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# Financial Market Integration of South Asian Countries: Panel data Analysis

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# "Financial Market Integration of South Asian Countries: Panel Data Analysis"

**Abstract:**

According to Frankel (1992) in order to find financial integration from Feldstein Horoika (FH, 1980) model, the real interest parity must hold. This paper estimates the degree of financial market integration of South Asian countries i.e. Pakistan, India, Bangladesh, Sri Lanka and Nepal with both the techniques. The study finds some degree of integration with FH model has which increased after 1990s, post liberalization period. Furthermore, Panel Unit Root techniques i.e. LLC, IPS and Hadri has been used to estimate the real interest rate differentials (RIDs) of South Asian countries are found to be stationary with USA, Canada, UK, Germany, Sweden, Netherland, Australia, Malaysia, Indonesia, South Korea, Singapore, China and Japan. The empirical evidence of integration with both the techniques in my study is unique in the literature. Even though, the RIDS technique provides strong evidence of integration, correlation between savings and investment is still significant.

## 1.1    INTRODUCTION

In the era of Globalization and information technology, countries have come closer to each other. The volume of merchandized trade and mobility of capital flows have been enhanced. Investors are able to diversify their portfolios by investing their capital almost anywhere in the world. The emerging markets are eliminating capital controls and introducing market friendly policies to attract foreign capital flows in the form of foreign direct investment or the equity flows. Free and perfect capital mobility refers to highly integrated financial markets.

The degree of capital mobility or financial integration is vital to be known for macroeconomic models. The degree of market integration can be estimated with interest parity conditions, saving-investment correlations of Feldstein and Horoika (1980) and degree of monetary autonomy[1]. Frankel (1992) mentions that if there is low correlation between savings and domestic investment, real interest parity must hold. My study contributes to the literature by applying both these techniques to the panel of South Asian countries. This is also the first study on South Asian markets to the best of my knowledge. Furthermore I applied liberalization dummies and estimated country slope dummies to find whether there is asymmetry in the correlation of savings and investments.

FH (1980) used panel data of 21 OECD countries from 1960-1974 and found controversial result that the domestic savings coefficient in investment is almost one implying capital immobility. Feldstein (1983) added post OPEC years in regression and found same results. Penati and Dooley (1984) estimated same results and argued that since incremental savings remain in home country so capital is not very mobile. Dooley et al. (1987) used data from 64 industrialized and developing countries 1960-1984 and found higher savings coefficient. Bayoumi (1990) also confirmed the results of FH (1980) but held government policy responsible for this correlation.

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[1] Edwards and Khan S (1985)

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Haque and Montiel (1991) estimated degree of financial openness in developing countries and found higher integration. Yamori (1995) found higher savings coefficient but argues that it's due to non- zero currency premium similar to Frankel (1991, 1992). Jansen (1996) found stationary current account to be the reason of FH (1980) findings.

Coakley et al. (2001) used panel unit roots and cointegration techniques using quarterly data on 12 OECD countries 1980-2001 found that savings and investment are I(1) and generally do not cointegrate. Chakrabarti Avik (2006) used annual data of 126 countries and found positive and significant association between savings and investment. But interestingly found lower coefficient for non OECD countries than OECD. Cooray and Sinha (2007) used data for 20 African countries and found high correlation using Johansen and fractional cointegration tests. Adedeji and Thornton (2008) used pooled data for 50 developed and developing countries for the period 1970-2000 and found that savings and investment are non stationary and cointegrated but also found differences in savings retention ratios.

The real interest rate parity hypothesis (RIPH) states that if the agents are rational and arbitrage forces are free to act in goods and assets markets, then real interest rates between countries will equalize. According to Ferreita et al. (2007) there are few studies which have tested RIPH through Unit Root analysis on RIDs.[2] But the literature does not offer conclusive answer.

This is obvious from literature on both the techniques provided different results. The results remained mixed as shown by literature. I noticed there is hardly any work which has provided estimates from more than one technique as suggested by Frankel (1992). My study intends to fill this gap.

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[2] Meese and Rogoff (1988), Edison and paul (1993), Obstfeld and Taylor (2002), Mancuso et al. (2003) and Goldberg et al. (2003)

. The South Asian countries i.e. Pakistan, Bangladesh, India, Sri Lanka and Nepal started financial liberalization process in the early 1990s.[3] The region is important since the aggregate net flows to this region increased since mid 1980s.[4] It reached $9.3 Billion in 1989. According to Global Development Finance (2006) private capital flows to South Asia more than doubled since 2000. They reached $23.6 billion in 2005 as compared to $9.7 billion in 2000. The FDI increased to $8.4 billion in South Asia, an increase of $1.2 billion since last year. The report mentions that India received major share of capital flows to South Asia. The Liberalization efforts in the 1990s and the subsequent surge in the capital flows to South Asian countries make them a special candidate to study.

