9-1-2010

Saving Investment Association in Turkey

Huseyin Kaya
Bahcesehir University

Saving Investment Association in Turkey

Hüseyin Kaya
Department of Economics, Bahçeşehir University
Çırağan Cad. Besiktas/İstanbul, Turkey
huseyin.kaya@bahcesehir.edu.tr
+90 212 381 04 97

Abstract

The aim of this paper is to investigate the domestic saving-investment relation in Turkey. In their very effective paper Feldstein and Horioka (1980) (FH hereafter) states that presence of relationship between national saving and investment would not be expected under the perfect capital mobility. In the case of perfect capital mobility, savings follow wherever the highest return is and the relations between domestic saving and investment disappear. Many empirical studies found that most of open economies have high saving investment association. Turkey experienced full capital account liberalization in 1989 and hence is like a well-designed laboratory to analyze the saving-investment relation by considering FH point of view. To analyze corresponding relation we use two different data sets, private investment-saving, and total investment-saving over the period 1984Q1-2007Q3. By using two different data sets we try to see change in corresponding relation when we reduce, by deducing public saving and investment from total saving and investment, the effects of solvency constraint and the balance of payment targeting. We employ ARDL bound testing procedure. Also existence of structural breaks in corresponding association is analyzed by using Bai and Perron (2003) procedure. We found hardly any evidence for structural break in corresponding relation as indicated by FH. We found strong long-run relationship between total investment and saving. On the other hand there is no significant long-run relation between private saving and investment. These two conflicting result may because of the balance of payment targeting and/or solvency constraint.

Keyword*: saving-investment, capital mobility, structural break, Feldstein-Horioka puzzle, cointegration*

JEL classification: C22; E21, E22, F21

1. Introduction

The relationship between saving and investment has long been interest of the analysts. While in closed economy the relationship between domestic saving an investment show strong positive association, the presence of international capital mobility makes it more complex to analyze.

In their very effective paper Feldstein and Horioka (1980) (FH hereafter) states that presence of relationship between national saving and investment would not be expected under the perfect capital mobility. In the case of perfect capital mobility, savings follow wherever the highest return is and the relations between domestic saving and investment disappear. However FH analyzed the corresponding relationships across 16 OECD countries, for the 1960–74 periods, and contrary to prediction found that domestic investment and savings were highly correlated. They argued that this is an evidence of imperfect capital mobility across countries and this result is named as FH puzzle in the literature. The FH conclusion of low capital mobility posed an uncomfortable puzzle because in most of the open macroeconomic models conventionally assume the high capital mobility since 1970s (Coakley et al, 1998).

Following FH, numerous studies devoted to analyze the FH puzzle. Feldstein (1983) extended the time period to 1960-1979, and show that there is no any decline in the corresponding relationship. Felstein and Bachetta (1991) investigate the same relation across 23 OECD countries over the period 1960-1986, and found that saving investment association only marginally declined. Also Obsfeld (1986), Golup (1990), Tesar (1991), use the same 16 OECD countries with FH and Penati and Doley (1984), Leachman (1990), Sinn (1992), Coakley et al (1994), Abott and De Vita (2003) and Helliwell (2004) use different OECD countries in their analysis and all of them found fully or partially empirical evidence for previous findings. On the other hand Murphy (1984) argued that large countries can effect the world interest rate and hence behave like closed economy, however small countries not. Dividing OECD countries as small and large, he found that response coefficient of saving (*saving retention coefficient*) is very close to one in large economies but it is 0.59 in small economies.

