an averaged plus 7% GDP growth rate due to various factors which began in the early 1990s entailing economic liberalization, industrial deregulation, reduced controls on foreign trade and investment and privatization of state owned enterprises.

Major features of India's diverse economy encompass:

- traditional village farming
- modern agriculture
- handicrafts
- multitude of services
- Wide range of modern industries.

Over years, major source of economic growth has been the services sector, yet in contrary the more employing sector is agriculture. Services sector has been dominant over the GDP figures and accounts for more than 50% of its GDP, in collaboration with utilization of one third of India's total employed labor force. The major employed force on the category of English-speaking population has become an export in form of information technology workers and software supporters.

Strong domestic demand and growth even exceeding 8% year-on-year in real terms despite of the worst global financial crisis, made India come out of it in a robust way. Despite the global financial crisis impacts, the merchandise exports accounted for about 15% of GDP. An industrial development and mushrooming food prices, resulting from the consolidated effects of the weak

Financial Integration in South Asia: an application of Feldstein-Horioka Puzzle

2009 monsoon and inefficiencies in the government's food distribution system, hyped inflation which peaked at about 11% in the first half of 2010, but has gradually decreased to single digits following a series of central bank interest rate hikes.

While enumerating the India's long term challenges, followings are worth to be mentioned as:

- Inadequate physical and social infrastructure
- Widespread poverty
- Limited non-agricultural employment opportunities
- Insufficient access to quality basic and higher education
- Accommodating rural-to-urban migration

India being the largest country of South Asia has always managed to rule over the economy of South Asia. As the Foreign Direct Investment averaged \$41 million per year in 1970s, which is more than 50% of the total FDI in South Asia. The workers remittances accounted for more than \$800 million. Furthermore, out of more than \$1 billion of net total debt inflow, the long-term debt marked a major share as it has been the case in Bangladesh as well. There were three times more average remittances in the 1980s as compared to 1970s. Foreign direct investment became more than doubled in 1980s as compared to 1970s. In the 1990s, trend of tremendous increase in worker remittances which increased three times as compared to the 1980s and reached \$7.8 billion approximately. The equity flows were more than FDI, which were \$1.8 billion on average in the 1990s. Remittances increased almost more than 3 times in 2000s. The most worthy thing to be mentioned is the huge level of Foreign Direct Investment which has India has been able to grabbed in 2000s and that increased almost more than seven times and reached a level of more than \$35 billion in 2009, in form of Foreign Direct Investment net(BOP, current US\$).

3.4.3 NEPAL

Nepal has been categorized as among the poorest and least developed countries of the world, with more than one-quarter of its population living below the poverty line. Agricultural sector has been the focal point of the economy of Nepal which provides livelihood for almost three-fourths of the population and accounting for about one-third of its annual output.

Basic industrial activities incorporate processing of agricultural products which include:

Financial Integration in South Asia: an application of Feldstein-Horioka Puzzle

- Processing of pulses
- Processing of jute
- Processing of sugarcane
- Processing of tobacco
- Processing of grain

The major potential hype of the Nepal has been highlighted as its estimated feasible capacity of 42,000 MW of hydropower production, but political instability has so far so less hampered the foreign interests.

The major and foremost challenges being faced by Nepal's growth include:

- Civil strife
- Labor unrest
- Landlocked geographic location
- Susceptibility to natural disaster.

Nepal being annexed with India has largely been dependent on India for trade and its economic growth. In the 1970s workers remittances were \$22 million. The share of long-term debt was higher as compared to short-term debt. In 1980s and 1990s workers remittances were consistent and on average almost doubled in every decade, but that double growth of workers remittances were not at all in any comparison with that of India or Bangladesh.

In the 1980s FDI flows reached \$1.4 million. They rose to \$9.5 million in the 1990s. The decade 1990 average of the overall FDI and equity flows remained lowest, in nominal terms, in the region. In 2000s, there has been significant growth in workers remittances which stood at \$147 million in 2001 and reached to a paramount in the history of Nepal at \$2,858 millions. While talking about Foreign Direct Investments in 2000s, there has been a huge volatility. In 2002 and 2006, FDI went into negatives even, while in 2004 FDI stood at zero. But overall, on average there has been no increase in FDI in 2000s, which is also a sign of crumbling economy of Nepal.

3.4.4 PAKISTAN

There have been numerous challenges being faced by Pakistan's impoverished economy and level of its dwindling foreign investments which incorporate majorly as internal political turmoil. Pakistan has tried to exploit development spending over a period of six years lasting 2001-07, which resultantly has managed to squeezed the poverty level by 10%

There has been recorded significant volatility in GDP growth rates of Pakistan over last decade. GDP growth rate has shown a persistent positive trend of ranging in between 5-8% during 2004-07, despite severe energy crisis. But this condition has been adjoined by hyperinflation and growth has been slowed down in 2008-09, portraying unemployment increases and galloping prices. Over a period of three years, from 2007 to 2010, inflation has adjusted itself in double digit cadre, climbing from 7.7% in 2007 to 13% in 2010. Political and economic instability has enraged the Pakistani rupee since 2007, which has significantly deteriorated over said period. Pakistan agreed to International Monetary Fund Standby Agreement in November 2008 in response to a severe balance of payments crisis, but during 2009-10 its foreign exchange position stabilized and current account strengthened, largely because of record remittances from workers abroad and significant slump in oil prices. In July-August 2010, a devastating floods of the history of Pakistan, hit its agricultural output in a miserable way, which also incited to a hype in galloping inflation in the country, specifically in food items. Pakistan planned to expand viable export base for a range of manufactures, but its exports remained stringent mainly to the textiles products.