The study intends to use panel of South Asian countries to examine integration of financial markets in these countries. Furthermore, it also measures the impact of liberalization on integration whether it increased or not?

The present study also adjusts some of the econometric criticism levied against FH (1980) and observes whether the estimates remain the same when the model is adjusted accordingly. Evaluating the overall results from all the techniques will make the final conclusion.

## 1.2 ORGANIZATION OF STUDY

The study has been analyzed and arranged as follows:

In section 1 introduction and main objectives of the study are provided.  In section 2, the estimates of descriptive statistics are discussed. The average savings and investments pertaining to individual South Asian countries are calculated. Section 3 provides the detailed methodology pertaining to Feldstein Horoika, and real interest rate differential test. The variable wise data sources and discussion of the methodologies to overcome the shortcomings have been provided.

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[3] Bekaert, Harvey and Lundblad (2000)

The original form of equations and the expected signs are briefly discussed. Section 4 pertains to the interpretation of empirical findings and the comparison of panel data results with various techniques. Last chapter contains concluding remarks and possible policy implications for South Asian economies.

## 2.2 PATTERN OF SAVING AND INVESTMENT IN SOUTH ASIA

Feldstein and Horioka (1980) model is primarily based on domestic saving and Investment Relationship. Therefore it is necessary to observe average saving and investment. The decade-wise changes in the saving-investment to GDP ratios are discussed below.

The average saving and investment to GDP ratio in Bangladesh are 10% and 18%, respectively, for the period 1970-99. In 2000 the S/Y and I/Y increased and their gap decreased to -5.7. In each decade, the ratio of savings and investment to GDP increased and indicate stable pattern overtime.

In India, savings and investment to GDP ratios were highest in the whole region. Both the ratios showed a stable pattern and a slight increase over decades. The saving-investment gap for India is also lowest in the region estimated as 1.67% of the GDP showing very low dependence on Foreign Capital. It clearly shows that domestic savings could finance most of the Domestic Investment in the case of India.

In the case of Nepal, saving investment gap is 12.74 of the GDP in 2000s, highest in region. Although savings to GDP ratio increased over time except in 2000s, the ratio of investment to GDP increased more than that. In the 2000s investment to GDP ratio was at ever-highest level of 23.6%.

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[4] For details see Hussian and Jun (1992)

Average saving and Investment to GDP ratio in Pakistan is estimated as 16 and 17.8 percent to GDP ratio in 2000s. The S/Y increased but I/Y decreased in 2000s as compared to 1990s. But the savings investment gap decreased sharply to 1.81 in 2000s from 11 in the 1990s. But this gap in 2000s remained more volatile than 1990s since CV is very high in 2000.

In Sri Lanka the average I/Y and S/Y are estimated to be 24.8 and 16.26 respectively. The I/Y is 2nd highest after India in the region in 2000s. The savings-investment to GDP gap was zero in

**Table 2: Savings Investment to GDP ratios in South Asia**

| Country | S/Y | CO-VAR. | I/Y | CO-VAR. | S-I/Y | CO-VAR |
|---|---|---|---|---|---|---|
| **1970s** | | | | | | |
| Bangladesh | 7 | 29.64 | 15 | 24.72 | -8 | -22.78 |
| India | 19 | 5.69 | 20 | 7.15 | -1 | -89.64 |
| Nepal | 9 | 32.65 | 14 | 23.47 | -4 | -66.71 |
| Pakistan | 11 | 8.52 | 17 | 8.39 | -6 | -9.05 |
| Sri Lanka | 13 | 7.51 | 19 | 23.47 | -6 | -66.71 |
| **1980s** | | | | | | |
| Bangladesh | 10 | 11.16 | 20 | 5.24 | -10 | -14.28 |
| India | 20 | 3.75 | 22 | 3.23 | -2 | -5.67 |
| Nepal | 11 | 4.14 | 19 | 23.47 | -8.0 | -21.28 |
| Pakistan | 8 | 8.56 | 16 | 10.76 | -8 | -26.47 |
| Sri Lanka | 13 | 4.98 | 13 | 21.2 | -12 | -21.28 |
| **1990s** | | | | | | |
| Bangladesh | 13 | 6.81 | 19 | 3.79 | -6 | -8.62 |
| India | 21 | 1.82 | 23 | 1.46 | -2 | -24.75 |
| Nepal | 12 | 10.49 | 22 | 7.22 | -10 | -4.54 |
| Pakistan | 8 | 6.3 | 19 | 0.55 | -11 | -4.73 |
| Sri Lanka | 15 | 7.13 | 15 | 7.22 | -0.07 | -4.54 |
| **2000-2006** | | | | | | |
| Bangladesh | 17.8 | 3.2 | 23.7 | 2.94 | -5.7 | -10.83 |
| India | 26.96 | 11.86 | 28.6 | 14.15 | -1.67 | -53.43 |
| Nepal | 10.9 | 22.6 | 23.6 | 9.9 | -12.74 | -23.6 |
| Pakistan | 16.03 | 8.3 | 17.8 | 10.7 | -1.81 | -175.39 |
| Sri Lanka | 16.26 | 6.6 | 24.8 | 12.44 | -8.51 | -25.53 |

