Savings-Investment Nexus: Experience of Major SAARC Economies based on the basic version of the Feldstein-Horioka Specification

Mahmood-ur-Rahman

MEXT Scholar, GSICS, Kobe University, 705 B HIH, 1-2-15 Wakinohama-Cho, Chuo-Ku, Kobe-Shi, Hyogo-Ken, 651-0072, Japan.

Abstract

This research has been designed to figure out the significance of the long run relation between domestic savings and gross capital formation along with approximating the extent of impact of savings on investment for the five chief SAARC economies with a view to comment on the status of the savings-investment nexus, utilizing the basic version of F-H specification. It has covered thirty-eight annual observations (1976-2013) and deployed the sophisticated panel cointegration approach as well as several alternative panel long-run association estimation techniques. It is believed that this study is the first one on that specific issue for these South Asian economies deploying such a protracted data set and incorporating alternative panel estimation methods. The results derived from the battery of sophisticated panel unit root tests have portrayed that for the pool of these developing economies, both the macro variables, savings and investment rates are non-stationary series. The residual-based panel cointegration tests have provided significant evidence suggesting that there is one cointegrating relationship between savings and investment rates. Finally, all the estimates of the savings-retention coefficient to quantify the contribution of domestic savings to gross capital accumulation deploying several alternatives of panel estimation techniques have detected moderate contributions ranging between 0.50-0.60. The magnitude of the estimated coefficients is less than those reported by numerous research works on the developed economies but completely synchronizes with those, represented by the plethora of studies on many developing economies. Cross-sectional dependence among these SAARC economies is also duly considered for the analyses. The derived moderate savings-retention ratio also signifies a reasonable extent of capital mobility within the region as well.

Keywords: Feldstein-Horioka Paradox, Panel Data, South Asia

1. Introduction

Empirically, the positive nexus between domestic savings and gross capital formation has been well documented through research since the 1980s; Salahuddin and Islam (2008) have substantiated the positive nexus in their study trying to figure out the catalysts for investments in developing economies. Wahid, Salahuddin, and Noman (2009) have also examined the relationship between savings and investment for South Asian economies. But the extent of contribution of domestic savings to gross investments could vary as it depends on time span as well as on state of economic development and policies; where several explanations could be put forward for this vast range of deviation. Even in their seminal paper, in an endeavor to identify the contribution of both international capital mobility and domestic savings to gross capital accumulation, renowned economists Martin Feldstein and Charles Horioka did ultimately end up with paradoxical findings (Feldstein and Horioka, 1980). They predicted that increased financial integration propped up by policy reforms should have had a dampening impact on the correlation between domestic savings and investment rates; but practically, they detected a high savings-investment coefficient for major industrialized economies. Subsequently, this became popularly known as the Feldstein-Horioka puzzle (F-H puzzle) (Obstfeld and Rogoff, 2000), and inspired various other empirical studies which covered both developed and developing economies, incorporating a wide range of econometric techniques with a view to resolve the puzzle.

In this era of globalization of financial markets, close integration among the global financial centers through policy deregulations has sped up the international capital mobility several folds. This liberalization of financial markets has unleashed tremendous opportunities for exorbitant business expansion to stimulate economic growth through providing easy access to a colossal pool of investible funds at competitive rates, which also ensures investment stability in the long run. Nowadays, burgeoning economies are not only relying on the sole contribution from domestic savings for capital formation but also international capital can fill in the savings-investment gap throughout the economic expansion. Setting aside the Keynesian notion of "paradox of thrift", it is perceived that both fiscal and monetary policies could fortify the positive relation between domestic savings and investments. Investment is believed to be one of the potent driving forces for contemporary economic growth and development. Several factors could positively as well as negatively influence this accumulation of capital, which could be classified into different categories such as human capital, physical capital, financial capital, natural capital, social capital, and so on. Alongside that, both internal and external influences contribute to formation of capital. Therefore, capturing the contribution of domestic savings in financing gross investments is of paramount importance to the policy makers. This would enable them to have a grasp on the effectiveness of both tax regime as well as monetary stimulus in regard to influencing savings-investment behavior. As developed economies are believed to have initiated extensive and swift deregulatory measures to liberalize the financial markets along with ensuring less restrictions on capital account transactions as compared to the developing world, cross-border capital flows are supposed to be phenomenal in the developed world, contributing vigorously in investments. But, as mentioned earlier, different researchers have detected high correlation between domestic savings and investments for the developed world implying low capital mobility which has made the Feldstein-Horioka conundrum intriguing as well as prominent. Empirically, the low magnitude of domestic savings-investment correlation among the developing countries has simply augmented the paradox. So, the Feldstein-Horioka specification could be used as an instrument of measuring the contribution of domestic savings to gross investments apart from showcasing the level capital mobility.

After the United States, the European Union and China, the combined economy of the South Asian Association for Regional Cooperation (SAARC) countries is the 4th largest in the world in terms of GDP (Purchasing Power Parity) and it is the 6th largest in terms of nominal GDP. Moreover, SAARC nations capture 3 percent of the world's total area and hold 21 percent (around 1.7 billion) of the world's entire population. It also covers around 9.12 percent of the global economy as of 2015. Propelled by a strong expansion in India, which accounts for nearly 80 percent of SAARC's economy, recently, South Asia has become the fastest-growing region in the world, where favorable oil prices since the last quarter of 2014 also did play a pivotal role. All these signify the gradually growing importance of the region (Press Release, World Bank, 2015). In spite of the robust economic growth in recent years, as a whole, the pace of development within the region is moderate as nearly 40 percent of its inhabitants are still poor and daunting challenges such as terrorism and security concerns, climate change, environmental degradation, political instability, increasing inequalities etc. pose serious threats to South Asia's growth and prosperity.

Most of the empirical studies on the F-H puzzle have covered both developed and developing countries in terms of extent of capital mobility through reviewing savings retention coefficient. At this juncture, it is fair, to cut the Gordian knot by reversing and confining this analysis for tracing out the savings-investment relation for emerging SAARC economies, utilizing the F-H specification. As mentioned earlier, in 2009, Wahid et al. investigated on the savings-investment dynamics of the largest five South Asian economies deploying the ratio based panel cointegration method, to extract the advantage from enhanced information embedded in a panel data set. The results revealed cointegartion between domestic savings and investments for the selected economies as a whole, bearing an indication about the inapplicability of the F-H puzzle within the region. However, those findings were not as decisive and apparent to comment on the savings-investment nexus and the pattern of capital mobility in South Asia. In this research, an effort has been undertaken to inspect the contribution of domestic savings to gross capital formation for a panel data set, again comprised of the five major SAARC economies, but this time using a more enlarged and different timeframe as well as deploying numerous different estimation methods for capturing the long-run relation. With this end in view, several alternative panel data estimation techniques covering a more sophisticated panel cointegration approach have been applied to the original version of the Feldstein-Horioka specification (F-H specification). Henceforth, this research scrutinizes the savings-investment interplay for a period of thirty-eight years for the selected developing economies from the SAARC. As mentioned before, advanced panel data estimation methods have been deployed to detect as well as to consistently estimate the long-run association between domestic savings and gross investments, which could also shed some light on the F-H puzzle within the region.

This research differs from the existing literature on the savings-investment nexus in the following respects. Firstly, this paper contributes to the literature through enhancing the power and accuracy of inference and estimation, using the most recent econometric techniques combined with a more expanded panel dataset over time for the chosen SAARC economies. Secondly, it has incorporated several alternative panel data estimation techniques simultaneously, which have been relatively rare for developing economies, especially from Asia. Finally, extensive varieties of panel data methods have been deployed simply to cross-check and augment the research findings, and so far, the previous researchers have been rather selective in that regard. In terms of deployed approaches, the empirical analysis in this paper has 2 segments - panel cointegration techniques to detect the cointegration between the variables of interest and estimation of the coefficient exhibiting the extent of long-run association. This study has begun with an Introduction as section 1, which is a brief overview of the background. Section 2 entails a detailed discussion of the mathematical model, utilized to examine the savings-investment interaction along with a comprehensive overview of the literature. Extensive discussions on the deployed empirical model, methodologies and the dataset are featured in section 3. Section 4 captures the descriptive analysis regarding the empirical findings. Finally, the last section wraps up the paper with the concluding remarks.

