Savings-Investment Correlations: The Feldstein-Horioka Puzzle for Lesotho

Abstract

This article examines long-run relationship between national savings and investment for the case of Lesotho. Using the bounds testing approach to cointegration within the ARDL framework, the findings suggest that there is evidence of long-run cointegration between savings and investment in Lesotho during the period 1975 to 2011. The results from CUSUM and CUSUM of squares also suggest that the parameters of the model are stable in the long-run.

JEL classification codes: C32, E22, F32
Keywords: Savings-Investments, Feldstein-Horioka puzzle, ARDL, bounds testing.
1. **Introduction**

Increasing investment levels has been a subject of intense discussion in as far as policy analysis and formulation is concerned in developed and developing economies alike. This is because capital accumulation is critical determinant of economic growth and development, and capital accumulation stem from investments which in turn depends on domestic and foreign capital; as such policy makers and economists have sought to ways of financing investment and reforming economies to attract investments. However, this study seeks to focus on one way of financing investment, which is mobilising savings. Thus understanding the saving-investment link is important for at least two reasons as suggested by Schmidt-Hebbel *et al* (1994). First, it may hold the key to the positive correlation between saving and growth. Second, if capital accumulation is in fact the centrepiece of growth engine, the interaction between saving and investment is crucial for assessing the validity of traditional thinking that raising savings is in essence increasing growth. It is however important to note that in order to realise growth as a result of increase in savings depends on the ability of an economy to channel adequate savings into productive investment via financial intermediation Hitris and Wiseman (1982).

The pioneer work by Feldstein and Horioka (1980) has become the blue-print of assessing savings-investment nexus. They investigated savings-investment correlations for 16 OECD (Organisation of Economic Co-operation and Development) countries with an expectation that in industrialised countries with lesser capital controls, savings and investment should be uncorrelated. This stems from the fact that savings in any country would be transferred to the world capital market and finance investments in countries with favourable returns hence capital mobility especially in cases where the country in question is small relative to the rest of the world. However, the results were rather odd and against the then conventional wisdom with savings and investment correlated, hence ‘The puzzle’.

After using cross-sectional analysis for the period 1960 to 1974 they show that almost 80 per cent of savings in those OECD countries was transformed into domestic investment and the coefficient for investment was statistically not different from zero hence indicating that capital was rather immobile despite loosened capital controls. Ever since this pioneer work by Feldstein and Horioka many researchers have sought to solve the puzzle, however the harder they tried the more the puzzle became more controversial.
The controversy has since caused many to either try to justify or counter the Feldstein and Horioka analysis using various methodologies and method of analyses. Some have used cross-section analysis to investigate capital mobility using saving-investment correlations, while on the other hand some have criticised the use of cross-section analysis. They argued that cross-section analysis suffer the problem of selection bias. Despite such controversy all these studies assume that savings-investment correlations imply capital is either mobile or immobile depending on the magnitude and size of correlation between savings and investments. However, the ambiguity of the results from such studies has encouraged another strand of literature that has claimed otherwise; that savings are correlated to investment due to other macroeconomic aspects such as country size, financial structure, current account dynamics and non-traded goods.

Given this contradicting choice of methodologies and method of analyses (hence results) the Feldstein-Horioka puzzle has since remained a puzzle unsolved and as such the study seeks to investigate this puzzle for the economy of Lesotho. Using the bounds testing procedure within autoregressive distributed lag model (ARDL) framework the paper investigates the saving-investment correlations for Lesotho. Hence the objective is to determine whether savings and investment are cointegrated; thus giving extend by which the country is able to mobilise its savings into investment or whether capital is mobile. Though, much emphasis will not be made on the latter.

The remaining part of this paper is organised as follows: Section 2 discusses dynamics of investment and savings in Lesotho as well as macroeconomic aspects of the country. Section 3 discusses empirical as well as theoretical literature on saving-investment nexus, section 4 discusses data and methodology while section 5 provides and analyses results and section 6 concludes.

