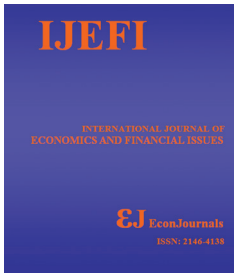

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Investment and Saving Relationship in South Asia

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ABSTRACT

This study tests the Feldstein and Horioka hypothesis (1980) for four South Asian developing economies and an oil producing economy, Saudi Arabia. Performing cointegration tests on annual data, the results indicate that approximately one to one long run relationship between investment and saving is present in India and Saudi Arabia thus validating the above hypothesis while a weak form relation for Bangladesh, Pakistan, and Sri Lanka shows the existence of Feldstein and Horioka puzzle.

Keywords: Saving-investment, Cointegration, South Asia
JEL Classifications: C32, E21, F41

1. INTRODUCTION

In a seminal study, Feldstein and Horioka (1980) examined the relationship between saving and investment for 16 OECD "open" and "integrated" countries and found that most of the domestic savings were invested in their respective economies. The study is important as the existence of strong positive correlation between saving and investment implies that extra saving in an economy will not be channelled to other economies with favourable investment climate, hence indicating very low capital mobility. The finding of this study has known as Feldstein-Horioka (F-H) puzzle. Testing the validity of F-H puzzle or alternatively the degree of capital mobility is important for many financial decisions. For example, the efficacy of fiscal policy is contingent upon the degree of capital mobility. The speed of economic activity to convergence to any meaningful equilibrium in any economy is influenced by the degree of capital mobility. Moreover, the effect of any external shock is mitigated to the extent that country has higher degree of capital mobility.

After this study, a vast literature has emerged either in favour of F-H puzzle or which provides alternative explanations for saving investment correlation. In the first line of literature, among others, Schmidt (2003), De Haan and Siermann (1994), Ang (2007) using longer periods of sample and Miller (1988), Sarno and Taylor (1998), De Vita and Abbott (2003), Alexakis and Apergis, (1994) and Narayan (2005) dividing the period under different exchange rate regime have tried to establish F-H hypothesis. Hadiwibowo (2010) has tested the relationship between savings and investment in the short run and in the long run for Indonesia using quarterly data from 1984 to 1995 and found that an almost one to one relation exists between these two variables. Ford and Horioka (2016) recently show the existence of this puzzle and conclude that global capital markets are incapable of achieving transfers of financial capital and need integration of global financial and goods markets. Frictions in these markets preclude real interest rates from being levelled across countries.

In the second category of literature, it is generally argued that if a country is following its international intertemporal budget constraint, the current account will be sustainable or will not deviate from its long run equilibrium value implying that saving and investment will be cointegrated in the long run. On the other hand, in the absence of long run relation between exports and imports or if the country is not following its international intertemporal budget constraint, fiscal or monetary authorities use measures to correct the balance of payments situation thus bringing the saving in line with the investment. This scenario permits the existence of high degree of capital mobility besides the co movements of savings and investments. The notable studies in these lines of arguments include Ballabriga et al. (1991), Coakly et al. (1996), Coakly and Kulasi (1997), Jansen (1996), Jansen (1998), and Shibata and Shintani (1998). In a recent study of 49 high, low, and middle income countries, Ozdemir and Olgun

(2007) have found very limited validity of the puzzle in 44 out of 49 countries. There are some other studies (Sachsida and Caetano, 2000), which completely reject the F-H puzzle by stating that correlation coefficient between saving and investment merely reflects the variability between external and domestic saving rather than degree of capital mobility.

This paper examines the validity of F-H hypothesis in four South Asian Economies, India Pakistan, Bangladesh and Pakistan using auto regressive distributed lag (ARDL) bound testing approach given by Pesaran et al. (2001) and is also discussed by Bardsen (1989). India and Bangladesh have been included in Ozdemir and Olgun (2007) study, however, the sample period selected for Bangladesh (1960-2003) is not appropriate as the country came into existence in 1971. The inclusion of India in our study gives interesting comparison of the results of Ozdemir and Olgun study based on different methodology and this study. The use of annual data in this study reduces the number of observations for analysis as often is the case for many developing countries. However, to find the long run relationship between two or more variables, the ARDL methodology is proven to be the superior over Johansen and Juselius and the Engle and Granger approaches especially in small sample size. Pesaran and Shin state that in ARDL framework for small sample sizes, the estimators of the long-run coefficients are super-consistent. The ARDL framework is capable of modeling series even if they are I(0) or I(1).

Following this introductory section, model used in the study is given in Section 2. Section 3 presents the estimation results, while Section 5 concludes the paper.