2. Savings-Investment Nexus in light of the basic F-H Specification based on Previous Empirical Works

As the quantum of empirical works on the F-H puzzle is quite extensive, an exhaustive coverage has been attempted in this section. It begins with the Feldstein and Horioka (1980) paper which initiated the debate and invented the basic specification, which is utilized for the panel cointegration approach as well as for the estimation of long-run relation. They predicted that increased financial integration should have diminished the correlation between domestic savings and investment rates. The investment rate of country i can be expressed as -

$$(I/Y)_i=\alpha_i - \beta_i r_i + \nu_i \text{ ....(1)}$$

Where, I is the level of gross capital accumulation, Y is the national output level, r is the domestic real interest rate, α is the intercept, and ν represents all the other factors influencing investments. Since it is assumed that the national savings rate is a function of the real interest rate, Fieldstien and Horioka have used the following equation for estimation - $(I/Y)_i = \alpha_i + \mu_i(S/Y)_i + \varepsilon_i$ ....(2)

In this basic equation, S is measured as gross national product minus private and government consumption which is nothing but domestic savings, α and ε are the intercept and the error terms respectively. In elucidating the equation, they have postulated that with perfect world capital mobility, an increase in the savings rate in country i is expected to cause an increase in investments across all the countries; where 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. If country i is infinitesimally small relative to the global economy, the value of μ, implied by perfect world capital mobility would be zero. But even for a relatively large country, the value of μ would only be of the order of magnitude of its share of total world capital. So, they have expected that the true value of μ, would thus vary among the OECD countries and on average would be less than 0.10. In contrast, estimates of μ, close to one would indicate that most of the incremental savings in each country invested within the country reflecting high rate of return as the stimulant for both domestic savings and domestic investments. But it contradicts with the hypothesis of perfect world capital mobility; with perfect capital mobility, the domestic savings rate does not depend on the domestic investment opportunities. It is of course possible that a high observed value of μ, could reflect other common causes of the variation in both savings and investments. The findings of a high value of μ, would however be strong evidence against the hypothesis of perfect world capital mobility. They have also pointed out that due to international capital flows, domestic savings and investments could differ for very long periods of time and so the national savings-investment identity couldn't imply equality of domestic savings and investments. In order for μ to have values close to zero, parity in real interest rates must hold, the world real interest rate must be exogenous and uncorrelated with the savings rate, as well as there must not be an endogeneity problem or no correlation between the savings rate and the stochastic error term. But critically from an econometric view point, both savings and investments are pro-cyclical and there exists simultaneous bias, with both reacting to population and productivity growth as well as government expenditures, which might result in an endogeneity problem (Isaksson, 2001). To deal with this endogeneity problem, among several alternative options, instrumental variables method (IV) has been preferred as it has manifold other advantages as well as, gross capital formation has been considered to take care of the pro-cyclicality. Theoretically, the supposition of exogeneity of real interest rate can also be threatened, as large economies could influence the global real interest rate. Although different economists have opined differently in this regard, this large country critique can easily be ignored in this paper, as none of the developing economies, in the present paper, is large enough to affect the global real interest rate.

Feldstein and Horioka, using a dataset on savings and investment rates for a sample of 16 OECD countries over a fifteen year period spanning from 1960 to 1974, have detected that the coefficient of savings rate in Equation "(2)" has been approaching unity rather than zero, as opposed to the usual expectations of mobile capital. It has indicated the retention of domestic savings in high proportions. High exchange rate risk and uncertainty of repatriation, which are more pronounced for long-term investments, institutional rigidities as well as official restrictions on capital outflow, international differences in tax regimes, and double taxation, might have prevented domestic savings from leaving the home country (Isaksson, 2001). Gordon and Bovenberg (1996) also have argued that asymmetric information across economies discourages domestic investors for cross border investments to tackle the high transaction costs. However, Feldstein–Horioka's terming of high cross-section slope coefficient in Eq. "(2)" as evidence of low capital mobility has been criticized, although many researchers have obtained similar results. Obstfeld (1986) has argued that since growth of a nation's labour-force positively affects the savings and the profitability of investments, so, it is the international immobility of labour that is behind the high savings-investments correlation. A similar effect can be anticipated from higher productivity growth. These explanations have been, however, dismissed by Feldstein and Bacchetta (1991) through the inclusion of growth variables, failing to affect the slope coefficient significantly. Bayoumi (1991) has explained that if the government is successful in systematically targeting the current account deficit, then there will be a distinct cross-section correlation between savings and investments, in spite of high capital mobility. Deploying a quantitatively restricted model, Baxter and Crucini (1993) as well as Ho (2003) have found that high (time-series) correlation between savings and investments is consistent with high capital mobility, where the correlation is increasing with the size of the economy. Harberger (1980) also has advocated that larger economies are more diversified with more shock-absorption capacity and therefore, requiring less quantum of capital movement. Wong (1990) has pointed out that high correlation between savings and investments is possible even under perfect capital mobility if both traded and non-traded goods are considered within the model. Schmidt-Hebbel., Serve´n, and Solimano, (1996) have identified a close link between corporate investments and retained earnings, to evade currency and political risks as a possible explanation of the contradiction.

Furthermore, to justify the skepticism about the Feldstein-Horioka interpretation of the puzzling findings, several other economists have come up with numerous other explanations. Obstfeld (1986) has held the pro-cyclical nature of savings and investments responsible for the high correlation; Frankel (1992) has argued about restrictive assumptions such as covered interest parity, zero exchange risk premium, zero expected real depreciation within the F-H framework; Coakley (1996) along with other researchers has attributed high coefficient to be a reflection of inter-temporal budget constraint and current account solvency; Sachsida and Caetano (2000) have pointed out that the savings retention coefficient do not measure capital mobility rather it measures the extent of substitutability between domestic and external savings.

For the developing economies, detection of either low or insignificant savings-investment coefficient evidencing relatively mobile capital has been elucidated by a number of economists through several rationales. Dooley, Frankel, and Mathieson, (1987), and Isaksson (2001) have attributed this to foreign aid inflow; Wong (1990) has presented evidence regarding the size of non-traded sector and the degree of trade openness; while Kasuga (2004) has emphasized that country's financial structure could have influenced the size of savings retention coefficient. Obstfeld (1986), has previously explained that, during the sample time span, if the economy does not diverge much from its steady-state ratio of net-foreign assets to income, and if nominal income growth remains moderate, then the difference between savings and investments can, on average, be small even under perfect capital mobility. In this way, he has justified the low cross-section savings-investment correlations in developing economies, before the debt crisis, as compared to the industrial ones. However, this reasoning appears to be more valid in a matured economy, with transitory inter-temporal trade gains rather than the developing economies where unexplored investment opportunities indicate a shortfall of external debts, well below the steady-state levels. In a nuts shell, the discovery of a high savings retention coefficient for developed economies as compared to that of developing ones has been replicated often and marked as "remarkably consistent" (Glick and Rogoff, 1995), and on the contrary the remainder of the research works has criticized the F-H notion.

Studies based on the F-H approach have incorporated cross-section, time-series, and panel analyses. In cross-sectional studies each observation consists of a country's average investment and savings rates along with average values of other regressors over a given period to eliminate the influence of short-run fluctuations around long-run averages. Time-series estimation captures the short-run relations well, specifically when the regression is run in first differences, where each observation consists of a country's investment and savings rates. Although both estimation techniques are instrumental in assessing capital mobility, but not necessarily the slope coefficients from the two methods contain the identical information. It is very much possible that in a sample of N countries, average savings and investment rates are strongly correlated on a cross-section basis, while for each specific country, the deviations of savings rates from their time-series averages are poorly correlated to those for investment rates. Obstfeld (1995) has exhibited that if cross-section observations are country averages over T periods, then OLS estimates of the slope coefficient will be high if N and T are sufficiently large and the time-series slope coefficient could be close to zero for each country. However, a school of researchers have believed cross-section estimation methods to be advantageous. Some very recent research papers have also employed panel-data techniques as it provides significant advantages from pooling huge information.

Pioneered by Miller (1988), numerous studies have resorted to cointegration techniques to analyze the dynamics of savings-investment relationship. Hoffmann (1998), De Vita and Abott (2002, 2003), Ang (2007) all have established cointegrated relationship between savings and investment for different countries with different time dimensions. However, some researchers like Schmidt (2003) and Narayan (2005) have failed to detect cointegrated relationship between savings and investments. For Japan, considering the period 1970-1985 and using ordinary least squares (OLS) as well as two-stage least squares (2SLS), Yamori (1995) has also failed to correlate savings with investments which implies perfect capital mobility. But for Tunisia, during the time-span 1970-2009, Adebola and Dahalan (2012), deploying Autoregressive Distributed Lag (ARDL) Model and Granger causality test, have identified the existence of long run relationship where two-way causality has validated the low capital mobility as per the F-H hypothesis.
Some of the recent empirical literature using the Feldstein-Horioka approach such as Kim, Oh, and Jeong (2005) have made use of the new developments in panel co-integration techniques that possesses higher power than the conventional time series tests, taking the advantage of pooling the long-run information contained in the panel while permitting the short-run dynamics and heterogeneity among different panel members. Constructing a sample composed up of low and middle income and OECD countries, Vamvakidis and Wacziarg (1998) are believed to be the first to investigate savings-investment correlations using panel-data methods which again has showed the OECD countries to display larger slope parameters than the developing countries. The other studies, employing panel estimation techniques by Coakley, Kulasi, and Smith (1996), Jansen (2000), Corbin (2001), Ho (2002), Coakley and Spagnolo (2004), Payne and Kumazawa (2005) and Kollias, Nikolaos, and Paleologou, S. M. (2008) have had mixed findings. It has been apparent from the findings of the previous studies that endogeneity has failed to explain the F-H puzzle and the basic F-H equation has tended to produce sensible results with respect to intra-national capital movements rather than the international ones along with highlighting significant moderate to high association between domestic savings and investments.
Of late, some researchers have deployed sophisticated econometric estimation methods such as Pooled Mean Group (PMG), Fully Modified OLS (FMOLS), and Dynamic OLS Panel Cointegration techniques to analyze the extent of contribution perusing more advanced panel cointegration approach.
This extensive literature on F-H puzzle has provided the basis for only focusing on to detect the contributions of domestic savings to gross capital accumulation, setting aside the notion of capital mobility. Using several alternative panel data estimation techniques for assorted datasets, varying both in terms of panels and timeframe, Payne and Kamazawa (2005), Adedeji and Thornton (2006), Bangake and Eggoh (2010, 2011) have detected moderate to high association between savings and investments, where the magnitude of coefficient has varied markedly depending upon the estimation methodology and structure of dataset. In contrast, as mentioned previously, some researchers surprisingly haven't detected any cointegrating relationship between savings and investments in some empirical researches. Narayan and Narayan (2008) employing a residual-based panel cointegration test have experienced that for a panel of G7 countries over 1971-2002 and have construed the very high mobility of capital within the G7 economies as the reason for non-existence of long-term relationship between savings and investments. Krol (1996) has postulated that the large savings coefficient estimates, reported in the earlier works are due to inter-temporal budget constraints. Although there have been criticisms, but for a panel data of 21 OECD countries over the period, 1962 to 1990, considering business cycle effects, Krol's point estimate for savings-investment correlation has been quite low. In his venture, Afzal (2007), covering developing economies and using cointegration techniques, has found no long-run relationship between savings and investment for 7 countries of the sample, implying high degree of capital mobility along with getting the evidence of both bi-directional and uni-directional causality. Esso and Keho (2010) have found the absence of causality between savings and investment for the West African Economic and Monetary Union (UEMOA). On the other hand, Olugbenga, Oluwole, and Florence (2011) have found the evidence of cointegration between savings and investment for 6 European Union economies out of 8 in their investigation. Arginon and Roldan (1994) have studied the savings-investment relationship for the EU economies during the period 1960-1988, and have indicated uni-directional causality running from savings to investments. Apergis and Tsoulfidis (1997) have exercised the ARDL bounds testing approach to cointegration for 14 EU economies and again have established a cointegrating relationship between saving and investment, where savings has Granger caused investment. Sanjib and Joice (2012) have showed a cointegrating relationship between savings and investments in USA, UK, China, and India.