1990s but increased to 8.51 which show that in the 20000s Sri Lanka is depending more on other sources to finance this gap and the relationship between savings and investment is weak.

India is the only country where saving-investment gap remained lowest around –2 in the 1980s and the 1990s. It decreased to 1.6 in 2000s. It means that the domestic saving is financing most of the domestic investment and dependence on foreign capital is relatively low in the case of India. In Pakistan, saving-investment gap increased over time and reached –0.11 or 11% in the 1990s, which stood highest in the region in the 1990s. But it decreased in 2000s to 1.81, $2^{nd}$ lowest after India in region.

Sri Lanka's saving-investment gap increased in the 1980s and it was highest in the region in this decade, which deceased in the 1990s. It increased in 2000s. Bangladesh is the only country for which saving-investment gap deceased over time. It increased in the 1980s but it reduced considerably in every decade later and in 2000s its average is 5.7.

I can say overall the capital flows increased in South Asian countries in 2000s and furthermore the savings investment patterns provide very interesting information every decade. It seems important to estimate the degree of financial integration of South Asian countries and it's over time change.

# 3. METHODOLOGY AND DATA SOURCE

## 3.1 Methodology

### 3.1.1 The Saving-Investment Approach

Feldstein and Horoika (1980) estimated the following equation for panel of OECD countries:

$$(GGDI)_{it} = \alpha + \beta (GDS)_{it} + \varepsilon_{it} \tag{1}$$

GGDI is ratio of gross domestic investment to GDP and GDS is the ratio of gross domestic saving to GDP. The null hypothesis of perfect capital immobility is failed to reject if $\beta$ is not significantly different from one and rejected if $\beta$ is not different from zero.

The equation (1) has been estimated for panel of five countries e.g. Pakistan, India, Bangladesh Srilanka and Nepal. This equation has been estimated by ordinary least square (OLS) method. Regressions are also estimated by other panel data techniques like Fixed Effect and Least Square Dummy Variable technique.

In this study, an effort has been made to remove some of the econometric issues raised in literature by incorporating remedial measures to make this approach more applicable for my sample.

### 3.2   Criticism to F-H Approach and Possible Remedial Measures

Dooley (1987), Bayoumi (1990), Feldstein (1983), and Feldstein and Horoika (1980) explained the problem that saving and investment both are strongly procyclical in nature even when they take the form of ratio to GDP. If both rise due to an exogenous shock, the correlation cannot be attributed to low capital mobility.

That's why I have used growth rate of GDP as an explanatory variable. It can take care of possible specification bias due to single variable equation.[5] But its inclusion may reduce the correlation of savings coefficient.

The other common issue is Endogeniety problem. It is said that the government reacts to a trade deficit induced by an increase in investment by slashing down government expenditure or raising

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[5] For details see Summer (1985) and Dooley et al. (1987)

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taxes. In this scenario, saving and investment will be correlated for the reasons other than capital mobility. This is how government policy creates endogeniety.

 Dooley et al. (1987) and Bayoumi (1990) in order to dismantle endogeniety problem used instrumental variables which affect saving but irrelevant for investment. I intend to use savings lag as an instrument and report the results.