Other major long term challenges include:

- Healthcare
- Education
- Electricity production
- Reducing dependence on foreign donors
- To kill the menace of corruption, which has deteriorated the country's economy in a devastating way

Financial Integration in South Asia: an application of Feldstein-Horioka Puzzle

In the 1970s remittances were almost half a billion dollars and FDI flows were \$22 million. FDI and remittances both were second highest in the region, after India. In the 1980s remittances showed remarkable figure of \$2.3 billion, which were almost equal to India's. In the 1990s, the average remittances were \$1.5 billion, less than the average of the 1980s. But in 2000s there has been significant increase in remittances as in 2001, remittances were accounted for as \$1,461 millions and in 2009 it inflated to a paramount of \$8,701 million, which impacted significantly over the capital inflow and supported the foreign exchange position to a great extent. In 2000s, till 2007, FDI has shown a significant growth, but after the country's political instability which mainly incited in 2008, it shown significant downfalls and in 2009, FDI became to almost half of the level of as it was in 2007.

3.4.5 SRI LANKA

Sri Lanka has recently engaged it self in number of development activities after a long lasting 26 years civil war, which hit its economy in miserable way over decades. Poverty has been one of the major curses of Sri Lanka over years and for alleviation of this curse, Sri Lankan government has planned a specific agenda which includes:

- Combination of state directed policies
- Private investment promotion
- Development of small and medium enterprises
- Promote increased agriculture
- Boosting tourism

Abrupt change might not be feasible for Sri Lankan government as government itself confronts with numerous challenges majorly involving high debt interest payments, a bloated civil service and historically high budget deficits. In 2008 global financial crisis and recession, Sri Lanka's balance of payments was hit badly and it has to rush for \$2.6 billion IMF standby agreement in July 2009. Sri Lankan stock markets have been able to lure the investors after the end of long-lasting civil war and IMF support, and its markets has been categorized as world's fastest performing stock markets of the world. Its economy has always been struggling positively even

Financial Integration in South Asia: an application of Feldstein-Horioka Puzzle

in prolonged civil war period, over which it managed to sustain the 5% growth rate, afterwards in 2006-08; its GDP growth mushroomed to 6-7%, which is even expected to rise further.

Sri Lanka received Workers Remittances (WR) around \$48 million on average and also attracted \$8.4 million of FDI in the 1970s.

The decade of the 1980s was marked with stability in capital flows for Sri Lanka. The WR crossed \$300 million figure and FDI also increased 5 times as compared to the 1970s. WR more than doubled and FDI increased 4 times more in the 1990s. The level of WR over 2000s has been consistent and on average has shown a positive trend and almost there has been three times increase of the WR level in 2009 as from the level of 2001. FDI level of Sri Lanka has been associated with a lot of volatilities in 2000s. In nutshell, it can be implied that there has been positive developments in the level of FDI in 2009 as compared to the level of 2001.

Table 3.7: Comparative Analysis of WR, NRF and FDI among South Asian Countries in 1970s, 1980s and 1990s respectively

| Countries | Workers Remittances (US\$ Millions) | Agg-NRF (US\$ Millions) | FDI-NiN (US\$ Millions) |
|---------------------|--|------------------------------------|------------------------------------|
| <u>1970s</u> | | | |
| Bangladesh | 82.55 | 734.47 | - |
| India | 810.09 | 1274.53 | 41.32 |
| Nepal | 22.08 | 38.97 | - |
| Pakistan | 546.24 | 712.04 | 22.14 |
| Sri Lanka | 48.50 | 149.17 | 8.41 |
| South Asia | 2410.01 | 3032.06 | 71.90 |

Financial Integration in South Asia: an application of Feldstein-Horioka Puzzle

Table 3.7(continued): Comparative Analysis of WR, NRF and FDI among South Asian Countries in 1970s, 1980s and 1990s respectively

| Countries | Workers Remittances (US\$ Millions) | Agg-NRF (US\$ Millions) | FDI-NiN (US\$ Millions) |
|---------------------|--|----------------------------|----------------------------|
| <u>1980s</u> | | | |
| Bangladesh | 558.04 | 1334.11 | 1.30 |
| India | 2329.60 | 4888.00 | 109.91 |
| Nepal | 49.31 | 228.50 | 1.38 |
| Pakistan | 2313.58 | 1078.40 | 125.96 |
| Sri Lanka | 319.80 | 527.61 | 40.71 |
| South Asia | 5570.90 | 8611.50 | (284.02) |
| <u>1990s</u> | | | |
| Bangladesh | 1196.20 | 1260.40 | 61.70 |
| India | 7814.50 | 6240.82 | 1385.40 |
| Nepal | 88.60 | 279.80 | 9.50 |
| Pakistan | 1512.20 | 2297.20 | 529.10 |
| Sri Lanka | 770.80 | 655.90 | 167.60 |
| South Asia | 12085.50 | 11898.08 | 2501.41 |

Where,

NRF

FDI-NiN

Net Resources Flows

Foreign Direct Investments Net Inflows

CHAPTER 4

THEORETICAL FRAMEWORK

To analyze the degree of financial integration of selected South Asian countries from 1981 to 2009 using the Feldstein–Horioka (1980) approach, theoretical framework is required.