3. Methodology and Data Description

To quantify the savings-investment nexus, the paper has resorted to calculating savings retention coefficient relying on the sophisticated panel cointegration technique. In this paper, panel data set is utilized for analysis, which is a special case of pooled time-series cross-section, where the same cross-section (here country) is surveyed over the chosen time period. In this research, the constructed panel data set is a macro panel, with number of time periods exceeding the number of cross-sections. As the focus of this study is to have reliable estimates of long run cointegrating relation between domestic savings and capital accumulation using a macro panel data set, so, the relatively newly developed panel cointegration method has been employed. Cointegration analysis under panel data setting is absolutely identical with that of time series analysis - (i) checking for unit root or stationarity of the variables; (ii) detecting cointegration relation among the variables, and (iii) estimation of long-run relationships.

3.1 Panel Cointegration

This study is based on macroeconomic variables that are collected for the largest developing economies from SAARC, over a significant number of years. Macro panels are subject to spurious relationships, specifically since macroeconomic variables are often characterized by non-stationarity. So, as per Baltagi's (2008) recommendation, panel cointegration techniques have been used which are basically an extension of time series methods (estimators and tests) for panels to tackle non-stationarity and cointegration. For this panel cointegration analysis, the basic Fieldstien-Horioka specification or Equation "(2)" has been considered.

3.2 Panel Unit Root Tests

The first step is to analyze the time series properties of the series in order to determine the persistence of the pooled savings and investment rates. Panel unit root tests are often classified into two main groups - (i) first-generation tests, assuming cross-sectional independence - Levin, Lin & Chu (2002), Im, Pesaran & Shin (2003), Maddala & Wu (1999), and Choi (2001); and (ii) second-generation tests, which explicitly allows for some form of cross-sectional dependence -Pesaran (2007). It has been illustrated in the literature that unobserved common factors such as externalities, regional and macroeconomic linkages or unaccounted residual interdependence could result in cross-sectional dependence. Recently, for addressing this dependence caused by macroeconomic dynamics and linkages, the second generation tests have emerged. Overall, the panel unit-root tests are also believed to be more powerful than time-series unit root tests. These tests consider the following autoregressive (AR) process for panel data -

$Y_{it} = \rho_i Y_{i,t-1} + \delta Z_{it} + U_{it}$………………… ..(3)

Where, both, ρ_i, the country-specific AR coefficients or the degree of lag augmentation to make the residuals white noise and the error term U_{it} are assumed to be independent and identically distributed (i.i.d.). Moreover, Z_{it} includes exogenous individual deterministic effects, such as constants (fixed effects) and linear time trends, which capture cross-sectional heterogeneity.

Levin et al. (2002) has proposed the test (LLC) allowing for heterogeneity of the intercepts across the panel members, which can be seen as a panel extension of the augmented Dickey-Fuller (ADF) test-

$\Delta Y_{it} = \alpha Y_{i,t-1} + \Sigma\beta_{ij}\Delta Y_{i,t-j} + \delta Z_{it} + U_{it}$………..(4)

This test is often recommended for moderately sized panels, especially for N>10 and T>25. Im et al. (2003) is quite similar to LLC test but it varies significantly as it assumes for country specific heterogeneous auto-regressive coefficients in other words, IPS test presumes for heterogeneity in the intercepts as well as in the slope coefficients and thus solves the serial correlation problem associated with LLC Test. The basic equation for the panel unit root tests for IPS follows as - $\Delta Y_{it} = \alpha_i Y_{i,t-1} + \Sigma\beta_{ij}\Delta Y_{i,t-j} + \delta Z_{it} + U_i$………..(5)

This is quite similar to that of LLC. Both LLC and IPS tests are constructed by averaging individual augmented Dickey–Fuller (ADF) (Dickey and Fuller, 1979) t-statistics across cross-section units and require N to be small enough relative to T, whilst the LLC test also requires a strongly balanced panel (Baltagi, 2008). Relying on Monte Carlo experiments, Breitung (2000) has proven that the power of the LLC and IPS test statistics is sensitive to the specification of the deterministic components, such as the inclusion of individual specific trends (Baltagi, 2008). So, he has proposed a test statistic based on modifications to the LLC assuming a common unit root process and often suggested for samples of around N=20 and T=30.

To overcome the problems associated with IPS test, Maddala and Wu (1999) and Choi (2001) has prescribed for using nonparametric Fisher tests, which combine the probability limit values (p-values) of unit root tests from each cross-section rather than average test statistics. Fisher tests are usually implemented by using individual ADF or Phillips-Perron unit root tests and the lag order of the differenced terms (ρ_i) is allowed to vary across individuals, which is usually determined by a lag selection criterion (to get rid of serial correlation). Both IPS and Fischer type tests combine information of individual unit root tests. Hadri (2000) has proposed a residual-based Lagrange multiplier (LM) test with a reversed null hypothesis, which is in fact a panel generalization of the KPSS test (Baltagi, 2008).

The major weakness of these first-generation tests is the assumption of cross-sectional independence implying that the movements of a given variable through time are independent across countries. But empirically, it has been found to be unrealistic. Banerjee, Marcellino, and Osbat (2005) have shown that these first-generation tests perform poorly by often over-rejecting the null hypothesis (unit root) when the sources of non-stationarity are common across individuals. Some cross-sectional dependence tests are devised by Pesaran (2004) and a Breusch-Pagan (for T>N) to deal with this problem. As an alternative, Levin et al. (2002) and Im et al. (2003) have suggested 'demeaning' the data in order to attenuate the biases, caused by the prevalence of cross-sectional dependence before deploying the unit root tests. The characteristics of the individual panel unit root tests are summarized in the following table -

Table 1 Summary of Panel Unit Root Tests

Unit Root Test	Null Hypothesis	Alternative Hypothesis	Deterministic Components	Auto-Correlation Correction	Cross-sectional Dependence
LLC	Unit Root Process	Stationary Process	No exogenous variables, fixed effect and time trend	Lags	demean
Breitung	Unit Root Process	Stationary Process	fixed effect and time trend	Lags	robust
IPS	Unit Root Process	Stationary Process for some cross sections	No exogenous variables, fixed effect and time trend	Lags	demean
Fisher	Unit Root Process	Stationary Process for some cross sections	No exogenous variables, fixed effect and time trend	Lags/Kernel	demean
Hadri	Stationary Process	Unit Root Process for some cross sections	fixed effect and time trend	Kernel	robust
Pesaran	Unit Root Process	Stationary Process for some cross sections	fixed effect and time trend	Lags	robust

Source: Compiled from QMS (2007, corrected) and Stata's 'xtunitroot' command help.