Given the above evidence, the following equation will be estimated after the inclusion of growth rate of GDP.

$$GGDI_{it} = \alpha_{it} + \beta_1 GDS_{it} + \beta_2 GG_{it} + +\varepsilon_{it} \tag{2}$$

Whereas GG is the growth rate of panel countries;

The other variable, which is used and suggested by Kim (1993), is openness which is proxied by Imports to GDP ratio. After the inclusion of openness, the regression equation will be of the following form.

$$GGDI_{it} = \alpha_{it} + \beta_1 GDS_{it} + \beta_2 GG_{it} + \beta_3 IMP_{it} + \varepsilon_{it} \tag{3}$$

The selected South Asian countries have introduced liberalization policies and opened their economies in 1990s. First, the fundamental F-H equation shall be estimated. After that time country dummies for intercept and slope will be introduced and incorporated in the regression separately. Another dummy for post liberalization period has been used which is one after 1993 and 0 before 1993.

$$GGDI_{it} = \alpha_1 + \beta_1 GDS_{it} + \beta_2 GG_{it} + \beta_3 IMP_{it} + \alpha_2 D93 + \varepsilon_{it} \tag{4}$$

All the variables are in shape of panel data, pooling cross section and time series of 5 countries.

 GGDI= Ratio of gross domestic investment to GDP; GDS= Ratio of gross domestic Savings to GDP; $\alpha_2 D93$ is slope dummy interacting with GDS, its value is 1 after 1992 and 0  otherwise.

### 3.3 Real Interest rates Differentials Hypothesis (RIPH):

The RIPH states that if the agents make their forecasts using rational expectations and arbitrage forces are free to act in the goods and asset markets, the real interest rates among countries will equalize. However, the empirical literature does not offer a conclusive answer regarding the existence of real interest rate differentials (RIDs). Ferreira et.al (2007) concluded that RIDs are short lived and mean reverting but different from zero in the long run. I intend to use RIDs methodology incorporated by Ferreira et.al (2007) to our sample of South Asian countries. Ferreira et.al (2007) estimated Rids between two countries and applied state of the art unit root tests to check the stationary of the differential. I am using same method with some modifications. I have a panel data for five countries. I have compiled quarterly data from 1980 to 2008 on low risk interest rates and CPI for 5 South Asian countries. The study intends to use Im, Pesaran and Shin (IPS) and Levin, Lin and Chu (LLC) panel unit root tests to check the null hypotheses of a unit root.

Theoretically if agents make their forecasts rationally and arbitrage forces in goods and assets markets are working, real interest parity holds.[6] The arbitrage forces are formalized by uncovered interest parity (UIRP) and relative purchasing power parity (PPP) conditions mentioned in the following equations:

$$i_{it} - i_{it}^{*} = ds_{it}^{e} \quad \text{Where, } i=1, 2\ldots \text{N and } t=1, 2 \ldots\text{T} \tag{5}$$

$$ds_{it} = \pi_{it} - \pi_{it}^{*} \tag{6}$$

$$ds_{it}^{e} = ds_{it} + \varepsilon_{it} \tag{7}$$

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[6] For details see Ferreira et al. (2007)

If PPP holds, one can substitute Equation 9 in to 10 and after manipulation, get the following resultant Equation;

$$i_{it} - i_{it}^* = \pi_{it} - \pi_{it}^* \tag{8}$$

$$(i_{it} - \pi_{it}) - (i_{it}^* - \pi_{it}^*) = rid_{it} = \varepsilon_{it} \tag{9}$$

The $rid_{it}$ may follow the following stochastic process:

$$rid_{it} = a_0 + a_1 rid_{it-1} + \varepsilon_{it} \tag{10}$$

The purpose is to check the stationarity of RID series by applying Panel Unit Root tests. If the RIDs series is estimated to be stationary that implies real interest rates differentials are converging, hence financial markets are integrated. This is the first study to estimate RIDs with panel unit root techniques for South Asian countries which has higher power of the test.

The LLC test assumes that the persistence parameters are same across cross sections. It means that $\psi_i=\psi$ for all $i$. Alternatively, IPS allows $\psi$ to vary across all cross sections.

The LLC model allow for fixed effects and unit specific time trend along with common time effects. The structure of their model is the following:

$$\Delta y_{it} = \alpha_i + \delta_i t + \theta_t + \rho_i y_{i,t-1} + \xi_{it}, \quad \text{i=1, 2 …N, t=1, 2 …T} \tag{11}$$

The unit specific fixed effect is important to capture heterogeneity since the coefficient of lagged dependant variable is homogeneous across all cross sections in equation 15. The LLC tested the null hypothesis: $H_{0:}\rho_i = 0$ for all i against the alternative $H_A : \rho_i = \rho < 0$ for all i. The LLC test assumes that errors are independent across all cross sections.[7]

Im et al. (1997) extended the LLC framework by allowing heterogeneity in $\rho_i$ under alternative hypothesis. First, specify separate Augmented Dickey Fuller (ADF) regression for each cross section, and then take average of the t-statistics for $\rho_i$ from individual ADF regressions. The IPS

test requires specification of the lags and deterministic component for each cross section in their separate ADF regressions.