2. **Lesotho Economy at glance**

As a small and least developing country, Lesotho has experienced relatively low growth rate averaging 3.8 per cent for the past ten years. The government substantially relies on external sources of revenue such as Southern African Customs Revenue (SACU) which has contributed almost 60 per cent of its total revenue, as well as royalties from transfer of water resources to the Republic of South Africa (RSA) as well as remittances from mineworkers from RSA. The fact that major sources of revenue are external explains why the country’s gross domestic saving have been negative while gross savings (which
accounts for Net Factor Income from abroad) have on the other been positive throughout the time except on few instances (i.e. 1998 and 1999) as seen on figure 1 below.

One other important feature of the economy is, as with all other economies investment plays an important role in the nation’s productivity averaging 42 per cent of the nation’s GDP since 1975 to 2011 and on several occasions being as high as 74 per cent (i.e. early to mid ‘90s). This clearly shows how important investment is to economic growth of the economy and therefore fostering policies aimed at increasing investment is very crucial. One of those policies might be increasing savings in the economy especially if such savings tend to remain in the economy and can be used to finance investment activities.

Fig. 1: The Savings and Investment Graphs in Lesotho (variables in levels)

Another important feature of the economy is the fact that the economy operates under fixed exchange regime in which the currency (Loti) is pegged to the South African Rand and hence shares similar monetary policies with the RSA. This is an important feature since exchange rate regime is thought to have implications on savings-investment nexus. Fixed exchange regime is thought to encourage more capital mobility because as it is perceived to offer less risky business environment for investors and as such a country with fixed exchange is perceived to attract more inflow of capital and as such investment becomes exogenous.
3. Review of Literature

The relationship between saving and investments was pioneered by Keynes (1936) and neo-classical economists; in his own words Keynes once said: “Provided it is agreed that income is equal to the value of current output, that current investment is equal to the value of that part of current output which is not consumed, and that saving is equal to the excess of income over consumption all of which is conformable both to common sense and to the traditional usage of the great majority of economists the equality of saving and investment necessarily follows.” This was one of the few concepts in which Keynes and neo-classical economists agreed, although they did not agree on institutions linking savings and investment. Their notion however presumed that one could not invest unless they have saved and that could be the case only in closed economies.

However, economies would open up and the age of globalisation would eventually begin and hence national savings would not be the only determinants of investments but also capital inflows would. Feldstein and Horioka (1980) were the first to empirically test the relationship between savings and investment. Their expectation was however different from that of Keynes, they expected that the two should not be cointegrated because economies had started to open up and national savings would be used to finance investment where returns were higher. However, the results did not match their hypothesis and were forced to believe that capital is immobile despite the fact that economies were open. This would prove to be a puzzle; and it was later to be included in six major puzzles in International macroeconomics by Obstfeld and Rogoff (2000).

Ever since this pioneer work by Feldstein and Horioka many empirical studies have tried to solve this conundrum; despite all these efforts the puzzle would however remain a puzzle and Obstfeld and Rogoff suggest that efforts to solve it have come at an expense of creating many other puzzles. As a result there emerged various strands of literature aiming to address the puzzle as suggested by Ang (2007) and Tang and Lean (2011). The first strand of literature tries to confirm the Feldstein-Horioka puzzle and argues that cointegration between savings and investment suggests that capital is immobile. While on the hand the second strand of literature challenges this puzzle by claiming that savings are cointegrated to investment due to other macroeconomic factors other than capital immobility.
The first strand of literature has sought to confirm that indeed is capital either perfectly mobile or immobile depending on the nature of link between savings and investment. Such studies have used different methods of data (i.e. cross-sectional data and time series data). Using cross-sectional data Feldstein (1983), Penati and Dooley (1984), Vos (1988) and Dooley et al (1987) found that indeed savings and investment were integrated and hence capital is mobile. However, Wong (1990) criticised the use of cross-sectional data by suggesting that it faces selection bias and hence time series studies are more appropriate.