4.1 Theoretical Framework Analysis

4.1.1 The Feldstein–Horioka paradox

To test the hypothesis of no cointegration between the savings and the investment ratios, Feldstein and Horioka (1980) used the following equation.

$$(I|Y)_{i,t} = \alpha + \beta(S|Y)_{i,t} + \varepsilon_{i,t} \dots\dots\dots (1)$$

where

$(I|Y)_{i,t}$ is the investment rate

$(S|Y)_{i,t}$ is the saving rate

β is the degree of financial integration

$\beta = 1$ shows weak financial integration

$\beta = 0$ shows strong financial integration

$\varepsilon_{i,t}$ shows other factors that explain investment

Feldstein used cross-section approach because it was assumed that a time series analysis may lead to biased upward correlation coefficient due to a business-cycle induced parallel movement of savings and investment rates. To sum up, the results of Feldstein Horioka could be interpreted as evidence of capital being completely immobile internationally.

4.1.2 Panel estimation

Krol was the first one who used panel technique for investigating the saving and investment relation. He estimates the following (fixed-effects) panel regression.

$$(I|Y)_{i,t} = \alpha + c(i) + d(t) + \beta(S|Y)_{i,t} + \varepsilon_{i,t} \dots\dots\dots (2)$$

where

$(I|Y)_{i,t}$ is the ratio of domestic investment to GDP

$(S|Y)_{i,t}$ is the ratio of national saving to GDP

β is the degree of financial integration or measure of linear association

i stands for country specific

The dummy variable $c(i)$ takes on a different value for each country.

t stands for time specific

The dummy variable $d(t)$ takes on a different value for each period.

$\varepsilon_{i,t}$ is a random term

Krol's estimate for the saving-investment correlation β is 0.20. Krol's result is surprising as he concludes that time effects $d(t)$ are not important, that make his regression equation relatively close to a set of time-series regression equations.

Financial Integration in South Asia: an application of Feldstein-Horioka Puzzle

These types of regression equations usually yield much larger estimates. Furthermore, recent studies have found that saving and investment tend to be cointegrated variables that mean that β is one.

This long-run association is interpreted as a demonstration of the intertemporal budget constraint, rather than indication of low capital mobility. However, under some conditions a panel regression in levels estimates the cointegration between the variables; one could be expecting a high estimate for β (Pesaran and Smith, 1995).

4.1.3 Quintessence

The high correlation between savings and investment remarkably proved to be a robust empirical regularity. Moreover, neither modification in the econometric approach nor in the time period nor in the no of countries could impact on the results significantly.

In this study, panel data is used to investigate the degree of financial integration of selected South Asian countries from 1981 to 2009 using the Feldstein–Horioka (1980) approach.

4.2 Data Description

The degree of financial integration is investigated for 5 South Asian Countries: Bangladesh, India, Nepal, Pakistan, Sri Lanka. Data come from World Development Indicators of the World Bank. The starting date for these series is 1981 (until 2009) measured at an annual frequency. The purpose of taking annual data is to avoid the loss of degree of freedom as the sample size is small. It has been the main feature of many panel data studies these days.

The data is taken from 1981 because the process of financial liberalization started at the beginning of the 1980s in Asia but the year 1988 is generally held by the literature to be when integration began its acceleration (Fukasaku & Martineau, 1999). Data is taken annually like did Krol (1996), Coiteux and Olivier (2000), and Jansen (2000) and conversely to FH (1980), Murphy (1984), Feldstein and Bachetta (1991) and Taylor (1994) who used five-year or eight-year averaged cross-section estimations.

4.2.1 Definition of developing economies

Selected South Asian countries are divided according to World Bank definition of developing economies which include low-income and middle-income countries.

Table 4.1 categories of countries

| Country | Income Group | Currency Unit | Region |
|-------------------|---------------------|----------------------|---------------|
| Bangladesh | Low income | Bangladeshi taka | South Asia |
| India | Lower middle income | Indian rupee | South Asia |
| Sri Lanka | Lower middle income | Sri Lankan rupee | South Asia |
| Nepal | Low income | Nepalese rupee | South Asia |
| Pakistan | Lower middle income | Pakistani rupee | South Asia |

(Source: World Bank)

4.2.2 Definition of variable

This study used two variables mainly Investments and Savings.

Gross domestic savings (% of GDP)

Definition of gross domestic saving: Gross domestic savings are calculated as Gross domestic product (GDP) less final consumption expenditure (total consumption).

(Source; World Bank)

Financial Integration in South Asia: an application of Feldstein-Horioka Puzzle

Investments (% of GDP)

Definition of Investments: Investments has been defined as Gross Fixed Capital Formation as % of GDP. Gross fixed capital formation (formerly gross domestic fixed investment) includes land improvements (fences, ditches, drains, and so on); plant, machinery, and equipment purchases; and the construction of roads, railways, and the like, including schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings.

(Source; World Bank)

Gross fixed capital formation is used since it excludes the procyclical inventories element that can cause spurious correlations with savings (see Bayoumi, 1990; Sinha and Sinha, 2004).