The Lagrange Multiplier tests of Hadri (2000) has different null hypothesis than other panel unit root tests. It says that all unit roots are stationary which is opposite to LLC and IPS. This is similar to univariate KPSS tests, and the test statistic is distributed standard normal under the null hypothesis. In our case, the comparison of the results from all three types of tests will be interesting to estimate. It will enable me to compare overall and cross section results and furthermore, the opposite null hypothesis will provide strong evidence if the estimated results are same.

## 3.4   Data Source

My main data source for this study is IMF's International Finance Statistics (IFS), World Tables of World Bank and Global Development Finance. Five countries of South Asia, Pakistan, India, Bangladesh, Sri Lanka and Nepal are included in the sample. For two other South Asian countries Maldives and Bhutan, enough time series is not available reason being they are not included in the sample. The data ranges from 1970 to 2007 in time series and we have 5 cross sections countries.

The variable of Gross Domestic Savings and Investments are divided with Gross Domestic Product. The data pertaining to imports of goods and services is also divided with GDP. In case of paneling cross section the data of all the countries is taken in million of US dollars. The data is taken from the same source for consistency.

The interest rates and Consumer Price Index (CPI) data has been taken from IMF (2009) CD. The interest rates are low risk rates mostly Treasury bill rate (TB), Call Money rates and deposit

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[7] For more technical details see Banerjee Anindya (1999)

rates. I have used TB rate for the countries like USA, UK, Singapore, Sweden, Malaysia, Germany, Canada, Japan and Sri Lanka. Whereas for Pakistan and Indonesia Call Money Rate is available. In the case of China I have deposit rate and for India bank rate. The interest rates data and CPI are from 1980-q1 to 2008-q2. They make large enough panel data to estimate Panel Unit root tests.

**4. Estimation and Results**

**4.1 FH Model and its Extension:**

The main results of FH (1980) and the extended model are presented in Table 3. Using data for the period 1970-2006 for 5 cross sections, we have 185 observations. The Panel data techniques have been used. Let's discuss the results in detail. First of all, the original FH (1980) model is reported, model 1 (row 1). The savings Coefficient is estimated to be highly significant and its value is almost 0.60. The model explains almost 50 percent of variations due to one explanatory variable. In second attempt, I used fixed effect model which significantly raises the savings coefficient to 0.8. I estimated the original FH model with GDS (-1) as an instrument first with Least squares form and then with Fixed effect. The coefficient of savings ranges among 0.6 to 0.8 and t values remain very high in all the FH and its extended models. I have mentioned that the original FH model has been criticized in the literature that it is subject to specification bias. I have incorporated GDP growth rate (GG) in the original FH model. The size of GDS significantly decreased to 0.71 as compared to 0.76 in model 2 with the inclusion of GG. The sign of GG is positive implying the fact that higher growth rate brings positive change in the GDI. The R-Sq increased from 0.60 to 0.62. The savings coefficient significantly increased to 0.75 when Panel 2SLS is applied in model 6. The t values of the variables and overall R-square decreased.

Note: In most of these regressions we have used fixed effect model.

Dooley (1987) mentions the importance of Imports to GDP ratio (IMP) variable since it captures the effect of openness. So i add IMP in FH model after adding GG variable. I see significant change in the results of model 7(row 7). The size of GDS significantly decreased to 0.46. The GG variable is not significant even at 10%. The IMP coefficient is highly significant and its sign is positive. I can safely say that GDS significantly explains variations in GDI but when the additional variables are added in the original FH model, the size of GDS decreased from 0.80 to 0.46. The adjusted R-Sq is estimated as 0.88 which is very high in this model. The savings coefficient further decreased to 0.4 when the same model is estimated with Panel 2SLS (model 8, row 8). The GG variable becomes significant with a positive sign. The IMP coefficient increased but its t value decreased but still very high. When the same model is estimated in ordinary form, the savings coefficient estimated to be 0.6. The size of GG coefficient and its t value increased. The size of IMP coefficient and its t value decreased but still highly significant. The savings coefficient ranges in between 0.8 to 0.4 depending on the model specification. In the original FH model, the savings coefficient is estimated to be close to 0.8 but with the addition of GG and IMP, the size significantly reduced. The savings coefficient remains high, 0.8 even when Panel - 2SLS has applied in single variable regression. But in the presence of GG and IMP the savings coefficient decreases to 0.4 with Panel 2SLS model. Higher growth rate and openness are estimated to be positively related to GDI.