In effect a vast array of time series studies then emerged to try to solve this puzzle. Using time series data across different capital controls and exchange rate regimes Miller (1988), Narayan (2005), Ho (1999) and De Vita and Abbott (2002) investigated capital mobility using savings-investment nexus. However, the results were rather not uniform and mixed hence sparking a new controversy. The controversy was about the methodology employed within those time-series studies. Jansen (1996) and Jansen and Schulze (1996) claimed that error correction models would be superior in examining capital mobility using savings-investment correlations. Rocha (2006) then tried to confirm that indeed error-correction models are superior but failed to agree with Jansen (1996) and Jansen and Schulze (1996) based on data from developing countries although he ‘agrees with them in principle.’

This in essence has caused frustration about capital mobility and savings-investment nexus. This is mainly because empirical evidence suggests that current account deficits are associated with investment booms, thereby implying that increases in domestic investment are at least partly financed by capital inflows Sachs (1981) a very frustrating prospect. The frustration has brought along a new strand of literature. This strand seeks to explain why it that savings and investment are cointegrated despite the fact that capital is mobile. Using a dynamic two country, one sector, stochastic growth model, Baxter and Crucini (1993) found that size of the country is the one that determines correlation between savings and investment. While on the other hand Caprio and Howard (1984) and Summers (1988) suggest that policy reactions are the ones responsible for correlation especially policies aimed at making current account solvent so that the country in question is not penalised by the world’s capital market Coakley et al (1996) and Montiel (1994).
The ambiguity of results and various explanations present in literature clearly suggests that it is difficult to assert systematic or rather consistent theory about investment-savings nexus behaviour. Hence country specific studies are very preferable in this case.

4. Data and Methodology

4.1 Data and model specification

This study uses annual data from the World Bank’s World Development Indicators for the period 1975 to 2011 for Lesotho. The savings rate \( S_t \) is defined as gross saving as percentage of GDP while investment rate is defined as gross capital formation as percentage of GDP. The time span of the analysis is determined by availability of data. The use of gross savings (% of GDP) deviates from many studies since such studies instead use gross domestic savings (% of GDP) as a measure of saving rate. This deviation stems from the fact that Gross Domestic savings for the country (Lesotho) have been negative all along, this entirely happens because major sources of revenue for public sector are external (i.e. SACU revenues and water transfers from RSA) also a substantial portion of the population get their income via remittances from mining workers based in RSA who Lesotho nationals all these factors are ignored by gross domestic saving which encompasses GDP less total consumption in economy, while on the other hand gross savings are calculated as GNI minus total consumption and this encompasses net factor income from abroad by all sectors in the economy. It should also be borne in mind that economically speaking savings are part of the income that is not consumed Jiranyakul and Tantatape (2008).

In order to investigate the relationship between savings and investment, the study employs the long-run generic model by Feldstein and Horioka (1980) with this form:

\[
I_t = \beta_0 + \beta_1 S_t + \varepsilon_t
\]  

(1)

Where, \( I_t \) is the ratio of gross capital formation to GDP at time \( t \), \( S_t \) is the ratio of gross savings to GDP at time \( t \). \( \beta_0 \) is the constant, while \( \beta_1 \) is the regression coefficient for savings and investment. The higher estimate for \( \beta_1 \) would suggest that most savings remain in the economy and are mobilised into investment while the lower estimate for \( \beta_1 \) would suggest that either capital mobility, the economy is poor in mobilising its national saving or both scenarios are true. The residuals \( \varepsilon_t \) are assumed to be white noise and spherically distributed. However, the above specification is subject to limitations such as
$I_i$ and $S_i$ have unit root hence regressing variables would yield spurious regression results. Also the specification ignores the short-run dynamics between savings and investment and hence some econometric manipulations have to be done.