3.3 Panel Cointegration Tests

After assessing the order of integration of the variables, through panel unit root tests, if it is detected that the variables of interest are integrated of order one I(1), then panel cointegration tests could be applied to address the non-stationarity of the series. Some of these panel cointegration tests have been developed as extensions of earlier tests for time series data. Pedroni (1999, 2004) has provided cointegration tests for heterogeneous panels, which is only valid if the variables are I(1). It is based on the two-step cointegration approach of Engle and Granger (1987). Using the residuals from the static (long-run) regression, Pedroni has constructed 7 panel cointegration test statistics - 4 of these are based on pooling (within -dimension or 'panel statistics test'), which assume homogeneity of the auto regressive term, while the remaining 3 are less restrictive (between - dimension or 'group statistics test') as these allow for heterogeneity of the auto regressive term. These assumptions have implications for the computation process as well as the specification of the alternative hypothesis. The v-statistic is analogous to the long-run variance ratio statistic for time series, while the rho-statistic is equivalent to the semi-parametric 'rho' statistic of Phillips and Perron Test (1988). The other two are panel extensions of the (non-parametric) Phillips-Perron and (parametric) ADF t-statistics, respectively. Kao (1999) has also proposed a residual-based DF and ADF tests like Pedroni with slightly different assumptions. Both Kao and Pedroni tests consider a single cointegrating vector, although Pedroni's test permits it to be heterogeneous across panels taking into account heterogeneity by using specific parameters that are allowed to vary across individual members of the sample. It is sensible to assume that the vectors of cointegration are identical among individuals on the panel. Maddala and Wu (1999), Larsson, Lyhagen, and Lothgren (2001), and Westerlund (2007) have also contributed significantly with some other sophisticated panel cointegration tests.

3. 4 Estimation of the Long-Run

A complementary issue of efficient estimation of long-run economic relationships is also the primary focus of this study. For efficiently estimating and testing the relevant cointegrating vectors with the presence of cointegrating non-stationary variables, numerous panel estimators have been suggested in the literature. Once again, most of them are developed as extensions of well-known time series methods. An important difference is that the panel OLS estimator of the (long-run) static regression model, contrary to its time series counterpart, is inconsistent (Baltagi, 2008). Kao and Chiang (2000) have proposed a panel dynamic OLS estimator (DOLS) which is a generalization of the method originally proposed by Saikkonen (1991) and Stock and Watson (1993) for time series regressions. The panel DOLS estimator, like as the panel FMOLS one, corrects for endogeneity and serial correlation by including leads and lags of the differenced I(1) regressors in the regression which is written as -

$Y_{it} = \theta_i + \Sigma\eta_{ij}\Delta X_{i,t+j} + \delta X_{it} + V_{it}$………..(6)

where, X_{it} is a vector of explanatory variables, δ is the estimated long-run impact, and η_{ij} is the associated parameters. It is believed that the DOLS estimator is superior to both the fully-modified OLS (FMOLS) and OLS estimators. Pesaran, Shin, and Smith (1999), have recommended a (maximum-likelihood) pooled mean group (PMG) estimator for dynamic heterogeneous panels, where the procedure fits to an autoregressive distributed lag (ARDL) model and can be re-specified as an error correction equation to facilitate economic interpretation. The PMG is basically an intermediate procedure, somewhere between the mean group (MG) estimator and the dynamic fixed-effects (DFE) approach. The MG estimator is derived through estimating N independent regressions and then averaging the (unweighted) coefficients, while the DFE requires pooling the data and assumes that the slope coefficients and error variances are identical. The PMG, however, restricts the long-run coefficients to be homogenous but allows for the short-run coefficients and error variances to vary across panels.

For the quantitative assessment, a panel data set has been constructed which is comprising up of the major 5 SAARC economies namely India, Pakistan, Bangladesh, Sri Lanka, and Nepal for the time span 1976-2013. The World Bank Indicators, World Bank has been exploited as the data source.

4. Empirical Analysis

From the analysis of Table 2, containing descriptive statistics for the chosen variables of the individual economies, it is detected that among the countries, Bangladesh has experienced both the lowest gross savings (% of GDP) and the lowest gross capital formation (% of GDP) during the early and mid 1970s. It is quite understandable for the newly born nation as it was battling hard to shrug off the impacts of the devastating liberation war and a deadly drought. Surprisingly, the relatively small economy of Nepal has come up with the highest gross savings (% of GDP). Apart from explaining the savings behavior, it also indicates the lack of investible opportunities in the landlocked country due to inadequate infrastructure. The ever expanding largest economy of India has stood at the top for the highest gross capital formation (% of GDP), justifying its remarkable economic growth. In terms of volatility, the economy of Pakistan has the least fluctuation in gross capital formation (% of GDP) and gross savings (% of GDP), with the lowest standard deviations. Again, Bangladesh's savings rate and India's investment rate have been found to be the most unpredictable with the highest variations. On an average, India has been placed at the top for having the highest savings and gross capital formation rates.

Table 2 Descriptive Statistics for selected variables across major 5 economies of SAARC, 1976-2013

Country	Mean	Std. Deviation	Min	Max
Bangladesh I/Y	19.90	5.08	9.91	28
S/Y	22.94	10.45	-0.83	39.94
India I/Y	26.17	6.19	18.04	38.93
S/Y	25.63	5.53	16.98	36.60
Nepal I/Y	23.58	6.06	15.13	38.27
S/Y	22.08	8.91	10.33	43.11
Pakistan I/Y	17.99	1.51	14.12	20.81
S/Y	22.59	3.34	14.66	30.43
Sri Lanka I/Y	25.12	3.75	14.44	33.76
S/Y	20.10	4.91	.79	25.66

Panel Cointegration Analysis

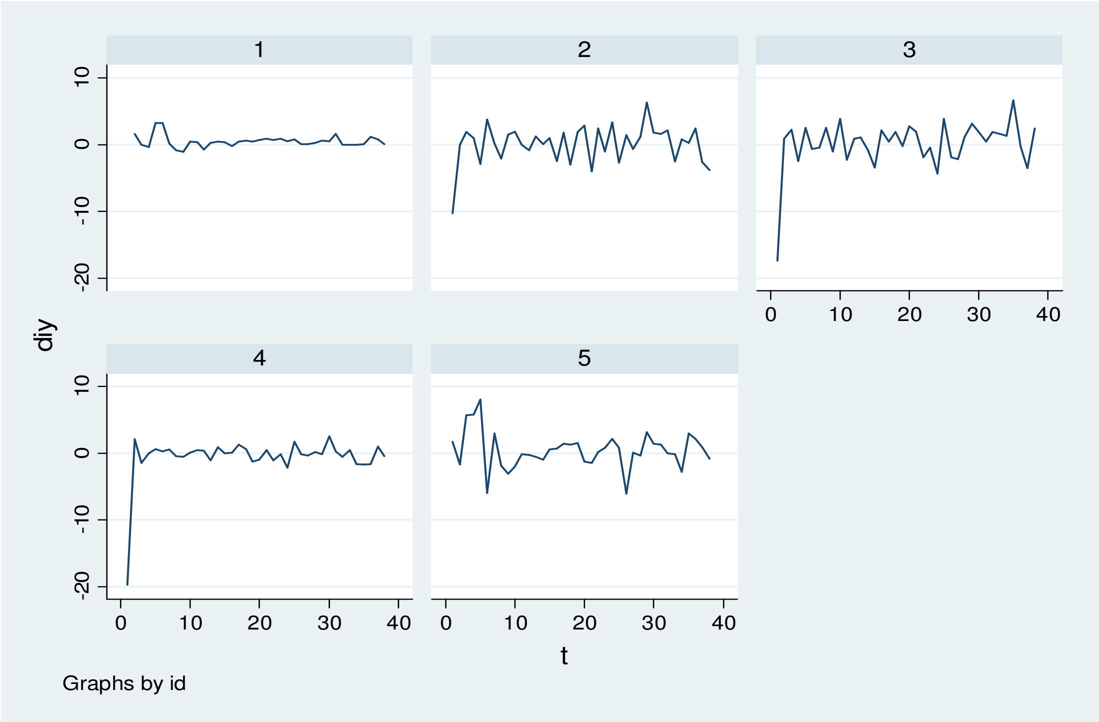
4.1 Panel Unit Root Tests

Before investigating for the presence of a cointegrating relationship between gross investment and domestic savings, time series properties of the panel data set need to be inspected as discussed earlier. For that, along with the graphical approach a battery of panel unit root tests have been deployed as mentioned previously - Levin et al. (2002) or LLC, Breitung (2000), Im et al. (2003) or IPS, Fisher-type tests using ADF (Maddala and Wu, 1999) and Fisher-type tests using PP tests (Choi, 2001) and Hadri (2000). The graphical approach (Graph 1 and Graph 2) clearly exhibits that both the macro variables - investment and savings rates are seemingly non-stationary at level but after first difference transformation becomes stationary. Among the tests, the LLC, Breitung and Hadri tests incorporate the proposition of common unit root process across all panel units, while the other 3 tests allow for panel specific individual unit root process. The null hypothesis of all panel unit root tests, with the exception of Hadri, is that the variable under investigation is non-stationary or possessing a unit root. On the contrary, the Hadri test postulates non-existing unit root as the null hypothesis against the alternative hypothesis of non-stationary series. Furthermore, except for the Fisher-type tests, all of the tests are asymptotic in nature. The IPS test accounts for a higher degree of heterogeneity in the cross-sectional data as compared to the other tests.