FH puzzle investigated not only in OECD countries but also in LDCs and developing countries. Coakley et al (1999) examine the saving investment association for 23 OECD countries and 44 LDCs over the 1965-1990 period and found that short-run covariance of saving-investment response is lower in the OECD countries. Wong (1990), found that in LCDs capital mobility is high and argued that this may because of the size of non-tradable sector. In addition to this Issakson (2001) found similar results with Wong (1990) and argued that this may because of the foreign aid. Dooley et al. (1987), investigate 62 countries which of 48 are developing and found that saving-investment correlation is weaker in developing countries than in OECD countries. Kasuga (2004) investigate the corresponding association for 79 developing and 23 OECD countries and concluded that countries that have developed financial markets has low capital mobility, and LDCs have the reverse. He argued that this may because of the way that asymmetric information effects investment. Also Ozmen (2005) analyze the 79 countries and found that investment saving association is higher in larger economies. Payne and Kumazawa (2006) use a sample of 47 developing economies and get some evidence of high capital mobility across developing countries.

Turkey as a member of OECD investigated in cross sectional FH puzzle analysis. On the other hand there are also time series analyses for Turkey. Coakley et al. (1994) individually investigate the OECD countries including Turkey over the 1960-1992 periods. The time series saving retention coefficient is found to be 0.717 for Turkey[1]. Yıldırım (2001) examine the nature of saving retention coefficient in Turkey by taking into account the structural reform in 1980 and found lower saving retention coefficient in post 1980 which support the FH interpretation. Lastly, Yentürk et al. (2007) conduct an empirical study to analyze the interaction among investment, saving and growth by using quarterly data including 1987Q1-2003Q1 period. Yentürk et al. (2007) use private saving and investment in their analysis and found that in medium and long run, saving and investment are cointegrated but there is no short run relationship between them. They also investigate the causality between variables and find that it is the growth induces both saving and investment and questioned the tight fiscal and monetary policies that rely on the basic understanding that saving trigger investment and growth. While understanding the nature of saving investment relationship is very crucial especially for an emerging market like Turkey, these previous empirical results give us conflicting results.

This study aims to investigate the nature of both private national saving-investment and total national saving-investment association in Turkey. To analyze the corresponding relation we use ARDL bound testing procedure. Turkey experienced full capital account liberalization in 1989 hence if FH interpretation of the relationship between saving and investment is correct, one should expect to structural break in saving-investment relation. Hence we investigate the

[1] The time series coefficients of saving are range from 0.025 (Luxemburg) to 1.18 (Switzerland) and for 17 of 24 OECD countries is found to be higher than 0.5.

existence of structural breaks in relation is by using Bai and Perron (1998, 2003) procedure. Main advantage of Bai and Perron (1998, 2003) structural break test is that we have opportunity to determine the structural break in relationship, if any, endogenously. We use two different data sets; are total saving and investment and private saving and investment cover the 1980Q1-2007Q3 period. Findings show that there is no any structural break in both total and private saving investment relation. In total saving investment relation we find strong long-run relation but in private ones there is no such relation. We think that this may because of the solvency constraint or balance of payment targeting.

The rest of this paper is organized as follows. Section 2 analyzes the time series properties of data. Section 3 analyzes the presence of structural break. Section 4 analyzes the cointegraiton relation and section 5 concludes.

2. Time Series Properties of Data

We have two data sets, private investment-saving and overall total investment-saving which are range from 1984Q1 to 2007Q3. Investment series are taken from consumption based GNP data set of TURSTAT. On the other hand saving series are calculated by following Yenturk et al. (2007) calculation method. Calculation method is following:

$$S_T = I + CAB$$

$$S_P = S_T - BB$$

Where S_T represents overall total national saving, I represents investment, CAB represents current account balance, S_P represents private saving and BB represents consolidated budget balance. Quarterly CAB series are taken from International Financial Statistics of IMF and quarterly BB series are taken from Ministry of Finance of Turkey. The data for the public saving were only released by State Planning Organization in annual frequency in Turkey. Because of that it is deduced consolidated budget balance from overall saving. Using consolidated budget balance as a proxy for public saving sector did not create a significant problem in Turkish case because correlation between constructed data and officially released private saving is about %70 in annual basis (Yentürk et al., 2007). Both data set seasonally adjusted by CensusX12 method.