Table 4.2 Investment and saving rates (% of GDP). Average on the period 1981–2009

| Country | I/Y | S/Y | (S-1)/Y |
|-------------------|------------|------------|----------------|
| Bangladesh | 20.02 | 13.27 | -6.75 |
| India | 23.88 | 24.04 | .157 |
| Sri Lanka | 24.42 | 15.27 | -9.15 |
| Nepal | 19.71 | 11.33 | -8.38 |
| Pakistan | 17.11 | 13.37 | -3.74 |

The investment and saving rates in the selected South Asian countries are shown by Table 4.2. In comparison to other countries India has the better saving rate while the investment rate is higher in Sri Lanka. Furthermore, all the countries except India have, therefore, a current account deficit.

CHAPTER 5

METHODOLOGY & EMPIRICAL RESULTS

PANEL DATA

**In the large panel structure “The hope ... is to combine the best of both worlds: the method of dealing with non-stationary data from the time series and the increased data and power from the cross-section”
(Baltagi and Kao, 2000)**

Panel of data or longitudinal data is such a data set which comprises of both time series and cross-sectional elements. Therefore, it permits the inclusion of data for N cross- sections (e.g countries, firms) and T time periods (e.g years, quarters).A short panel data set has many entities but a small number of time periods (small T), while a long panel has many time periods (large T) but a small number of entities (Cameron and Trivedi 2009: 230).

5.1 Panel data model

Econometrically, a simple linear model can be described in the following equation

$$Y_{it} = \alpha + \beta X_{it} + \mu_{it}$$

Here

Y_{it} is the dependent variable,

α is the intercept term,

β is a $k \times 1$ vector of parameters to be estimated on the explanatory variables,

X_{it} is a $1 \times k$ vector of observations on the explanatory variables

Y_{it} and X has both i and t subscripts for $i = 1, 2, 3, \dots, N$ sections and $t = 1, 2, \dots, T$ time periods.

In this thesis lower middle income and low- income countries³ are used so to show differences in their behavior the model becomes

$$Y_{it} = \alpha_i + \beta X_{it} + \mu_{it}$$

Where, α_i differ for each country

5.2 Advantages of using panel data

Following are the advantages of using panel data.

- Allow identifying effects that cannot be distinguished in simple cross-section or time series data.
- Provide efficient estimations of parameters.
- Make more information available, hence more degrees of freedom.
- Allow controlling for individual heterogeneity (to some degree).
- Less multicollinearity
- Its double dimension (individual & temporal) eliminates the weakness of unit root and cointegration tests with a limited dataset that is faced in time series (Salanie´ (1999)).

³ Pakistan, Sri lanka and India are lower middle income while Nepal and Bangladesh are low-income countries.

5.3 Panel Unit Root Tests

A wide range of measures for the analysis of panel unit roots have been developed. The importance in this development is the effort to connect information from the time-series dimension with that acquired from the cross-sectional dimension with the expectation that inference about the existence of unit roots and cointegration can be made more simple, more straightforward and precise by taking account of the latter.

Recent literature advocates that panel-based unit root tests have higher power as compared to unit root tests based on individual time series.

Tests with Common Unit Root Process

Levin, Lin, and Chu (LLC) and Hadri tests both assume that there is a common unit root process.

Tests with Individual Unit Root Processes

The Im, Pesaran, and Shin, and the Fisher-ADF and PP tests all allow for individual unit root processes. The tests are all describing by the combining of individual unit root tests to derive a panel-specific result.

The following table summarizes the null hypothesis and the alternative hypothesis for each of the five panel unit root tests.

Table 5.1: Unit root tests (Null & alternative hypothesis)

| Test | Null Hypothesis | Alternative hypothesis |
|----------------------|-----------------|--|
| Levin, Lin and Chu | Unit root | No Unit Root |
| Im, Pesaran and Shin | Unit root | Some cross-sections Without unit roots |
| Fisher-ADF | Unit root | Some cross-sections Without unit roots |
| Fisher-PP | Unit root | Some cross-sections Without unit roots |
| Hadri | No Unit Root | Unit root |

Note: For Hadri's test (2000), unit root hypothesis is the alternative hypothesis.

5.3.1 Levin, Lin and Chu (LLC) Test (2002)

One of the first unit root tests to be developed for panel data is that of Levin and Lin (1992, 1993) and Levin, Lin and Chu (2002)⁴. Their test is based on the analysis of the equation:

$$\Delta Y_{i,t} = \alpha_i + \rho Y_{i,t-1} + \sum_{k=1}^n \phi_k \Delta Y_{i,t-k} + \delta_i t + \theta_t + \mu_{it}$$

This model allows for two-way fixed effects (α_i, θ_t). The model incorporates a time trend as well as individual and time specific effects. Similar to the majority of the unit root tests in the literature, LLC suppose that the individual procedures are cross-sectionally independent.

Null-Hypothesis

The null hypothesis for LLC test is

$$H_0 : \rho = 0$$

$$H_1 : \rho < 0$$

LLC consider as an extension of DF test with different lag lengths across the different sections in the panel.

Drawback of LLC:

It restricts ρ to be homogeneous for all observations.

⁴ Levin and Lin developed their test in first time in 1992. In 1993 they provide some new results as these tests are intended to take care of the problem of heteroscedasticity and autocorrelation. Their paper was finally published in 2002 (Levin, Lin and Chu, 2002) gather major outcome of their researches.