Table 3 and Table 4 capture the results of the deployed panel unit root tests. It is obvious from the Tables that except for the Breitung test regarding savings ratio at level, all the other tests LLC, IPS, and two Fisher-type tests (ADF and PP) cannot reject the null hypothesis of unit root for both the investment and savings series at the conventional 5 percent level of significance, allowing for trend and intercept. However, considering the first difference of the variables, the null hypothesis is rejected for both the series. These tests depict that both investment and savings series are I(1). The Hadri test, which has the opposite null hypothesis of no unit root, has also been performed with assorted assumptions. The tabulated results in Table 5 again confirm that both the macro variables are integrated of the order one, as the null hypothesis of stationary series is rejected for both the variables at level but cannot be discarded after first difference transformation. Although different test statistics and p-values, reported in Table 3, Table 4, and Table 5, with diversified underlying assumptions unambiguously indicate that the variables under consideration are unit root process but the mixed findings (only in 3 cases out of 9) about savings rate at level in Table 3 and Table 4, the case with only intercept but no trend, does cast some doubt about the stationarity issue. Having mixed results points out that the results might have been affected by some level of cross-sectional dependence, which could lead to over-rejection of the null hypothesis of unit roots. Considering that, the cross-sectional averages have been subtracted from each series (de-meaning) prior to applying the IPS test (Table 10) as it is believed that the IPS test (with no trends, as inclusion of trends could reduce the power of the test) fits best with this existing macro panel data set. Although there could still be some residual dependence left, the results (Table 10) point towards I(1) for both the series. Moreover, several researchers and econometricians have made conclusions based on the results of the majority of the tests. So, as a whole, it is fair to conclude that there is (at least) some non-stationarity at level for both the macro variables that needs to be properly addressed, as almost all the panel unit root tests do suggest likewise. The notion of stationary series, however, is not rejected univocally when first differenced data is used. It allows for resorting to panel cointegration tests to check the cointegration between the variables.

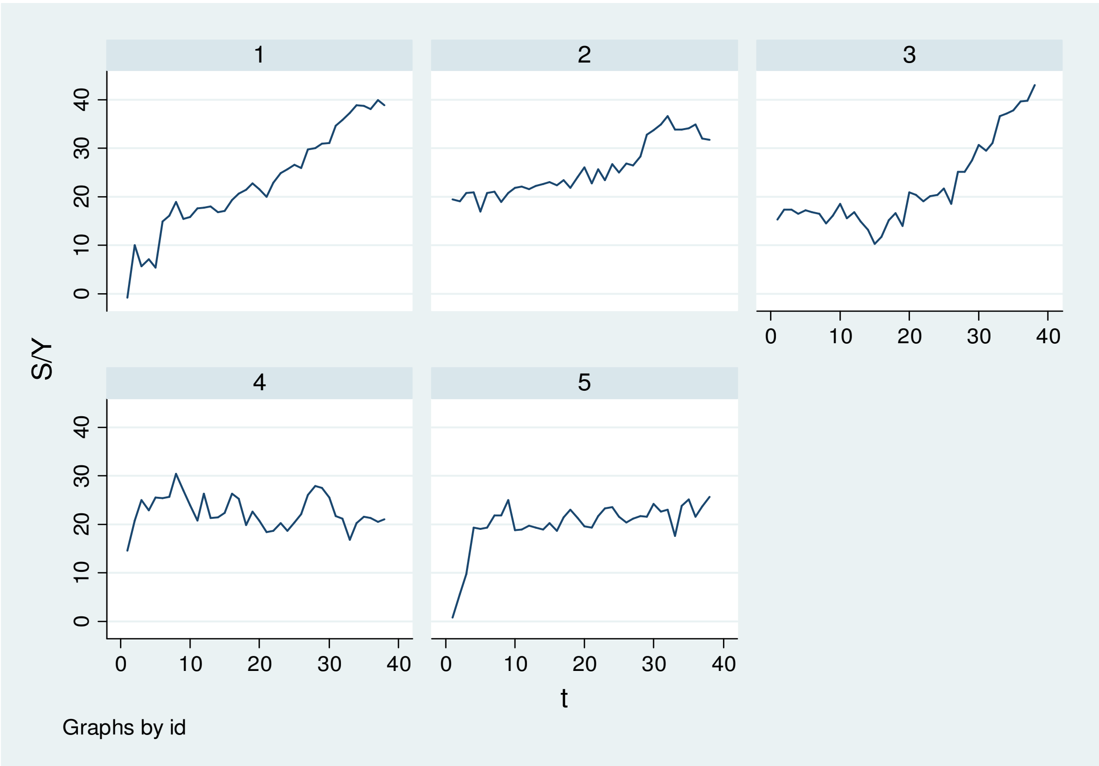
Graph 1 Trends of investment rates across SAARC, 1976 to 2013 (5 economies)

At level, clearly there is evidence of non-stationary series for I/Y

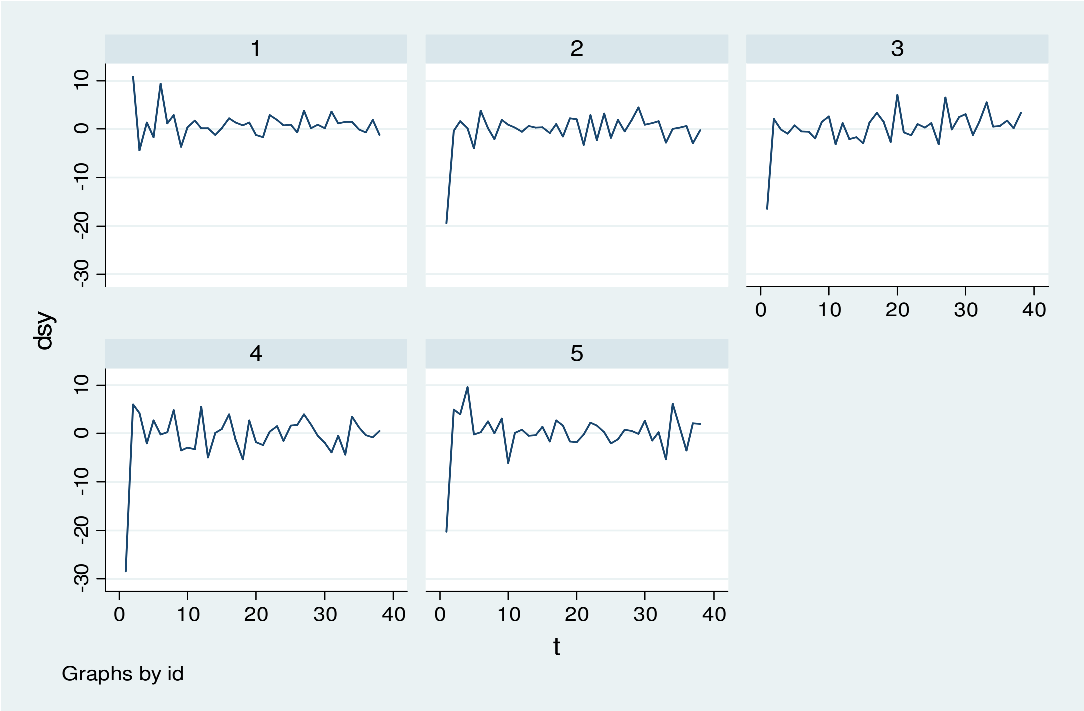


At 1st difference, the series becomes stationary for I/Y.

Graph 2 Trends of savings rates across SAARC, 1976 to 2013 (5 economies)



Again at level, apparently there seems to be a non-stationary series for S/Y.



Likewise before, after transforming into 1st difference, the series becomes stationary for S/Y.

Table 3- 5, Panel unit root tests for savings and investment ratios, 1976 to 2013 (5 economies)
Assumptions - Trend, Intercept, Auto Lag and Bandwidth Selection
Null Hypothesis - Unit root process /Non-stationary series

Table 3 Panel unit root tests for savings and investment ratios, 1976 to 2013 (5 economies)

Statistics (p-values)	Levin, Lin & Chu	Breitung	Im, Pesaran and Shin	ADF - Fisher	PP - Fisher
(I/Y)it	-0.8170 (0.2070)	-0.8577 (0.1955)	-1.6179 (0.0528)	14.9972 (0.0592)	9.3541 (0.3133)
Δ(I/Y)it	-9.4672 (0.0000)	-3.7652 (0.0000)	-8.4942 (0.0000)	61.1069 (0.0000)	67.1536 (0.0000)
(S/Y)it	-2.5736 (0.0050)	-0.5696 (0.2844)	-3.9814 (0.0000)	38.7881 (0.0000)	61.8105 (0.0000)
Δ(S/Y)i	-3.8286 (0.0001)	-4.3678 (0.0000)	-6.5101 (0.0000)	50.9160 (0.0000)	368.04 (0.0000)

Assumptions - Intercept, Auto Lag and Bandwidth Selection

Table 4 Panel unit root tests for savings and investment ratios, 1976 to 2013 (5 economies)

Statistics (p-values)	Levin, Lin & Chu	Im, Pesaran and Shin	ADF - Fisher	PP - Fisher
(I/Y)it	-0.5571 (0.2887)	-0.0416 (0.5166)	9.7387 (0.4637)	9.6380 (0.4728)
Δ(I/Y)it	-11.6201 (0.0000)	-10.2933 (0.0000)	90.7127 (0.0000)	102.622 (0.0000)
(S/Y)it	-0.9434 (0.1727)	-1.0374 (0.1498)	28.2162 (0.0017)	38.2337 (0.0000)
Δ(S/Y)i	-5.7827 (0.0000)	-8.0000 (0.0000)	76.2136 (0.0000)	137.689 (0.0000)

Null Hypothesis – Stationary

Table 5 Panel unit root tests for savings and investment ratios, 1976 to 2013 (5 economies)

Statistics (p-values)	Hadri Assumptions-Trend, Intercept Auto Lag and Bandwidth Selection	Hadri Assumptions -Intercept, Auto Lag and Bandwidth Selection
(I/Y)it	3.3950 (0.0003)	5.4553 (0.0000)
Δ(I/Y)it	0.8333 (0.2023)	-0.6591 (0.7451)
(S/Y)it	2.9768 (0.0015)	5.7352 (0.0000)
Δ(S/Y)i	1.6088 (0.0538)	1.4761 (0.0700)

Several incorporated tests with different sets of assumptions show that both I/Y and S/Y are I(1). So, we can go for Panel Cointegration Tests to check if the variables are cointegrated or not.