### 4.2 Econometric framework

#### 4.2.1 Model Specification

The study employs the bounds testing approach to cointegration developed by Pesaran and Shin (1999) and extended by Pesaran *et al* (2001) within the autoregressive distributed lag (ARDL) framework to investigate the relationship between savings and investment in Lesotho. The use of this method is encouraged by a number of reasons. First, it does not matter whether the series are integrated of order one $I(1)$ or the series are not integrated $I(0)$ or whether they are mutually integrated, also contrary to simple VAR (Vector autoregressive) models the number of variables in ARDL can be large. Moreover, unlike the Engel and Granger (1987) two-step cointegration procedure, the bounds test approach does not push short-run dynamics into the error term, so it is possible to examine short-run dynamics also. So in order to examine this long-term relationship the following ARDL model is estimated:

$$
\Delta I_i = \alpha_0 + \beta I_{i-1} + \theta S_{i-1} + \sum_{i=1}^{p} \gamma_i \Delta I_{i-1} + \sum_{i=0}^{q} \psi_i \Delta S_{i-1} + \epsilon_i \tag{2}
$$

The above specification is done under the assumption that the series are not stationary as is the case with many time series. Where, $\Delta$ is the first difference operator and $\epsilon_i$ is a well behaved error-term with white noise and spherically distributed. The lag order of the ARDL is determined using information criteria: Akaike Information Criterion (AIC), Schwarz Bayesian Information Criterion (SBIC) and Hannan and Quinn information criterion (HQIC).

To test long-run relationship between savings and investment using bounds testing, the joint significance test for $H_0: \beta = \theta = 0$ against the alternative hypothesis of $H_1: \beta \neq \theta \neq 0$ is performed. The test is based on Wald-test (F-statistics); the asymptotic critical values for the test were supplied by Pesaran *et al* (2001) however the critical values were found to be inapplicable for small sample studies i.e. Narayan found critical values for a sample of 31 to be 35.5% higher than those reported by Pesaran *et al* (2001)
1000 observations. Thus critical values will be taken from Narayan (2005) since the sample size is small. To affirm the cointegration exists, the F-statistics from joint test of significance should be greater than asymptotic critical values from Narayan for upper bounds and lower bounds, otherwise there is no cointegration.

4.2.2 Unit root tests

To ascertain the order integration of the variables, the study uses four conventional unit root tests: ADF Augmented Dickey Fuller test by Dickey and Fuller (1979), ADF-GLS, PP by Phillips and Perron (1988) and KPSS by Kwiatkowski et al (1992). This is to ensure that the series are either are $I(0)$ or $I(1)$ since the use of bounds testing is only applicable for series either $I(0)$ or $I(1)$ whereas it is inapplicable if they are $I(2)$. The use of multiple unit root test is to complement the short comings of traditional unit root tests (i.e. ADF and PP), which have been found to be unreliable because of their power and size as suggested by Rapach and Weber (2004) and hence the use of GLS transformed ADF and the KPSS (Kwiatkowski, Phillips, Schmidt & Shin 1992).

However, even these tests might be misleading in the presence of structural breaks in the series failing to reject the hypothesis that series have unit root in the presence of structural break. In other words they may erroneously assert that series are $I(1)$ while in fact series are stationary around structural breaks and thus $I(0)$ as stated Perron (1989). To complement for this limitation the study further employs Zivot and Andrews (1992) unit root tests in the presence of structural break. There are three versions of ZA test for endogenous structural break. The model that allows for break in intercept, the model that allows for break in trend of the series as well as the model which allows for break in the intercept and slope, their specification looks thus:

Intercept: $\Delta y_t = \kappa + \alpha y_{t-1} + \beta t + \theta_1 DU_1 + \sum_{i=1}^{k} d_i \Delta y_{t-i} + \epsilon_t$ \hspace{1cm} (3)

Slope: $\Delta y_t = \kappa + \alpha y_{t-1} + \beta t + \gamma_1 DT_1 + \sum_{i=1}^{k} d_i \Delta y_{t-i} + \epsilon_t$ \hspace{1cm} (4)

Intercept and slope: $\Delta y_t = \kappa + \alpha y_{t-1} + \beta t + \theta_1 DU_1 + \gamma_1 DT_1 + \sum_{i=1}^{k} d_i \Delta y_{t-i} + \epsilon_t$ \hspace{1cm} (5)

Where, $\Delta$ is the first difference operator, the error term $\epsilon_t$ is assumed to be normally distributed and white noise. While $DU_1$ and $DT_1$ are dummy variables for break in intercept and trend shift respectively both at time $TB_1$ where,
The optimal lag length $k$ is determined by the significant "$t$–significant" method and the breakpoint is determined where ADF $t$-statistics is maximised in absolute terms.