Tabel 1. Unit Root Test (1984Q1-2007Q3)

	ADF[a]		PP[a]		KPSS[b]		DF-GLS[a]	
	intercept	Trend and int.	Intercept	trend and int.	intercept	trend and int.	intercept	trend and int.
PI	-2.189	-2.07	-2.192	-2.044	0.24	0.23*	-0.91	-1.52
PS	*-1.94*	*-0.96*	*-2.29*	*-2.12*	*0.29*	*0.22*	*-1.50*	*-1.60*
TI	*-2.82****	*-2.84*	*-2.94***	*-2.95*	*0.23*	*0.22**	*-2.35****	*-2.62*
TS	*-2.59****	*-2.84*	*-2.62****	*-2.87*	*0.41****	*0.26*	*-2.52****	*-2.67*

PS: private saving/GNP, TS: total saving/GNP
PI:private investment/GNP, TI: total domestic investment/GNP
Outcomes of the following tests: Augmented Dickey-Fuller (ADF), Philipps-Perron (PP), KPSS, and Dickey-Fuller GLS de-trended (DF-GLS)
a: Null hypothesis is seri is nonstationary, b: Null hypothesis is that series are stationary
* (**) [***] indicate significance level at %1 (%5) [%10]. Maximum lags are 12 and the information criterion is the Modified Akaike Information Criterion defined by Ng and Perron (2001). In the DF-GLS test, Elliot-Rothenberg-Stock (1996) modified the ADF tests by detrending the data so that explanatory variables.

Table 1 shows the four different unit root test results for the private saving/GNP (PS), private investment/GNP (PI), total saving/GNP (TS) and total domestic investment/GNP (TI*).* For PS-PI data all test except KPSS in the case of trend and intercept, indicate that PS-PI are I(1). However the test results for GS and GI show less clear picture about the time series properties of data. For the case of trend and intercept test statistics indicate that, except KPSS, TS and TI are I(1). On the other hand for the case of intercept test results indicate some degree of stationarity.

3. Structural Break Test for Relationship Between Investment and Saving

In this section we analyze the presence of structural break. If FH hypothesis of the relation between saving and investment disappear under the free capital mobility, one should expect that at 1989 there must be a structural break.

To test the presence of a break in investment saving association we employ Bai and Perron (1998, 2003) procedure which consists of running regressions and testing for breaks simultaneously. We examine the following FH relation:

$$PI_t = \alpha_{PI} + \beta_1 PS_t + \varepsilon_{t,PI} \qquad (1)$$

$$TI_t = \alpha_{TI} + \beta_1 TS_t + \varepsilon_{t,TI} \qquad (2)$$

where ε_t is white noise error term .

Table 2: Structural Break Test for TS-TI Relation (*1984Q1-2007Q3*)

$TI_t = \alpha + \beta TS_t + \varepsilon_t$		
$supF_T(k)$	$supF_T(l+1/l)$	U Dmax and W Dmax
The supF(1): 0.18 The supF(2): 4708* The supF(3): 1072925	supF(2|1): 0.00 supF(3|2): 0.00	U Dmax: 1072925* W Dmax: 1605732*
Number of break selected by procedure		
Sequential : 0		

The number of observations is 95. By following Bai and Perron (2003) it is allowed serial correlation in errors of the regression. It is allow up to 3 break and a trimming $\varepsilon = 0.20$

The number of observation in our sample is 95, and we allow serial correlation in errors of the regression. We allow up to three break and trimming value 0.20. U Dmax and W Dmax significant at %1 level but supF(1), supF(2|1) and supF(3|2) are insignificant. These results indicate that we have at most one break (in here 1998Q3). However the sequential procedure found no break and the confidence intervals (*not reported*) indicate meaningless interval which also indicate the difficulty to conclude that a break is presents. Consequently we can conclude that there is no o break in the association between total saving and investment during the period 1984Q1-2007Q3.