4.2 Panel Cointegration Tests

The next step is supposed to be assessing whether savings and investment rates are cointegrated or not. As per the previous discussion in methodology, Pedroni Cointegration Test (2004) and residual based Kao Cointegration Test (1999) have been exercised, where both the tests provide several different statistics for checking the null hypothesis of no cointegration, assuming homogenous slope coefficients across countries. Table 6 and Table 7 exhibit the upshots from the cointegration tests between savings and investment rates, again where diversified assumptions regarding trend and intercept have been tried to fit in. Pedroni test performs 4 within group tests (containing computed values of the statistics based on estimators that pool the autoregressive coefficient across different countries for the unit root tests on the estimated residuals) and 3 between-group tests (with the computed values of the statistics based on estimators that average individually calculated coefficients for each country) to check whether the panel data are cointegrated or not. Except for the rho-statistics in the case, assuming both deterministic trend and intercept, all the results for both the within-group tests and the between-group tests show that the null hypothesis of no cointegration can be rejected at the usual 5 percent significance level. The Kao Cointegration Test (Table 8) with zero probability value simply assures the validity of the findings of the Pedroni Test. All these corroborate the existence of cointegrating relationship between investment and savings rates for the panel of all countries and for the panels of country groups and also set up the basis for panel cointegration estimation.

Table 6-7, Pedroni Cointegration Test
Series - I/Y on S/Y
Assumptions - No Deterministic Trend, Auto Lag and Bandwidth Selection
Null Hypothesis - No Cointegration
Alternative Hypothesis - common AR coefficients (Within-dimension) and individual AR coefficients (Between-dimension)

Table 6 Pedroni Cointegration Test

	Within dimension (Panel)				Between dimension (Group)		
Weighted statistics for Within and statistics for Between dimensions (Probabilities)	v-stat	rho-stat	PP-stat	ADF-stat	rho-stat	PP-stat	ADF-stat
	2.9764 (0.0015)	-3.8681 (0.0000)	-3.1741 (0.0008)	-3.0737 (0.0011)	-2.4350 (0.0074)	-2.7715 (0.0028)	-2.6565 (0.0039)

Series – I/Y on S/Y
Assumptions – Deterministic Trend and Intercept, Auto Lag and Bandwidth Selection
Null Hypothesis – No Cointegration
Alternative Hypothesis - common AR coefficients (Within-dimension) and individual AR coefficients (Between-dimension)

Table 7 Pedroni Cointegration Test

	Within dimension (Panel)				Between dimension (Group)		
Weighted statistics for Within and statistics for Between dimensions (Probabilities)	v-stat	rho-stat	PP-stat	ADF-stat	rho-stat	PP-stat	ADF-stat
	0.91484NA	-2.0907 (0.0183)	-2.4817 (0.0065)	-2.6164 (0.0044)	-0.5737 (0.2831)	-1.5164 (0.0647)	-1.7575 (0.0394)

Kao Residual Cointegration Test
Series – I/Y on S/Y
Assumptions – No Deterministic Trend, Auto Lag and Bandwidth Selection
Null Hypothesis – No Cointegration

Table 8 Kao Residual Cointegration Test

ADF t-statistics	Probability
-4.370220	0.0000

Again, there is evidence of cointegration between I/Y and S/Y. So, we can go for calculating LR estimates.

4.3 Panel Cointegration Estimations of Long-run Savings Retention Ratios

In this segment FMOLS, DOLS, DFE, FE, MG, and PMG estimators are employed to capture the long-run co-integrating vector between savings and investment. Earlier, it has been mentioned that these estimators do use different estimating techniques and are designed for non-stationary panels to capture the long-run economic relation. Kao and Chiang (1998) have proven that for macro panels, used in this study (5 countries for 38 years), the DOLS estimator outperforms both OLS and FMOLS in parameter estimation and inference testing. The several long run coefficient estimates of the savings-retention ratio along with respective standard errors are reported in Table 9. For the entire period (1976–2013), the DOLS estimate of the coefficient is 0.54, whereas the FMOLS estimate is 0.59. Both the estimates are statistically significant at the 1 percent level. Both DOLS and FMOLS estimators are better than the OLS or POLS estimators as these make correction for problems like auto-correlation and endogeneity. The results derived from the PMG, MG, DFE, and FE estimators are almost similar to those provided by the FMOLS and DOLS estimations as well. The PMG coefficient is surprisingly very high; exceeding 1 but the MG coefficient, again drops back to the moderate level of 0.50, while both the DFE and FE estimates range between 0.50 and 0.59. Again, all the estimates are statistically very significant. Several incorporated diagnostic tests ensure the superiority of MG over PMG and DFE over PMG. The above outcomes can therefore be termed consistent with the previous results. Along with these, some of the estimates also provide the short-term coefficients for each country and the adjustment parameter between the short and long terms, but these are not shown in this study, as it only focuses on detecting the long run association between savings and gross investments. These moderate contributions from domestic savings for gross capital accumulation, within the 0.50-0.59 range, signify the relatively mobile capital within these SAARC developing economies as compared to the OECD developed economies. In their survey of the empirical literature, Coakley, Kulasi, and Smith (1998) have found the cross-section coefficient for OECD countries as 0.62, while Adedeji and Thornton (2008) have found a savings retention coefficient of 0.50 for OECD countries in their recent study. These results are broadly in line with the earlier studies on the relationship between savings and investment using panel data. The finding of a generally moderate retention ratio without much difference in the size depending on the estimation method is in line with the results derived from the recent studies on developing economies as well that have used similar techniques. Ho (2002) has certified savings-retention coefficients of 0.84 (FMOLS) and 0.47 (DOLS) for a data panel of 20 OECD countries, and Kim et al. (2005) have detected the coefficient to be 0.58 (FMOLS) and 0.76 (DOLS) from a panel data of 11 Asian countries during 1960-1979, which fell significantly to 0.39 (FMOLS) and 0.42 (DOLS) if the timeframe is changed to 1980-1998. Relatively lower retention ratios for the developing economies than the developed economies have also been detected in the early empirical literature on the issue, with Dooley et al. (1987) and Mamingi (1994) attributing this primarily to country size factors. They suggested that the small open economies are unable to influence the world interest rate (hence their savings-investment correlation is not biased upwards) and the fiscal policy, used for demand management purposes usually does not crowd out private sector investment. However, if the studies on developing economies are specifically considered, then it has been detected that the estimated savings retention coefficients of this study are absolutely consistent. In their very recent paper in 2013, combining both panel cointegration and static liner panel model approaches to cover 20 sub-Saharan economies (SSA), Adeniyi and Festus (2013) have detected the savings retention coefficients to be ranging from 0.35 to 0.60. These estimates have absolutely converged with the estimated coefficients from a similar study on SSA by Bangake and Eggoh (2010), who have found savings retention coefficients of 0.36, 0.38, and 0.58 using PMG, FMOLS, and DOLS estimators, respectively. In his research, Javed (2011) has detected that the savings-investment correlation is high for the developed economies (0.89 by Feasible Generalized Least Squares method-FGLS) as compared to the developing economies (0.66 by FGLS), where he has reexamined the dynamics of savings-investment correlation through integrating two major improvements in the existing literature. Sangjoon (2011) has deployed the panel cointegration approach again to grasp the savings-investment nexus for 19 Asian economies. The

savings retention coefficients have been found to vary within the 0.37-0.63 range for the overall time period, where the coefficients have declined significantly over time.
In the context of the Feldstein–Horioka framework, from the above findings, it could be conceived that capital has been relatively mobile in the region where the mobility has been notching up gradually. This also validates the ongoing structural reform process of these economies over the sample period, manifested through financial sector liberalization, more flexible and attractive tax regime for business, outward-orientated economic reforms, privatization, rationalization of the public sector, and the partial liberalization of the exchange rate regime.