2. THE MODEL

Following Feldstein and Horioka (1980), the long run relationship between saving and investment can be modelled as:

$$I_t = c_0 + c_1 S_t + \varepsilon_t \quad (1)$$

Where I_t is the ratio of gross capital formation to gross domestic product (GDP) (investment) and S_t is the ratio of gross domestic savings to GDP (saving). c_0 is an intercept, c_1 is regression coefficient and ε_1 represents a disturbance term. The above equation can be written in a vector error correction model which is stated as,

$$\Delta I_t = \tau + \rho I_{t-1} + \delta S_{t-1} + \sum_{j=1}^{p-1} \omega_{I,j} \Delta I_{i-j} + \sum_{j=1}^{q-1} \omega_{s,j} \Delta S_{t-j} + \sigma \Delta S_t + v_t \quad (2)$$

The above model, which is also called ARDL(p, q), allows the first difference of investment and saving be different in lag lengths where p represents number of lag lengths of the first difference of investment and q is the number of the first difference of the saving. To check the absence of long run relationship between investment and saving the null hypothesis is $\rho=\delta=0$ while the alternative hypothesis $\rho\neq0$ and $\delta\neq0$ implies the existence of long run relationship between the two variables of interest.

Using ordinary least squares, equation (2) can be estimated and the F-statistic for above null and alternative hypothesis can be computed. However, the distribution of this test is non standard which is dependent on number of factors including the order of the integration, the number of repressors and the choice of intercept and a time trend. The asymptotic critical values of this test for two cases, i.e., When both the series are I(0) and I(1) are calculated and reported by Pesaran et al. (2001), and Narayan (2004). As the sample size is small in this study, we use the small sample size (30 to 80) based critical values reported by Narayan as Pesaran et al. critical values are based on large sample size. The two set of reported critical values represent two bounds, upper and lower. If the calculated value falls below the lower critical value we accept the null hypothesis of no long run relationship between saving and investment. Alternatively, if the calculated value falls above the upper critical value, the alternative hypothesis of the existence of long run relationship between two variables is accepted regardless of the order of integration of two variables. An inconclusive inference can emerge if the calculated value falls in between these two bounds.

3. ESTIMATION

For the estimation of above model we have used annual data for all countries. These data set are obtained from the World Development Indicators 2015 CD-ROM prepared by the World Bank. Though the ARDL bound testing procedure does not need any tests of stationarity, the study makes sure that none of the variable involved in estimation is integrated at an order higher than one otherwise critical values given by Pesaran et al. (2001) will not be applicable. The Dickey–Fuller test (ADF) test results (not reported) indicate that none of the variable is integrated of order two.

The equation 2 has been estimated to examine the long run relationship between saving and investment for India, Pakistan, Bangladesh, Sri Lanka, and Saudi Arabia for the period 1965-2014, 1972-2014, 1972-2014, 1970-2014, and 1975-2014 respectively. For the selection of optimal lag lengths in the ARDL model, three different criteria including, akaike information criterion (AIC), Schwarz Bayesian criterion (SBC), and Hannan-Quinn were employed. We began with estimating a higher order ARDL and then on the basis of above criterion narrow it down accordingly. The calculated F-statistics are reported in Table 1. Three columns indicate three different criteria besides mentioning the order of ARDL (p, q) model, where p is the number of lagged differences of investment and q is the number of lagged differences of savings.

The estimated ARDL model includes an intercept term but no time trend. The critical values for the upper and lower bound are reported in Table 2.

Observing the estimation results for India, we find that three criteria produced the same number of lag lengths. The F-calculated value is more than 80, which is well above the upper bound of F-critical value given in Table 3 even at 0% significance level. This indicates the presence of long run relationship between investment and saving, when savings have been normalised. One advantage of ARDL is its ability to estimate an exact one to one

Table 1: Calculated F-statistics by normalising on investment

Country	F(p, q) (AIC)	F(p, q) (SBC)	F(p, q) (Hannan-Quinn)
India	86.27 (1, 1) 1.05 (0.00)	86.27 (1, 1) 1.05 (0.00)	86.27 (1, 1) 1.05 (0.00)
Bangladesh	5.13 (3, 0) 0.25 (0.65)	5.13 (3, 0) 0.25 (0.65)	5.13 (3, 0) 0.25 (0.65)
Pakistan	6.36 (1, 3) −0.13 (0.15)	8.92 (1,0) −0.05 (0.49)	8.92 (1,0) −0.05 (0.49)
Sri Lanka	2.15 (1, 0) 0.22 (0.77)	2.15 (1, 0) 0.22 (0.77)	2.15 (1, 0) 0.22 (0.77)
Saudi Arabia	9.54 (1, 1) −1.13(0.00)	9.54 (1, 1) −1.13(0.00)	9.54 (1, 1) −1.13(0.00)