Table 5.2: The result of Levin, Lin and Chu (2002) test

| at Level | | | |
|-------------------------------------|----------------------|------------------------------|------------|
| Variables | Without Trend | Trend & Intercept | Lag |
| Saving Rate | -1.00647 | 1.06365 | 1 |
| Investment Rate | .32421 | -.82396 | 1 |
| at 1st Difference | | | |
| Variables | Without Trend | Trend & Intercept | Lag |
| Saving Rate | -3.29171*** | -1.96816** | 1 |
| Investment Rate | -2.42713*** | -.45353 | 1 |

Note: *** Indicates the rejection of the null hypothesis of non-stationary at 1%

** Indicates the rejection of the null hypothesis of non-stationary at 5%

* Indicates the rejection of the null hypothesis of non-stationary at 10%

The results of Table 4.2 show that saving rate and investment rate are non-stationary at the level. In the level form, the null hypothesis of non-stationarity is not rejected at different levels of significance. However both of them become stationary in the first difference form (I (1)). At first difference they become stationary at 1% without adding trend and intercept.

5.3.2 Im, Pesaran and Shin (IPS) Test (2003)

Im–Pesaran–Shin (IPS, 1997) extends the LLC test to allow for heterogeneity in the value of ρ_i under the alternative hypothesis. Their test is based on the following equation:

$$\Delta Y_{i,t} = \alpha_i + \rho_i Y_{i,t-1} + \sum_{k=1}^n \phi_k \Delta Y_{i,t-k} + \delta_i t + \theta_t + \mu_{it}$$

Null-Hypothesis

The null hypothesis for IPS test is

$$H_0 : \rho_i = 0 \text{ for all } i$$

$$H_1 : \rho < 0 \text{ for at least one } i$$

Thus under the null hypothesis, all series are non-stationary processes while under the alternative, a fraction of the series is assumed to be stationary. Contrary to IPS test, LLC assumes that all series are stationary under the alternative hypothesis.

Table 5.3: The result of Im, Pesaran and Shin

| at Level | | | |
|--------------------------|---------------|-------------------|-----|
| Variables | Without Trend | Trend & Intercept | Lag |
| Saving Rate | -.64662 | -.14270 | 1 |
| Investment Rate | -.49330 | -.99238 | 1 |
| at 1st Difference | | | |
| Variables | Without Trend | Trend & Intercept | Lag |
| Saving Rate | -6.09871*** | -4.55219*** | 1 |
| Investment Rate | -4.99828*** | -3.50116*** | 1 |

Note: *** Indicates the rejection of the null hypothesis of non-stationary at 1%

** Indicates the rejection of the null hypothesis of non-stationary at 5%

* Indicates the rejection of the null hypothesis of non-stationary at 10%

Table 5.3 reports the results of IPS. It indicates that IPS fails to reject the unit root null for both the variables in level form but it rejects the null of a unit root in difference form. As results shows that saving rate and investment rate become stationary at 1% without adding trend and intercept. These results confirm the findings of LLC.

5.3.3 The Fisher’s type test: Maddala and Wu (1999) and Choi (2001)

Fisher-ADF and Fisher-PP tests are defined by Maddala and Wu (1999) and Choi (2001) as they consider the shortcomings of both the LLC and IPS frameworks. Non parametric Fisher type test is based on a combination of the P-values of the test-statistics for a unit root in each cross-sectional unit⁵.

Table 5.4: The result of ADF Fisher Unit Root

| at Level | | | |
|-------------------------------------|----------------------|------------------------------|------------|
| Variables | Without Trend | Trend & Intercept | Lag |
| Saving Rate | -0.62016 | -0.20011 | 1 |
| Investment Rate | -0.41804 | -0.93018 | 1 |
| at 1st Difference | | | |
| Variables | Without Trend | Trend & Intercept | Lag |
| Saving Rate | -5.69495*** | -4.25925*** | 1 |
| Investment Rate | -4.88066*** | -3.45288*** | 1 |

Note: *** Indicates the rejection of the null hypothesis of non-stationary at 1%

** Indicates the rejection of the null hypothesis of non-stationary at 5%

* Indicates the rejection of the null hypothesis of non-stationary at 10%

For the ADF Fisher Unit Root & PP Fisher Unit Root, the results are reported in Table 5.4 & 5.5 respectively. The results in the above table show that both the variables are stationary at first difference, proving that the series are integrated of order one, I (1).

⁵ Maddala and Wu (1999) note that “IPS test is for testing the significance of the results from N independent tests of a hypothesis”. Pooling on the basis of significance levels (p-value) is a common practice under the title ‘Meta Analysis’ (see Tippett(1931), Fisher(1932), Becker(1977), and Hedges and Olkin(1985)).

Table 5.5: The result of PP Fisher Unit Root

| at Level | | | |
|-------------------------------------|----------------------|------------------------------|------------|
| Variables | Without Trend | Trend & Intercept | Lag |
| Saving Rate | -.61135 | -1.50804* | 1 |
| Investment Rate | .74503 | .16788 | 1 |
| at 1st Difference | | | |
| Variables | Without Trend | Trend & Intercept | Lag |
| Saving Rate | -9.45856*** | -8.88125*** | 1 |
| Investment Rate | -6.41811*** | -5.35872*** | 1 |

Note: *** Indicates the rejection of the null hypothesis of non-stationary at 1%

** Indicates the rejection of the null hypothesis of non-stationary at 5%

* Indicates the rejection of the null hypothesis of non-stationary at 10%

In accordance with table 4.5, saving rate become stationary at level contrary to other tests. However the results confirms that saving and investment rate are stationary in the first difference form (I (1)) as both the variables are stationary at 1% .