Table 9 Long Run Coefficient Estimates

	DOLS	PMG	MG	DFE	FMOLS	FE
LR coefficient	0.5438**	1.0615**	0.5099**	0.5908**	0.5900**	0.5749**
Standard Error	0.0525	0.0579	0.1769	0.0951	0.0447	0.0266

** indicates significance at 1% level

Specification Tests-

Hausman test for MG vs. PMG:$\chi2(1)$ = 6.63 and Prob>$\chi2$ = 0.0019 (MG is preferred over PMG)

Hausman test for MG vs. DFE:$\chi2(1)$ = 0.34 and Prob>$\chi2$ = 0.5590 (FE is preferred over MG)

Breusch-Pagan LM test of cross-sectional independence: $\chi2(10)$ = 29.034, Pr = 0.0012 (cross-sectional dependence exists)

All the estimates are statistically significant and match with the previous studies. For the estimation, the basic F-H specification or Equation "(2)" has been considered. The Hausman Test shows that MG is preferred over PMG and DFE is superior to MG. The Breusch-Pagan LM test for cross-sectional independence confirms the existence of cross-sectional dependence as the Null Hypothesis of cross sectional independence is rejected. As cross-sectional dependence is detected, Pesarans 2nd generation Unit Root Test has been performed, which again has revealed that cointegration could exist between the variables. This is also validated by the Im-Pesaran-Shin (IPS) panel unit root test (Table 10). After demeaning, the IPS test is regarded as a possible correction for cross-sectional dependence and the results indicate that both the series are non-stationary at level but turn out to be stationary after transforming into 1st difference.

4.4 Panel unit-root test considering Cross-sectional Dependence
Im-Pesaran-Shin unit-root test considering Cross-sectional Dependence
Null Hypothesis-All panels contain unit roots
Alternative Hypothesis-Some panels are stationary
Number of panels = 5 Number of periods = 38

Table 10 Im-Pesaran-Shin unit-root test considering Cross-sectional Dependence

Assumptions-Cross-sectional means removed, No Time Trend, Panel-specific AR parameter, Asymptotics-T,N -> Infinity sequentially, ADF regressions-chosen by AIC	Statistics (p-values)
(I/Y)it	0.6102 (0.7291)
Δ(I/Y)it	-14.4807 (0.0000)
(S/Y)it	0.6200 (0.7324)
Δ(S/Y)i	-10.9600 (0.0000)

5. Concluding Remarks

This research paper has been designed to figure out the significance of the long run relation between domestic savings and gross capital formation along with approximating the extent of impact of savings on investment for the chief five SAARC economies with a view to comment on the status of the savings-investment nexus, utilizing the basic version of F-H specification. It has covered thirty-eight annual observations and installed several alternatives of panel data estimation techniques. It is believed that this study is the first one on that specific issue for these South Asian economies deploying such a protracted data set and incorporating alternative panel estimation methods. Empirical findings of this paper are summarized in this concluding part. Firstly, the results derived from the sophisticated panel cointegration approach have portrayed that for the pool of these developing economies, both the macro variables, savings and investment rates are non-stationary co-integrated series. In other words, both the domestic savings and investment rate series are integrated of order one (nonstationary), individually and in the panel system of five major SAARC economies. Secondly, the residual-based panel cointegration tests of both Kao (1999) and Pedroni (2004) have provided significant evidence suggesting that there is one cointegrating relationship between savings and investment rates. Finally, all the estimates of the saving-retention coefficient to quantify the contribution of domestic savings to gross capital accumulation deploying several alternatives of panel data estimation techniques are detected to have moderate contributions ranging between 0.50-0.60. The magnitude of the estimated coefficients is less than those reported by numerous research works on developed economies but completely synchronizes with those, represented by the plethora of studies on many developing economies. There might be cross-sectional dependence associated with these SAARC economies, which is also duly considered for the analyses. The derived moderate savings-retention ratio also signifies reasonable extent of capital mobility as well. In contrast with the developed economies, usually the developing economies are characterized by higher levels of marginal productivity of capital and greater demand for foreign capital for growth which may have contributed to higher capital mobility and greater foreign investment than in the industrialized OECD countries with lower yields to capital. Apparently, proper utilization of foreign capital to supplement the insufficient domestic savings seems to be a prudent growth strategy for these emerging developing economies leaving vigorous policy implications.

In an open economy, domestic investment is financed by the pool of global savings, so, a major limitation of the basic F-H specification used in this paper, considering the extent of financing of domestic investment by domestic savings has been highlighted by Younas (2005) in his study through incorporating the view point of Rossini and Zanghieri (2003). Conceptually, it has been argued that since FDI is not financed by the savings of the residents of the recipient country, so, the savings retention coefficient derived by excluding FDI from gross investments would have more precisely reflected the extent to which domestic savings is used to finance domestic investments as well as the true degree of capital mobility. To support that, empirically, capital has been detected to be remarkably more mobile when FDI is excluded from domestic investments of the recipient country. That is why this study has refrained from emphasizing on capital mobility, rather has only given impetus to capture the contribution of domestic savings to gross capital formation.

References

Afzal, M. (2007). Savings and investment in developing countries: Granger Causality test. *Philippine Review of Economics*, 44(2), 99-110.
Adedeji, O., & Thornton, J. (2006). Saving, investment and capital cobility in African countries. *Journal of African Economies*, 16(3), 393-405.
Adeniyi, O., & Egwaikhid, F., O. (2013). Saving-Investment nexus in developing countries: Does financial liberalization matter? *Journal of Economic Development*, 38(2), 119-140.
Ang, J.B. (2007). Are saving and investment cointegrated? The case of Malaysia (1965-2003). *Applied Economics*, 39(17), 2167-2174.
Apergis, N. & Tsoulfidis, L. (1997). The relationship between saving and finance: Theory and evidence from EU countries. *Research in Economics*, 51(4), 333-358.
Argimon, I. & Roldan, J. M. (1994). Saving, investment and international capital mobility in EC countries. *European Economic Review*, 38(4), 59-67.
Baltagi, B. (2008). *Econometric Analysis of Panel Data (Fourth Edition)*. John Wiley & Sons, Chichester.
Banerjee, A., M. Marcellino & Osbat, C. (2005). Testing for PPP: Should we use panel methods? *Empirical Economics*, 30(1),77–91.
Bangake, C., & Eggoh, J.C. (2010). International capital mobility in African countries: Do the legal origins matter? *Economics Bulletin*, 30(1), 73-83.
Bayoumi, T.A. (1991). Savings-investment correlations. *IMF Staff Papers*, 37(1), 362–387.
Bordoloi, S., & John, J. (2011). Occasional papers / Reserve Bank of India. ISSN 0972-7493, ZDB-ID 2077106X. 32(1), 42-55.
Baxter, M., & Crucini, M. J. (1993). Explaining saving-investment correlations. *American Economic Review*, 83(3), 416–436.
Breitung, J. (2000). The local power of some Unit Root Tests for Panel Data. Nonstationary Panels, Panel Cointegration, and Dynamic Panels. In B.H. Baltagi (ed.). *Advances in Econometrics*, 15, 161–178.
Choi, I. (2001). Unit Root Tests for Panel Data. *Journal of International Money and Finance*, 20(2), 249–272.
Coakley, J., Fuertes, A.M. & Spagnolo, F. (2004). Is the Feldstein-Horioka puzzle history? *The Manchester School*, 72(5), 569-90.
Coakley, J., F. Kulasi, F. & Smith, R. P. (1998). The Feldstein–Horioka puzzle and capital account mobility. *International Journal of Finance and Economics*, 3(2), 169-188.
Coakley, J., F. Kulasai, & Smith (1996). Current account solvency and the Fieldstien-Horioka puzzle. *Economic Journal*, 106(436), 620-627.
Corbin, A. (2001). Country specific effect in the Feldstein-Horioka paradox: a Panel Data analysis. *Economics Letters*, 72(3), 297-302.
De Vita, G. & Abott, A. (2002). Are savings and investment cointegrated? An ARDL bounds testing approach. *Economics Letters*, 77(2), 293-299.
De Vita, G. & Abott, A. (2003). Another piece in the Feldstein-Horioka puzzle. *Scottish Journal of Political Economy*, 50(1), 69-87.
Dooley, M., Frankel, J.A., & Mathieson, D.J. (1987). International capital mobility: What do savings-investment correlations tell us? *NBER Reprint* from *IMF Staff Papers*, 34(3), 503-530.
Engle, R. & Granger C. (1987). Co-integration and Error-Correction: Representation, estimation and testing. *Econometrica*, 55(2), 251-276.
Esso, L.J. (2010). Re-examining the finance-growth nexus: Structural break, threshold Cointegration and Causality evidence from the ECOWAS, Journal *of Economic Development*, 35(3), 57-79.
Feldstein, M., & Bacchetta, P. (1991). National savings and international investment. NBER Chapters, NBER in *National Savings and Economic Performance* by Bernheim, D., Shoven, J. (Eds.), Chicago University Press, Chicago, 201–220.
Feldstein, M. & Horioka, C. (1980). Domestic saving and international capital flows. *The Economic Journal*, 90(358), 314-329.
Frankel, J.A. (1992). Measuring international capital mobility: A review. *American Economic Review Papers and Proceedings*, 82(2), 197–202.
Glick, R., & Rogoff, K. (1995). Global versus country-specific productivity shocks and the current account. *Journal of Monetary Economics*, 35(1), 159-192.
Gordon, R.H., & Bovenberg, A.L. (1996). Why is capital so immobile internationally? Possible explanations and implications for capital income taxation. *American Economic Review* 86(5), 1057-1075.
Hadri, K. (2000). Testing for stationarity in heterogeneous Panel Data. *Econometrics Journal*, 3(2), 148-161.

Harberger, A.C. (1980). Vignettes on the world capital market. *American Economic Review*, 70(2), 331-337.