In order to capture the effect of liberalization and openness policies, i incorporate dummy variable which is 1 after 1993 and 0 otherwise. According to Bekaert, Harvey and Lundblad (2000) most of the South Asian countries started liberalization in early 1990s.[8]  The results are

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[8] Pakistan's Liberalization date is 1991 where as it is 1992 for India and Sri Lanka.

shown in row 10 of Table 1. I notice that the dummy variable is not significant but all the other variables are significant. The coefficient of GDS is 0.6 which implies the fact that almost 60 percent of GDI has been estimated to be financed by GDS. The overall results remained almost same when I estimated the model with Panel 2SLS (Model 11).

**Table 3: Saving Investment Model for South Asia**

| Form | Method | C | GGDS | GG | IMP | D93 | DS93 | R^2 |
|---|---|---|---|---|---|---|---|---|
| Fixed Effect | Panel-LS | 11.42*<br>[16.28] | 0.62*<br>[13.18] | | | | | 0.5 |
| Fixed Effect | Panel-LS | 9.6*<br>[-10.4] | 0.76*<br>[12.10] | | | | | 0.6 |
| Ordinary | Panel-2SLS | 11.41*<br>[14.91] | 0.63*<br>[12.17] | | | | | 0.5 |
| Fixed effect | Panel-2SLS | 9.13*<br>[9.16] | 0.80*<br>[11.21] | | | | | 0.6 |
| Fixed Effect | Panel-LS | 9.08*<br>[10.4] | 0.71*<br>[11.6] | 0.27*<br>[3.31] | | | | 0.63 |
| Fixed Effect | Panel-2SLS* | 8.61*<br>[8.84] | 0.75*<br>[10.30] | 0.26**<br>[2.96] | | | | 0.62 |
| Fixed Effect | Panel-LS | 2.11*<br>[3.67] | 0.46*<br>[13.20] | 0.08<br>[1.69] | 0.51*<br>[20.18] | | | 0.88 |
| Fixed Effect | Panel-2SLS | 2.57*<br>[4.06] | 0.42*<br>[9.50] | 0.09***<br>[[1.90] | 0.52<br>[19.23] | | | 0.88 |
| Ordinary | Panel-2SLS | 6.06*<br>[9.65] | 0.59*<br>[16.29] | 0.15**<br>[2.32] | 0.24*<br>[14.4] | | | 0.77 |
| Ordinary | Panel-LSDV | 5.86*<br>[9.41] | 0.61*<br>[16.11] | 0.15**<br>[2.30] | 0.24<br>[14.04] | -0.13<br>[-0.28] | | 0.8 |
| Ordinary | Panel-2SLS | 5.95*<br>[8.83] | 0.60*<br>[14.17] | 0.15**<br>[2.28] | 0.23*<br>[13.70] | -0.25<br>[-0.50] | | 0.8 |
| Fixed Effect | Panel-2SLS | -0.7<br>[-0.80] | 0.62*<br>[11.52] | 0.04<br>[1.06] | 0.60*<br>[18.76] | -0.88<br>[-0.88] | -0.09<br>[-1.99]** | 0.91 |

Note: *, **, *** denote significance at 1, 5 and 10 percent respectively.

It is also important to find change in the slope of GDS in the post liberalization period. I have incorporated a slope dummy in model 12 (row 12). The model shows the sign of slope dummy is negative and it's significant which may imply that the relationship between domestic savings and investment weakened in the post liberalization period. It further provides evidence in favor of increased integration after 1990s. The overall intercept and intercept dummy after 1993 both are insignificant.

The $R^2$ is estimated at 0.91 which is very high. The overall results support the moderate degree of integration which increased in the post liberalization as shown by Model 12. But according to model 11 no significant structural shift has been observed after 1993 period.

### 4.1.2 Cross section Dummies and FH model:

It is important to estimate the cross section intercept and slope dummies for this model. It contains important information about difference in cross section behavior. The results are reported in Table 2. Model 1 has overall intercept with 4 intercept dummies (Nepal excluded). It does not have overall GDS so contains 5 slope dummies. Model 2 has both the overall intercept and GDS variables with dummies excluding Nepal. In the Model 3, we added other 2 overall variables GG and IMP. Let's discuss the results now.

In model 1 the intercept dummy is significant for three countries which are Pakistan, Bangladesh and Sri Lanka. The overall and India's intercept dummy is not significant. As far as slope dummies are concerned, they are almost one in the case of India, 0.80 for Bangladesh and 1.5 for Nepal. But in the case of Pakistan and Sri Lanka the slope dummy is insignificant which may imply higher degree of integration since there intercept dummies are positive and significant too. The R-Sq is 0.70.