However, to assume the series have one break is too big an assumption to make that is why Lumsdaine and Papell (1997) extended ZA test by proposing that the series have two breaks. However, their approach has come under criticism that it tends to suggest stationarity in breaks under null hypothesis of unit root Glynn et al (2007). Hence, The Perron-Vogelsang and Clemente-Montanes-Reyes unit root tests by Perron and Vogelsang (1992) and Clemente et al (1998) are more preferable. These two tests offer two models which are:

a) An additive outliers (AO) model, which captures sudden change in the mean of the series; and
b) An innovational outliers (IO) model, which captures a gradual change in the mean of the series.

These models test the null hypothesis $H_0$ against the alternative hypothesis $H_1$:

$$H_0: y_t = y_{t-1} + \delta_1 DTB_{it} + \delta_2 DBT_{2t} + \mu_t$$  \hspace{1cm} (6)

$$H_1: y_t = \mu + d_1 DU_{it} + d_2 DTB_{2t} + e_t$$  \hspace{1cm} (7)

In these equations $DTB_{it}$ is a dummy variable that assumes the value of one if $t = TB_i + 1$ for $(i = 1, 2)$ and zero otherwise. Also $DU_{it} = 1$ if $t > TB_i$ for $(i = 1, 2)$ and zero otherwise.

5. Results

5.1 Unit root tests results

To ascertain that the series are either $I(0)$ or $I(1)$ we use conventional unit root tests: ADF, ADF-GLS, PP and KPSS. The results are reported in Table 1 below.
Table 1: The Classical unit root tests results

<table>
<thead>
<tr>
<th>Variables</th>
<th>ADF</th>
<th>PP</th>
<th>ADF-GLS</th>
<th>KPSS^#</th>
</tr>
</thead>
<tbody>
<tr>
<td>$I_t$</td>
<td>-2.248</td>
<td>-1.766</td>
<td>-1.568(3)</td>
<td>0.183(4)***</td>
</tr>
<tr>
<td>$\Delta I_t$</td>
<td>-1.764</td>
<td>-6.355***</td>
<td>-5.716(0)***</td>
<td>0.0898(7)</td>
</tr>
<tr>
<td>$S_t$</td>
<td>-0.850</td>
<td>-2.739</td>
<td>-2.445(0)</td>
<td>0.112(4)***</td>
</tr>
<tr>
<td>$\Delta S_t$</td>
<td>-2.221</td>
<td>-6.455***</td>
<td>-3.583**</td>
<td>0.0514(1)</td>
</tr>
</tbody>
</table>

Note: The asterisks ***,** and * denote significance level at 1%, 5% and 10% for the four tests of unit root. The null hypothesis is that the series are non-stationary for ADF, PP and ADF-GLS. The optimal lag length and bandwidth for ADF-GLS and KPSS respectively in the parentheses are determined using Newey and West (1994) method for KPSS, while the lag length for ADF-GLS is selected using the Ng-Perron method by Perron and Ng (1996). The critical values used for ADF-GLS are obtained from Elliott, Rothenberg, and Stock (1996).^# the null hypothesis for KPSS test is that the series are stationary, against the alternative hypothesis that they are non-stationary.

As can be seen from the results above majority of the tests (i.e. PP, ADF-GLS and KPSS) suggest that all series are $I(1)$ in levels and become stationary after being differenced. As such, the bounds testing approach to cointegration can be used; however it remains to be seen if the series have structural breaks in them.

Table 2: The Zivot and Andrews’s unit root test results with one structural break

<table>
<thead>
<tr>
<th></th>
<th>Investment</th>
<th></th>
<th>Savings</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Trend</td>
<td>Intercept</td>
<td>Both</td>
<td>Trend</td>
</tr>
<tr>
<td>$t(\lambda_{inf})$</td>
<td>-2.919</td>
<td>-3.442</td>
<td>-3.264</td>
<td>-3.458</td>
</tr>
<tr>
<td>Critical values</td>
<td>1%</td>
<td>-4.93</td>
<td>-5.43</td>
<td>-5.57</td>
</tr>
<tr>
<td></td>
<td>5%</td>
<td>-4.42</td>
<td>-4.80</td>
<td>-5.08</td>
</tr>
</tbody>
</table>

Note: the null hypothesis is that the series are unit root.