Ho, T. W. (2003). The savings-retention coefficient and country-size: Fieldstien-Horioka Puzzle Reconsidered. *Journal of Macroeconomics*, 25(3), 387-396.

Hoffmann, M. (1998). Long run capital flows and the Feldstein-Horioka puzzle: A new meansure of international capital mobility and some historical evidence from Great Britain and the United States. European *University Institute urn: hdl: 1814/675*, *European University Institute Working Paper ECO No*. 1998/30.

Im, K., H. Pesaran & Y. Shin (2003), 'Testing for Unit Roots in Heterogeneous Panels.' *Journal of Econometrics*, 115(1), 53–74.

Isaksson, A. (2001). Financial liberalization, foreign aid, and capital mobility: Evidence from 90 developing countries. *Journal of International Financial Markets*, *Institutions, and Money*, 11(4), 309-338.

Jansen, W.J. (2000). International capital mobility: Evidence from Panel Data. *Journal of International Money and Finance*, 19(4), 507-511.

Kasuga, H. (2004). Savings-investment correlations in developing countries. *Economics Letters*, 83(3), 371-376.

Keho, Y. (2010). Effect of financial development on economic growth: Does inflation matter? Time series evidence from the UEMOA countries. *International Economic Journal*, *Taylor & Francis Journals*, 24(3), 343-355.

Kao, C. (1999). Spurious regression and residual-based tests for Cointegration in Panel Data. *Journal of Econometrics*, 90(1), 1-44.

Kao, C., & Chiang, M. (2000). The estimation and inference of a Cointegrated Regression. Nonstationary Panels, Panel Cointegration, and Dynamic Panels. In B. Baltagi (ed.). *Advances in Econometrics*, 15,179-222.

Kao, C., & Chiang, M. H. (1999). On the estimation and inference of a Cointegrated Regression and inference of a Cointegrated Regression in Panel Data, *Working Paper*, 2, Center for Policy Research, Syracuse University.

Kim, H., Oh, K.Y., & Jeong, C.W. (2005). Panel Cointegration results on international capital mobility in Asian economies. *Journal of International Money and Finance*, 24(1), 71-82.

Kollias, C., Nikolaos, M. & Paleologou, S. M. (2008). The Feldstein-Horioka puzzle across EU members: Evidence from the ARDL Bounds Approach and Panel data. *International Review of Economics and Finance*, 17(3), 380-387.

Krol, R. (1996) International Capital Mobility: Evidence from Panel Data. *Journal of International Money and Finance,*15(3), 467-474.

Larsson, R., Lyhagen, J. & Lothgren, M. (2001). Likelihood-Based Cointegration Tests in Heterogeneous Panels. *Econometrics Journal*, 4(1), 109-142.

Levin, A., Lin, C. & Chu, C. (2002). Unit Root Tests in Panel Data: Asymptotic and Finite-Sample Properties. *Journal of Econometrics*, 108(1), 1-24.

Maddala, G. & Wu, S. (1999). A comparative study of Unit Root Tests with Panel Data and a new simple test. *Oxford Bulletin of Economics and Statistics*, 61(S1), 631-652.

Mamingi, N. (1997). Savings-investment correlations and capital mobility: The experience of developing countries. *Journal of Policy Modeling*, 19(6), 605-626.

Miller, S.M. (1988). Are saving and investment co-integrated?" *Economics Letters*, 27(1), 31-34.

Narayan, P. K. & Narayan, S. (2010). Testing for capital mobility: New evidence from a panel of G7 countries. *Research in International Business and Finance*, 24(1), 15-23.

Narayan, P.K. (2005). The saving and investment nexus for China: Evidence from Cointegration Tests. *Applied Economics*, 37(17), 1979-1990.

Obstfeld, M. (1986). Capital mobility in the world economy: Theory and measurement. *Carnegie–Rochester Conf. Ser. Public Policy*, vol. 24(1), 55-103.

Obstfeld, M. (1995). International capital mobility in the 1990s in *Kenen, P.B. (Ed.), Understanding Interdependence: the Macroeconomics of the Open Economy*, Princeton University Press, Princeton, 201-261.

Obstfeld, M. & Rogoff, K. (2000). The six major puzzles in international macroeconomics: is there a common cause? *NBER Working Paper* No. 7777, Cambridge, MA.

Olugbenga, A. O., Oluwole, O., & Florence, H. (2011). The temporal relationship between saving and investment: Evidence from advanced EU countries. *International Journal of Business and Social Science*, 2(2),1-12.

Payne J. E., & Kumazawa, R. (2005). Capital mobility, foreign aid and openness: Further Panel Data evidence from Sub-Saharan Africa. *Journal of Economics And Finance,* 29(1),122-126.

Pedroni, P. (2004). Panel Cointegration; Asymptotic and finite sample properties of Pooled Time Series Tests with an application to the PPP hypothesis. *Econometric Theory*, 20(3), 597-625.

Pedroni, P. (1999). Critical values for Cointegration Tests in Heterogeneous Panels with Multiple Regressors. *Oxford Bulletin of Economics and Statistics*, 61(1), 653-670.
Pesaran, H. (2004). General Diagnostic Tests for Cross Section Dependence in Panels. *Cambridge Working Papers in Economics*, 0435, Faculty of Economics, University of Cambridge.
Pesaran, H., Shin, Y., & Smith, R. (1999). Pooled Mean Group estimation of Dynamic Heterogeneous Panels. *Journal of the American Statistical Association*, 94(446), 621-634.
Peter, C., Phillips, B., & Perron, P. (1988). Testing for a Unit Root in Time Series Regression. B*iometrika,* 75(2), 335-346.
QMS (2007), EViews 6 User's Guide II, Quantitative Micro Software, LLC.
Rossini, G., & Zanghieri, P. (2003). A simple test of the role of foreign direct investment in the Feldstein-Horioka puzzle, *Applied Economics Letters*, 10(1), 39-41.
Salahuddin, M. & Islam, R. (2008). Factors affecting investment in developing countries: A Panel Data study. *The Journal of Developing Areas*, 42(1), 21-37.
Sachsida, A., & Caetano, M. (2000). The Fieldstien puzzle revisited. *Economic Letters*, 68(1), 85-88.
Saikkonen, P. (1991). Asymptotically efficient estimation of Cointegration Regressions. *Econometric Theory*, 7(1), 1-21.
Stock, J. & Watson, M. (1993). A simple estimator of Cointegrating Vectors in higher order integrated systems. *Econometrica*, 61(4), 783-820.
Schmidt, M.B. (2003). Savings and investment in Australia. *Applied Economics*, 35(1), 99-106.
Schmidt-Hebbel, K., Serve´n, L., & Solimano, A. (1996). Savings and investment: Paradigms, Puzzles, Policies. *World Bank Res. Observer* 11(1), 87-117.
Solarin, S. A. & Jauhari Dahalan, (2012). Capital mobility: An application of savings-investment link for Tunisia. *International Journal of Economics and Financial Issues, Econjournal*, 2(1), 1-11.
Sangjoon, J. (2011). The savings-investment Correlation in Asian countries, Pacific Science Review, 12(3), 321-330
Vamvakidis, A., & Wacziarg, R. (1998). Developing countries and the Feldstein–Horioka puzzle. *International Monetary Fund Working Paper* 98/2. International Monetary Fund, Washington, DC.
Wahid, A. N. M., Salahuddin M., & Noman A.,M., (2010). Savings and investment in South Asia-evidence from likelihood ratio based panel cointegration. *Journal of Economic Studies, 37*(6), 658-666.
Westerlund, J. (2007). Testing for Error Correction in Panel Data. *Oxford Bulletin of Economics and Statistics*, 69(6), 709-748.
Wong, D.Y. (1990). What do savings–investment relationships tell us about capital mobility? *Journal of International Money Finance*, 9(1), 60-74.
World Bank, (2015) press release.
Yamori, N., (1995). The relationship between domestic savings and investment: The Feldstein-Horioka test using Japanese regional data. *Economics Letters, Elsevier*, 48(3-4), 361-366.
Younas, J., (2011). Role of foreign direct investment in estimating capital mobility: a reappraisal of Feldstein-Horioka puzzle. *Applied Economics Letters, Taylor & Francis Journals,* 18(12), 1133-1137.

The IISTE is a pioneer in the Open-Access hosting service and academic event management. The aim of the firm is Accelerating Global Knowledge Sharing.

More information about the firm can be found on the homepage:
http://www.iiste.org

CALL FOR JOURNAL PAPERS

There are more than 30 peer-reviewed academic journals hosted under the hosting platform.

Prospective authors of journals can find the submission instruction on the following page: http://www.iiste.org/journals/ All the journals articles are available online to the readers all over the world without financial, legal, or technical barriers other than those inseparable from gaining access to the internet itself. Paper version of the journals is also available upon request of readers and authors.

MORE RESOURCES

Book publication information: http://www.iiste.org/book/

Academic conference: http://www.iiste.org/conference/upcoming-conferences-call-for-paper/

IISTE Knowledge Sharing Partners

EBSCO, Index Copernicus, Ulrich's Periodicals Directory, JournalTOCS, PKP Open Archives Harvester, Bielefeld Academic Search Engine, Elektronische Zeitschriftenbibliothek EZB, Open J-Gate, OCLC WorldCat, Universe Digtial Library , NewJour, Google Scholar