In model 2, Nepal is excluded to avoid dummy variable trap. Interestingly, the overall results remain same. We can find cross section slope by adjusting the cross section slope coefficient with the overall GDS which is significantly 1.50. In the case of India the slope is almost one, 0.80 in the case of Bangladesh. It is calculated as 0.08 for Pakistan and almost 0.25 in the case of Sri Lanka. The intercept is significant in the case of Pakistan, Sri Lanka and Bangladesh where as it is insignificant for India.

It supports the hypothesis that the degree of integration is higher in the case of Pakistan and Sri Lanka. There is some degree of integration in the case of Bangladesh. But Surprisingly India is not integrated with world financial markets, although is received largest capital flows in the

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region. In model 3, two more explanatory variables have been added e.g. GG and IMP. I incorporated 4 intercept and 5 slope dummies. We found that none of the cross section country has estimated GDS close to one. In the case of Bangladesh the slope dummy is 0.62.

In the case of India and Nepal, it is almost 0.50 which is in between 0 and 1 showing moderate degree of integration. Whereas in the case of Pakistan and Sri Lanka 0.3 and 0.2 respectively. One can say that the degree of integration is higher in the case of Pakistan and Sri Lanka where as its fairly moderate for other countries.

I can conclude about FH model that when used the original FH model the relationship between GDI and GDS is estimated to be higher (0.80). But with the inclusion of other important variables in the model and dummy variables the size of the GDS coefficient significantly decreased which casts doubt on the original FH model with one variable regression.


**Table 4: Dummy variables and FH model**

| Countries | C | GDS | C | GDS | C | GDS | IMP | GG |
|---|---|---|---|---|---|---|---|---|
| Pakistan | 13.75* [6.42] | 0.08 [1.2] | 13.75 [6.32] | -1.43 [-7.73]* | 2.6* [2.5] | 0.27* [6.2] | | |
| India | -3.21 [-1.24] | 1.08* [24.72] | -3.21 [-1.01] | -0.43 [-2.30]** | 4.27* [3.6] | 0.50* [10.30] | | |
| Sri Lanka | 16.20* [3.74] | 0.27 [0.98] | 16.19* [5.36] | -1.24 [-5.52]* | -2.02 [-0.70] | 0.18 [0.96] | | |
| Bangladesh | 5.81** [2.9] | 0.81* [16.5] | 5.8* [3.12] | -0.7 [-4.33]* | 0.2 [0.20] | 0.62* [18.3] | | |
| Nepal | 13.8* [6.42] | 1.5* [8.81] | | | | 0.5* [4.05] | | |
| Overall | 2.93 [1.50] | | 2.93*** [1.8] | 1.5* [10.52]* | 2.61** [2.3] | | 0.5* [11.85] | 0.04 [0.77] |
| Model No. | 1 | | 2 | | 3 | | | |
| R^2 | 0.71 | | 0.71 | | 0.9 | | | |

*, **, *** denote significance at 1, 5 and 10 percent respectively.

The dummy variable for the post liberalization period implies that over the time South Asia integrated with the world although the degree of integration may vary across countries.

## 4.2 Real Interest Parity and integration

I have applied Panel Unit root techniques to check the hypothesis that the real interest rate differentials among Panel of South Asian countries with USA, Canada, UK, Germany, Netherland, Sweden, Australia, South Korea, Indonesia, Malaysia, Singapore, China and Japan. It is said that generally the power of unit root tests is low if the number of observations are low which our case is if we apply country by country basis. I have applied two panel unit root methods, Levin, Lin and Chu (LLC), Im, Pesaran and Shin (IPS) and Hadri tests. Let's report the unit root tables and discuss the results;

Table 5 shows that for most of the cases RIDs have been found to be stationary at the first difference, integrated for order one using two techniques Hadri and LLU. This is the case of Australia, Canada, Germany, UK, USA, Indonesia, Korea, Malaysia and Singapore. But IPS tests shows the RIDS of South Asia with these countries stationary at levels. In the case of China, LLC and IPS show the RIDs is non stationary at levels but Hadri test shows it to be stationary at levels. In the case of Sweden and Netherland LLC and IPS test provide evidence of stationarity at levels but Hadri test found them to be integrated of order 1. This is only for the case of Japan that all the tests found the RIDs series to be integrated of order one. I failed to reject the null of a unit root with Hadri and LLC for 9 countries at levels since the computed probabilities for most of the cases are more than 0.05. Besides, I reject the null hypothesis of unit root here for the overall South Asia since the Probability is almost zero at first difference.