Table 3: Clemente-Montañés-Reyes unit root test results with double mean shift

<table>
<thead>
<tr>
<th></th>
<th>Investment</th>
<th></th>
<th>Savings</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Additive Outliers (AO)</td>
<td>Innovative Outliers (IO)</td>
<td>Additive Outliers (AO)</td>
<td>Innovative Outliers (IO)</td>
</tr>
<tr>
<td>Min. $t$-statistics</td>
<td>-4.321</td>
<td>-4.570</td>
<td>-4.519</td>
<td>-5.422</td>
</tr>
<tr>
<td>Critical values</td>
<td>5%</td>
<td>-5.490</td>
<td>-5.490</td>
<td>-5.490</td>
</tr>
</tbody>
</table>

Note: The null hypothesis is that the series are unit root.
Overall, the unit root tests for presence of structural breaks find no further information against presence of breaks in the series. Hence, the use of ARDL bounds testing approach to cointegration is justified since the classical unit root tests have confirmed that the series are either $I(0)$ or $I(1)$ while on the other hand there is enough evidence to support presence of breaks.

5.2 ARDL bounds test results
To implement the bounds testing approach to cointegration we first determine the optimal lag order of the ARDL. To do that we use information criteria as suggested by literature: AIC, SBIC and HQIC. Majority of these information criteria suggest that optimal lag order is ARDL (1, 1). The results for regression output and bounds testing are reported in Table 4 below.

<table>
<thead>
<tr>
<th>Table 4: Estimated ARDL model and Bounds Testing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependent variable: $\Delta I_t$</td>
</tr>
<tr>
<td>Method: Ordinary Least Squares (OLS)</td>
</tr>
<tr>
<td>Sample: 1977-2011 (adjusted)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Independent variable</th>
<th>Coefficient</th>
<th>t-statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>constant ($\alpha_0$)</td>
<td>1.529</td>
<td>0.490</td>
</tr>
<tr>
<td></td>
<td>(3.094)</td>
<td></td>
</tr>
<tr>
<td>$I_{t-1}$</td>
<td>-0.207</td>
<td>-2.84**</td>
</tr>
<tr>
<td></td>
<td>(0.073)</td>
<td></td>
</tr>
<tr>
<td>$S_{t-1}$</td>
<td>0.195</td>
<td>3.10***</td>
</tr>
<tr>
<td></td>
<td>(0.063)</td>
<td></td>
</tr>
<tr>
<td>$\Delta I_{t-1}$</td>
<td>-0.034</td>
<td>-0.23</td>
</tr>
<tr>
<td></td>
<td>(0.149)</td>
<td></td>
</tr>
<tr>
<td>$\Delta S_{t-1}$</td>
<td>-0.194</td>
<td>-3.39***</td>
</tr>
<tr>
<td></td>
<td>(0.057)</td>
<td></td>
</tr>
</tbody>
</table>

**Bounds Test**

F- Test: 6.920

<table>
<thead>
<tr>
<th>Critical Values (F-test)</th>
<th>Lower $I(0)$</th>
<th>Upper $I(1)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1%</td>
<td>4.948</td>
<td>6.028</td>
</tr>
<tr>
<td>5%</td>
<td>3.478</td>
<td>4.335</td>
</tr>
<tr>
<td>10%</td>
<td>2.845</td>
<td>3.623</td>
</tr>
</tbody>
</table>

Note: ***, **, * denote significance level at 1%, 5%, and 10% respectively. Robust standard errors are given in brackets. For bounds test: T=35 Critical values from Narayan (2005) are used for k=2 in Case II (restricted intercept and no trend). R-squared: 0.2815; Adjusted R-squared: 0.1857; F-statistics: 7.94 (0.0002), Ramsey RESET: 0.48 (0.699), ARCH test [1]: 0.037 (0.8473), [2]: 0.046 (0.9772) Durbin’s alternative test for autocorrelation [1]: 2.287 (0.1305).