5.3.4 Hadri (2000) test

Hadri (2000) permits an easy formulation for a residual based Lagrange Multiplier (LM) test which is an extension of stationarity test for time series of Kwiatkowski *et al.* (1992). It suggests a parameterization which gives an adequate illustration of both stationary and non stationary variables. It can be represented as

$$y_{it} = \hat{z}_{it}\gamma + r_{it} + \varepsilon_{it}$$

Where

\hat{z}_{it} is the deterministic component

Financial Integration in South Asia: an application of Feldstein-Horioka Puzzle

r_{it} is a random walk

ε_{it} is a stationary process

The statistics are asymptotically distributed as standard normal with rejection area on the left hand side in all the tests (LLC, IPS, and Fisher) except on the Hadri test where it is right sided.

Table 5.6: The result of Hadri test

| at Level | | | |
|-------------------------------|---------------|-------------------|-----|
| Variables | Without Trend | Trend & Intercept | Lag |
| Saving Rate | 5.77309*** | 2.95718*** | 1 |
| Investment Rate | 5.16961*** | 2.42608*** | 1 |
| at 1 st Difference | | | |
| Variables | Without Trend | Trend & Intercept | Lag |
| Saving Rate | -.56938 | 1.82738** | 1 |
| Investment Rate | -.41060 | .37595 | 1 |

Note: *** Indicates the rejection of the null hypothesis of non-stationary at 1%

** Indicates the rejection of the null hypothesis of non-stationary at 5%

* Indicates the rejection of the null hypothesis of non-stationary at 10%

The table 5.6 reports the widely used Hadri-Z test statistic, which, as opposed to the aforementioned (LLC, IPS, Fisher) tests, uses a null hypothesis of no unit root & alternative hypothesis of unit root. The results of this test are consistent with those of LLC, IPS, ADF Fisher unit root & PP Fisher unit root. It rejects the null hypothesis (stationarity) in favor of a unit root for both the variables in level form. However, they then become stationary in the first difference form (I (1)).

5.4 Comparison of unit root tests

| Test | Model specification | Advantages (+) /Disadvantages (-) | Characteristics |
|------------|---|--|--|
| LLC | <ul style="list-style-type: none"> • Individual effects • Time trends • Structure of the errors are heterogeneous serial correlation | <p>+ Unbalanced panels are acceptable with further simulations.</p> <ul style="list-style-type: none"> - Infinite number of groups required. - It is assumed that all groups have the similar type of non-stochastic components. - In the individual ADF regressions, critical values are sensitive to the lag lengths. - It is not permitted that some groups have a unit root and others do not have a unit root | <ul style="list-style-type: none"> • Pooled test • More appropriate for panel of moderate size (10 < N < 250 and 25 < T < 250) • Loss of power when time trends are incorporated |
| IPS | <ul style="list-style-type: none"> • Individual linear trend • Structure of the errors are heterogeneous serial correlation | <p>+ Unbalanced panels are acceptable with further Simulations.</p> <ul style="list-style-type: none"> - Infinite number of groups required. - It is assumed that all groups have the similar type of non-stochastic components. - In the individual ADF regressions, critical values are sensitive to the lag lengths. - It is not permitted that some groups have a unit root and others do not have a unit root | <ul style="list-style-type: none"> • Averaged t-test • Loss of power when time trends are incorporated • In general, it is more powerful than LLC and Fisher tests |

Financial Integration in South Asia: an application of Feldstein-Horioka Puzzle

| Test | Model specification | Advantages (+) /Disadvantages (-) | Characteristics |
|---------------|---|--|---|
| Fisher | <ul style="list-style-type: none"> • Individual fixed effects and time trend • Structure of the errors are heterogeneous serial correlation | <p>+ Unbalanced panels are acceptable.</p> <p>+ It can be carried out for any unit root test.</p> <p>+In the individual ADF regressions, different lag lengths can be used.</p> <p>-The p-value have to be derived by Monte Carlo simulations</p> <p>-With serial correlated errors, size distortion problem</p> | <ul style="list-style-type: none"> • Combination test. • Loss of power when time trends are incorporated. • More powerful than LLC |
| Hadri | <ul style="list-style-type: none"> • individual specific variances and correlation patterns | <p>+Avoids oversized tests due to incorporating not only N but also T asymptotic</p> <p>+ Asymptotic distribution moments of the test are exactly derived.</p> | <ul style="list-style-type: none"> • Residual based LM test |

5.5 Panel cointegration tests

Given that both the variables under investigation are integrated of order one, now the next part of the process is to test whether there is a statistically acceptable cointegration relationship between the saving and investment rates.

The motivation of cointegration is the provision of examining the problem of spurious regressions which normally observe in the presence of non-stationarity while the idea of cointegration is that if two variables are related according to economic theory, they will not part away in the long run.

Three panel cointegration tests are used to test for the existence of cointegration between the saving and investment rates.

- The Kao Test
- The Pedroni Tests
- The Johansen Fisher Panel Cointegration Test

5.5.1 Residual-Based Cointegration Tests

The residual-based tests build on the basis of the Engle and Granger (1987) test in time series structure and utilize residuals of the panel static regression to create the test statistics.

