

Feldstein-Horioka Puzzle in South Asia and KSA

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Abstract: - The Feldstein-Horioka puzzle (1980) poses the question that why saving and investment are linked across countries. This is perplexing as it is normally considered that financial markets are frictionless and can quickly transfer capital between economies, and there is no reason why the best investment opportunities should be in a saver's home country. 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.

Key-Words: - Saving, Investment, Cointegration, South Asia, Saudi Arabia, ARDL, Time series,

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. Many studies have validated the existing of this puzzle in most of the developed and developing countries, while

some studies could not prove the existence of this puzzle.

This paper examines the validity of F-H hypothesis in four South Asian Economies, India Pakistan, Bangladesh and Pakistan and one oil producing economy, KSA using auto regressive distributed lag (ARDL) bound testing approach given by Pesaran et al. (2001). This approach is also discussed by Bardsen (1989). 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 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_t represents a disturbance term. The above

equation can be written in a vector error correction model (VECM) which is stated as,

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

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 $\rho \neq 0$ and $\delta \neq 0$ implies the existence of long run relationship between the two variables of interest.

3 Estimation

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 (SBS), 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 3.

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 zero percent 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 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 per cent 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 five per cent (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 per cent. 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.

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

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) | 86.27 (1, 1) | 86.27(1, 1) |
| | 1.05 (0.00) | 1.05 (0.00) | 1.05 (0.00) |
| Bangladesh | 5.13 (3, 0) | 5.13 (3, 0) | 5.13 (3, 0) |
| | 0.25 (0.65) | 0.25 (0.65) | 0.25 (0.65) |
| Pakistan | 6.36 (1, 3) | 8.92 (1,0) | 8.92 (1,0) |
| | -0.13 (0.15) | -0.05 (0.49) | -0.05 (0.49) |
| Sri Lanka | 2.15 (1, 0) | 2.15 (1, 0) | 2.15 (1, 0) |
| | 0.22 (0.77) | 0.22 (0.77) | 0.22 (0.77) |
| Saudi Arabia | 9.54(1, 1) | 9.54(1, 1) | 9.54(1, 1) |
| | -1.13(0.00) | -1.13(0.00) | -1.13(0.00) |

Table 2
 Calculated F-statistics by normalising on saving

| Country | F(p,q) | F(p,q) (SBC) | F(p,q) |
|---------|--------|--------------|--------|
|---------|--------|--------------|--------|

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)

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 weak 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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