My results strongly support the hypothesis of financial integration. Since the real interest rate differentials are found to be stationary at first difference (short lived) for most of the cases. The order of integration may be different for some countries with three techniques.

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It implies that the financial markets of major South Asian countries are integrated with USA,

UK, Canada, Sweden, Germany, South Korea, Malaysia, Indonesia, Singapore, Japan and China

which are major developed and emerging economies of the world.

**Table5: Stationarity of Real interest rate differentials**

| RIDS | Hadri | | LLC | | IPS | |
|---|---|---|---|---|---|---|
| | Null: Stationarity | | Unit root (common) | | Unit root(individual) | |
| | level | 1st diff | Level | 1st diff | level | 1st diff |
| SA-Australia | 2.64 | -1.6 | -0.93 | -13.34 | -3.2 | |
| | [0.004] | [0.9] | [0.2] | [0.00] | (0.0005) | |
| SA-Canada | 6.4 | -0.6 | 0.67 | -14.87 | -1.91 | |
| | [0.00] | [0.72] | [0.74] | [0.00] | [0.03] | |
| SA-China | 0.87 | | -0.83 | -15.74 | -2.9 | |
| | [0.19] | | [0.20] | [0.00] | [0.002] | |
| SA-Germany | 6.28 | -1.2 | -0.87 | -1.9 | -3.18 | |
| | [0.00] | [0.87] | [0.2] | [0.03] | [0.0007] | |
| SA-Indonesia | 2.44 | -1.85 | -0.04 | -1.74 | -2.57 | |
| | [0.007] | [0.96] | [0.48] | [0.04] | [0.005] | |
| SA-Japan | 10.5 | -0.85 | 3.8 | -3.7 | -0.77 | -17.2 |
| | [0.00] | [0.80] | [0.99] | [0.000] | [0.22] | [0.00] |
| SA-Korea | 6.4 | 0.5 | -1.11 | 2.63 | -5.02 | |
| | [0.00] | [0.30] | [0.85] | [0.99] | [0.00] | |
| SA-Malaysia | 1.5 | -0.32 | 2.43 | -10.3 | -1.9 | |
| | [0.07] | [0.62] | [0.99] | [0.00] | [0.02] | |
| SA-Netherland | 15.7 | -1.95 | -3.83 | | -3.5 | |
| | [0.004]# | [0.97] | [0.001] | | [0.00] | |
| SA-Singapore | 6.6 | -0.2 | -0.36 | -13.86 | -1.67 | |
| | [0.00] | [0.57] | [0.35] | [0.00] | [0.05] | |
| SA-Sweden | 3.7 | 1.09 | -2.8 | | -3.7 | |
| | [0.00] | [1.3] | [0.002] | | [0.00] | |
| SA-UK | 3.61 | 0.62 | -0.5 | -12.6 | -2.3 | |
| | [0.00] | [-0.73] | [0.31] | [0.00] | [0.01] | |
| SA-USA | 3.5 | -0.8 | -0.4 | -13.7 | -2.43 | |
| | [0.00] | [0.77] | [0.34] | [0.00] | [0.008] | |

**Note: Figures in brackets are probabilities.**

**The cross section results in IPS are also stationary at first difference and are not reported here for brevity, can be requested from author.**

**6. Conclusion:**

This study estimates the degree of financial integration in panel of 5 South Asian countries by applying 2 Econometric techniques i.e. Savings Investment relation and Real interest rate differential condition. The overall GDS coefficient is estimated to be in between 0.8 and 0.4 which may imply some degree of integration. The post liberalization dummy has shown a reduction in the size of GDS which can be interpreted as increased integration with the initiation of liberalization process in South Asia in the 1990s. The degree of integration may vary across countries. The real interest differential model when applied provides evidence in favor of high degree of financial integration in the overall South Asia. The result stands consistent with all the panel unit root methods Hadri, IPS and LLC.

The interesting aspect of my study is to find evidence of financial integration with saving investment technique which is considered to be a method to estimating low integration and capital mobility. I found the case of some integration after adding Growth rate of GDP and Imports to GDP ratio as explanatory variables in to FH model. Furthermore, I also estimated the model with Panel 2SLS using the lag of GDS as an instrument and the result remained consistent. Since the saving Investment relationship technique requires real interest parity to hold suggested by Frankel (1992), my estimates strongly support that the real interest parity hold for Panel of major South Asian countries with 13 major economies of the world. The empirical evidence with real interest rate parity provides stronger evidence of integration as compared to savings investment technique which provides moderate evidence. Hence Feldstein Horoika savings investment model remains a puzzle for South Asian countries.

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