5.5.1.1 Kao test (1999)

Kao (1999) presents two tests for cointegration

- DF type tests
- ADF type tests

Kao's test considers the special case where cointegration vectors are homogeneous and indicates that the asymptotic distribution of these statistics will converge to a standard normal one $N(0, 1)$.

Model

Kao's model is given below:

$$Y_{it} = \alpha_i + \beta X_{it} + e_{it}, \quad i = 1, \dots, N, \quad t = 1, \dots, T$$

Where

$$Y_{it} = Y_{it-1} + \mu_{it}$$

$$X_{it} = X_{it-1} + \varepsilon_{it}$$

α_i are the fixed effects varying across the cross-section observations

β is the slope parameter common across i

Y_{it} & X_{it} are random walks

While the residual based cointegration can be shown as

$$\hat{e}_{it} = \rho \hat{e}_{it-1} + u_{it}$$

Hypothesis

H_0 = No cointegration

H_1 = Cointegration

Table 5.7: The result of Kao Residual Cointegration Test

| | t-Statistic | Prob |
|-----|-------------|--------|
| ADF | -3.128045 | 0.0009 |

The results of Kao test shows that saving rate and investment rate are cointegrated as p values rejected the null hypothesis of no cointegration at 1%. Kao's results indicate the low capital mobility in South Asian countries as a result of segmented capital markets.

5.5.1.2 The Pedroni Tests

Pedroni (1999, 2004) proposes seven tests for cointegration that permit considerable heterogeneity in panel data models. The good feature of Pedroni tests is that they pool only the information relating to the likely existence of the cointegrating relationship that comes from the statistical properties of the estimated residuals.

Model

Pedroni's model has the following form

$$Y_{it} = \alpha_i + \delta_i t + \beta_{1i} x_{1it} + \beta_{2i} x_{2it} + \dots + \beta_{ki} x_{kit} + e_{it}$$

$$i = 1 \dots N, \quad t = 1 \dots T, \quad k = 1 \dots K$$

Where

T is the number of observations over time

N is the number of units in the panel

K is the number of regressors

In his early work, Pedroni (1995, 1997) investigated the characteristics of tests for the null of no cointegration in panels with homogeneous cointegrating vectors. But due the problem of this approach, Pedroni (2004) considers residual-based test statistics for the null of no cointegration in the general case of fully endogenous regressors, no pooled slope coefficients and varying dynamics.

Hypothesis

H_0 = No cointegration

H_1 = Cointegration

Table 5.8: The result of Pedroni Residual Cointegration Test

| <u>Sample</u> | <u>Statistic</u> | <u>Prob.</u> |
|---------------------|------------------|--------------|
| Within-dimension | | |
| Panel v-Statistic | 3.371515 | 0.0014 |
| Panel rho-Statistic | -1.927015 | 0.0623 |
| Panel PP-Statistic | -1.795274 | 0.0796 |
| Panel ADF-Statistic | -3.461146 | 0.0010 |
| Between-dimension | | |
| Group rho-Statistic | -1.583806 | 0.1138 |
| Group PP-Statistic | -1.451506 | 0.1391 |
| Group ADF-Statistic | -2.555311 | 0.0152 |

These seven tests are proposed to capture the within & between effects. First four of the tests are within-dimension statistics and based on pooling the AR coefficients across the different countries of the panel for the unit root tests on the residuals. The last three tests are between-dimension statistics and based on averaging the AR coefficients for each country of the panel for the unit root tests on the residuals.

Pedroni (1999) explains it as “The first of the simple panel cointegration statistics is a type of non-parametric variance ratio statistics. The second is a panel version of a non-parametric statistics that is analogous to the familiar Phillips Perron rho statistics. The third statistics is also non-parametric and is analogous to the Phillips and Perron t-Statistics. The fourth statistics is the simple panel cointegration statistics which is corresponding to augmented Dickey-Fuller t-statistics. The rest of the statistics are based on a group mean approach. The first of these is analogous to the Phillips and Perron rho-statistics and the last two analogous to the Phillips and Perron t-statistics and the augmented Dickey-Fuller t-statistics respectively.”⁶

The Pedroni tests are one sided and all the statistics mentioned above have a critical value of -1.64 with the exception of the v-Statistic. This shows that if the statistical value is greater than -1.64 then null hypothesis of no cointegration is rejected. Contrary to the other tests, v-Statistic has a critical value of 1.64 that means that null hypothesis is rejected when statistical value is greater than 1.64.

The results of the Table 4.8 indicates that out of seven, five tests show that saving rate and investment rate are cointegrated. By considering p-values of the tests, Panel v-Statistic, Panel rho-Statistic, Panel PP-Statistic & Panel ADF-Statistic rejected the null hypothesis of no cointegration at 1%, 10%, 10% & 1 % respectively. While in case of group statistics group rho-Statistic & group PP-Statistic accepts the null hypothesis of no cointegration but group ADF-Statistic rejects the null hypothesis at 5%.

Moreover, the results of Pedroni tests show that the series are cointegrated. The fact that the series are cointegrated can be deemed evidence that international capital flows are weak between South Asian countries. These findings validate the existence of Feldstein Horioka Puzzle for South Asian countries.