( ) refer to the p-value. [ ] refer to the order of test.
Diagnostics tests for the ARDL model were conducted and the results show no problems. The Ramsey’s RESET test shows that the model is correctly specified and no variables have been omitted. The ARCH test on the other hand shows that the errors are homoscedastic and are not serially correlated as per Durbin’s alternative test. Shapiro-Francia test for normal data shows that the errors are normal.

In order to test the long-run relationship between savings and investment, a joint significance Wald F-test for $H_0: \beta = \theta = 0$ is conducted. The computed F-statistic is 6.92, which is greater than the 5% upper critical value. This suggests that there is cointegration between savings and investment in Lesotho.

The study further employs the CUSUM and CUSUM of squares tests to the recursive residuals of the estimated ARDL model. The tests are used to test the stability of the parameters of the ARDL model. If the plots stay within the 5% critical bounds then the coefficients in the model are said to be stable.

**Fig. 2: Plot of cumulative sum and cumulative sum of squares recursive residuals**
The results from CUSUM and CUSUM squared tests suggest that the parameters of the model are stable over time save on several occasions when the plots went beyond the bounds. However, it can be said that the cointegration parameters are stable over time as they came back to stability.

These findings are rather against what was hypothesised by Baxter and Crucini (1993). They suggested that savings should be more cointegrated to investment in larger countries which can have impact on the world’s is interest rate and be less cointegrated in smaller countries which cannot impact the world’s interest rate. It is also against assertion by Razin and Rubinstein (2006) that capital is more mobile under fixed exchange regime. It is also against empirical findings by Tang and Lean (2011) who found savings and investment not to be cointegrated, they also gave suggestions that under fixed exchange rate regime capital should be mobile (i.e. savings should not be cointegrated to investments). The results on the other hand conform to what was found by Ang (2007) in the case of Malaysia. It is important however to note that above studies suggest that cointegration between savings and investment suggest that capital is immobile and the opposite also holds.

6. Conclusion
The study aims to investigate the Feldstein-Horioka puzzle for Lesotho over the sample period of 1975 to 2011 using bounds testing approach to cointegration in ARDL framework. In particular, the study is more interested in cointegration between savings and investment. This is very important since it relates to formulation of macroeconomic policies aimed at increasing saving rate in order to realise higher investment rate thus growth.¹

First, the results from the bounds testing approach show that indeed there is a long-run cointegration between savings and investments and as such any movement in savings will likely result in changes in investment rate. Also the results from CUSUM and CUSUM of squares further suggest that parameters of the model are stable over time. Hence policies aimed at mobilising savings into investment may have very good results. However, increasing savings should not be the only way of financing investment but policy makers should also look into reforming the business climate in order to attract more capital inflows.

¹ i.e. In cases where savings and investment show long-run co-movements.
However, unlike many other studies, the results in this study are not treated as suggesting that capital is immobile for the economy of Lesotho. In order to make such bold assertions it may be important to investigate dynamics of capital inflow and outflow for the economy. It should also be acknowledged that the short-run dynamics were not much looked into as well as the direction of causality between the two variables. These aspects leave a room for further research.

It also should be acknowledged that the results from this study are rather puzzling as much as findings by Feldstein and Horioka (1980) are. First, as noted earlier it takes reasonable level of financial intermediation to channel savings into investments, which still remains a question mark for Lesotho given its level of financial development is still infant. Two although the study is cautious with treating the results as suggesting that capital is immobile, it is quite puzzling why savings remain in the economy despite the fact that Lesotho’s capital account is liberalised.
Bibliography


Appendix

**Fig. 1**

![Differenced Series](image1)

**Fig. 2.** The Kernel density estimate for normality of residuals

![Kernel density estimate](image2)

kernel = epanechnikov, bandwidth = 2.5639