AIC: Akaike information criterion, SBC: Schwarz Bayesian criterion

Table 2: Calculated F-statistics by normalising on saving

Country	F(p, q) (AIC)	F(p, q) (SBC)	F(p, q) (Hannan-Quinn)
India	88.39 (1, 1) −0.82 (0.00)	88.39 (1, 1) 0.82 (0.00)	88.39 (1, 1) 0.82 (0.00)
Bangladesh	12.33 (2, 3) 1.25 (0.00)	14.19 (2, 2) 1.36 (0.00)	12.33 (2, 3) 1.25 (0.00)
Pakistan	1.42 (3, 0) 29.61 (0.88)	0.78 (1,0) 1.76 (0.64)	0.78 (1,0) 1.76 (0.64)
Sri Lanka	5.04 (1, 0) 0.14 (0.45)	5.04 (1, 0) 0.14 (0.45)	5.04 (1, 0) 0.14 (0.45)
Saudi Arabia	7.98 (1, 3) 0.93(0.00)	7.98 (1, 3) 0.93(0.00)	7.98 (1, 3) 0.93(0.00)

AIC: Akaike information criterion, SBC: Schwarz Bayesian criterion

Table 3: Bound critical values

Significance level	Restricted intercept and no trend		Restricted intercept and trend	
	I(0)	I(1)	I(0)	I(1)
1%	4.614	5.966	5.333	7.063
5%	3.272	4.306	3.710	5.018
10%	2.676	3.586	3.008	4.150

Sources: Narayan (2004)

relation between investment and saving or the magnitude of c_1 in equation 1 can be estimated. Besides the F-statistics, Table 1 has presented the value of c_1 and its significance level represented by P-value. For India the value of c_1 is 1.05 indicating an almost one to one relationship between investment and saving. This result is consistent to F-H hypothesis which states that a high correlation between saving and investment exists in closed economies, where all the saving are invested domestically.

For Saudi Arabia, three selection criteria produced the same lag length. The calculated F-value (9.54) is well above the upper bound critical value at 5% level of significance (4.306). The result indicate that there is long run relationship between investment and saving given that the investment is normalised. When estimated the strength of relationship (c_1) was found to be 1.13, indicating a strong relationship between savings and investment.

For Bangladesh, three criteria again selected the same number of lag lengths and the reported calculated F value (5.13) is higher than the upper bound critical value at 5% (4.306). This indicates the presence of long run relationship between investment and saving for Bangladesh when investment is normalised. Regarding the one to one relationship between the two variables, the estimates of c_1 gives a value of 0.25 that is statistically significant at 65%, indicating the presence of week form of correlation. The estimates for Pakistan specify the presence of long run relationship, as indicated by the F-statistics (6.36 and 8.92). However, a very low, statistically insignificant, and negative sign on c_1 value can be observed. To double check the results, different data set from Ministry of Finance on both the variables was used for estimation. The results remained almost similar, with negative sign on c_1. Some further investigation is needed to resolve this sign ambiguity. In case of Sri Lanka, we can clearly reject the hypothesis of the existence of long run relationship between investment and saving when investment is normalised, as calculated value of F falls below the lower bound critical value even at 10%. To check the sensitivity of the results to the selection of lag lengths in ARDL model, which often is the case, besides using three different criteria we have also estimated the model with various other lag lengths for all the above countries. It can be confidently concluded that overall results are almost similar with various lag lengths. The LM and F version tests of autocorrelation and normality of residuals indicate that results are robust and do not have these problems.

4. CONCLUSION

This study has examined the long run relationship between investment and saving using ARDL bound testing cointegration approach for developing South Asian economies. The F-H study postulates that this relationship would be strong as the capital mobility is very limited in a closed economy. Their findings however proved that this relationship is strong for open and integrated OECD countries, thus giving birth to a puzzle.

The result of this study indicates that long run relationship between saving and investment exists in India, Saudi Arabia, Pakistan, and Bangladesh when investment is normalised, while the relation could not be established for Sri Lanka. One to one relation between investment and saving in India and Saudi Arabia, relatively large countries, confirms F-H hypothesis that the two variables would be closely related in developing and relatively closed economy. However, the week or insignificant relationship for Bangladesh, Sri Lanka and Pakistan indicates that economic policies addressed to attract foreign investment explain that investment is higher than domestic savings but domestic savings is also important to increase investment. In general terms, empirical evidence supports the expected positive relationship between investment and savings. The results also indicate that country size may be another factor in resolving F-H. Puzzle.

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