⁶ Pedroni, 1999, p 658

Table 5.9: Properties of Residual-based Cointegration Tests

| | KAO (1999) | PEDRONI (2004) |
|-------------------|--|---|
| Properties | <ul style="list-style-type: none"> • Residual tests. • <i>DF</i> and <i>ADF</i> type tests. • Standard normal limiting distribution. • When T and N are small, all tests have little power. • When T is small (e.g. $T = 10$) and N is large, all of the tests have a large size distortion and little power. • When T increases to at least 25 for all N, the size distortion begins to disappear quickly. | <ul style="list-style-type: none"> • Residual tests. • Standard normal limiting distributions. • $T > 100$ all statistics have the same power. • $T < 20$ most powerful is the group t-statistic. • No exogeneity requirements are obligatory for the regressors of the cointegrating regressions. • They pool only the information relating to the likely existence of the cointegrating relations. |

Table 5.10: Comparison of Residual-based Cointegration Tests

| Test | Hypothesis | Model specification |
|----------------------------------|---|---|
| <i>KAO (1999)</i> | <ul style="list-style-type: none"> • Null hypothesis of no cointegration • Homogeneous alternative | <ul style="list-style-type: none"> • varying intercepts • common slopes • identical long-run variance-covariance matrix for all of the cross-section observations • <i>LSDV</i> estimator |
| <i>PEDRONI (2004)</i> | <ul style="list-style-type: none"> • Null hypothesis of no cointegration • Heterogeneous alternative (tests based on the between dimension) | <ul style="list-style-type: none"> • varying dynamics • heterogeneous fixed (individual and time) effects • heterogeneous trend terms |

5.5.2 Johansen Fisher Panel Cointegration Test

Johansen (1988) suggests two special approaches to find out the existence of cointegration vectors in non stationary time series.

- Likelihood ratio trace statistics
- Maximum eigenvalue statistics

Financial Integration in South Asia: an application of Feldstein-Horioka Puzzle

For Trace Statistics

H_0 = At most r cointegrating vectors

H_1 = r or more cointegrating vectors

For Maximal Eigen Value statistics

H_0 = At most r cointegrating vectors

H_1 = r + 1 cointegrating vectors

Fisher (1932) developed a combined test that utilizes the results of the individual independent tests. Maddala and Wu (1999) using Johansens (1988) test and employing Fisher's result to present an alternative approach to test cointegration in panel data by combining tests from individual cross-sections to acquire test statistic for the full panel.

Table 5.11: The result of Johansen Fisher Panel Cointegration Test

| Hypothesized | Fisher Stat.* | | Fisher Stat.* | |
|--------------|-------------------|--------|-----------------------|--------|
| No. of CE(s) | (from trace test) | Prob. | (from max-eigen test) | Prob. |
| None | 46.26 | 0.0000 | 38.58 | 0.0000 |
| At most 1 | 24.61 | 0.0061 | 24.61 | 0.0061 |

* Probabilities are computed using asymptotic Chi-square distribution

The results of the table 5.11 indicate that there is one cointegrating vector between saving rate and investment rate. P-values show that the null hypothesis of no cointegration is rejected in favor of one cointegrating vector.

All the three panel cointegration tests confirm the existence of cointegration between the saving and investment rates resulting in low degree of financial market integration as proposed by Feldstein and Horioka.

CHAPTER 6

CONCLUSION & SUGGESTIONS

6.1 Conclusion

The puzzles of International macroeconomics are the perplexing stylized facts that are inconsistent with theories. The results of this study shed light on the Feldstein-Horioka puzzle, at least for the South Asian countries. The main objective is to re-examine the Feldstein-Horioka findings by studying different data samples and periods with the help of using different estimation methods in order to show that the Feldstein-Horioka puzzle still exists today. The continuing interest in the puzzle raises the obvious question of whether the apparently high capital mobility of recent decades is a chimera or an elusive reality. This issue matters because capital mobility is critical both for the efficient allocation of capital to the most productive uses and locations and for consumption smoothing. The attractions of the FH approach are its intuitive simplicity and data availability.

Our results confirm the Feldstein-Horioka findings by studying the degree of financial integration of 5 South Asian countries from 1981 to 2009. The existence of long-run relationship between domestic saving and investment rates remains a pervasive regularity in the data. Therefore, for the South Asian countries in the long run, the Feldstein-Horioka puzzle remains a puzzle as saving-investment relation is also not compatible with the increasing degree of capital mobility. Virtually savings of a country is also invested in that country. The high correlation between domestic savings and investment can be interpreted as implying segmented capital markets or low capital mobility in South Asian countries. This argument is evidence against the high capital mobility because in case of high international capital mobility capital flows among countries make equal the yield of investors, so it is not essential for domestic savings and investments to be associated.

The results of our study is in conformance of Feldstein- Horioka (1980), Feldstein (1983), Bayoumi (1990), Tesar (1991), and Coiteux and Olivier (2000) in order to show significant relationship between domestic saving and investment.

6.2 Suggestions

1. During the conduct of this study, only Feldstein- Horioka approach with same variables is followed. Therefore, other remarkable presumption is likely to incorporate in the further research in order to make it more comprehensive.
2. In this research, I observe the Feldstein- Horioka Puzzle for South Asian countries. However, it can be observed for other regions for different time period with different econometric technique.

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Financial Integration in South Asia: an application of Feldstein-Horioka Puzzle

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