Table 3: Structural Break Test PS-PI(*1980Q1-2007Q3*)

$PI_t = \alpha + \beta PS_t + \varepsilon_t$		
$supF_T(k)$	$supF_T(l+1/l)$	U Dmax and W Dmax
The supF(1): 6.40 The supF(2): 5832* The supF(3): 10551*	supF(2|1): 0.04 supF(3|2): 0.04	U Dmax: 482904* W Dmax: 898916*
Number of break selected by procedure		
Sequential : 0		

The number of observations is 111. By following Bai and Perron (2003) it is allowed serial correlation in errors of the regression. It is allow up to 3 breaks and a trimming $\varepsilon = 0.20$

Table 3 show the structural break test results for PS-PI relation. The test results for PS-PI data are very similar with test results for TS-TI. While the test found first possible break at 1988Q3, the significance of break is questionable. SupF(1) and sequential procedure indicate no break also confidence intervals (*not reported*) are meaningless. Thus we cannot conclude that there is significant presence of structural break in that relation.

4. Testing the Relationship Between Investment and Saving in Turkey: ARDL Model Bound Testing Approach

In this section we analyze the cointegraiton relation between saving and investment. Cointegration techniques, developed by Engle and Granger (1987), Johansen (1991, 1995), employed previous studies require that all variables are integrated in same order. However autoregressive distributed lag model (ARDL) bound test approach to cointegration (Pesaran et al., 2001) does not require that all variables are integrated same order. As time series properties of our data show some inconclusive results, employing ARDL bound testing approach save us from being sure about that all series are I(1).

ARDL is the major workhorse in dynamic single-equation regressions. The ARDL modeling approach is popularized by, Pesaran and Smith (1998), Pesaran and Shin (1999), and Pesaran *et al.* (2001). The main advantage of this approach lies in the fact that it can be applied irrespective of whether the variables are I(0) or I(1). Another advantage of this approach is that the model takes sufficient numbers of lags to capture the data generating process in a general-to-specific modeling framework. Moreover, a dynamic error correction model (ECM) can be derived from ARDL through a simple linear transformation. The ECM integrates the short-run dynamics with the long-run equilibrium without losing long-run information. It is also argued that using the ARDL approach avoids problems resulting from non-stationary time series data (Shrestha, 2005).

ARDL (*p*,*q*) model without trend for FH relationship is :

$$\Delta TI_t = \alpha + \sum_{i=1}^{p} \beta_i \Delta i_{t-i} + \sum_{i=0}^{q} \delta_i \Delta TS_{t-i} + \lambda_1 i_{t-1} + \lambda_2 s_{t-1} + \upsilon_t \tag{3}$$

$$\Delta PI_t = \alpha + \sum_{i=1}^{p} \beta_i \Delta i_{t-i} + \sum_{i=0}^{q} \delta_i \Delta PS_{t-i} + \lambda_1 i_{t-1} + \lambda_2 s_{t-1} + \upsilon_t \tag{4}$$

Where α is drift component and υ_t are white noise errors. Δ denotes first difference operator. The first part of the equation with β and δ represents the short run dynamics of model and the second part of the equation with λ 's represents the long-run dynamics of the model. If the all λ 's are zero it means that there is no long-run relationship between variables.

In the equation (2) the terms with summation signs represents the error correction dynamics and the terms with the λ represents the long-run relationship. To test the non-existence of level relationship between growth of industrial production index and term structure of interest rate two separate bond test applied. In the first step it is used *F*-test for the null hypothesis

$\lambda_1 = \lambda_2 = 0$ and t-test for the null hypothesis of $\lambda_1 = 0$. Rejecting the null hypothesis will lead to reach stable long-run level relationship.

Given statistics of structural break we employ ARDL bound testing procedure to the whole period. Table 4 and 5 shows the *Fιv* and t statistics for the existence of level relationship between TI-TS and PI-PS respectively. For both models Akaike and Schwartz information criterion select lag 1.

Table 4: F and t statistics for testing the existence of cointegration relationship for TS-TI relation

P	$F_{\iota v}$	*t*	*F [prob]*
1 (AIC, SIC)	5.82**	-3.30*	1.3061 [0.2754]
2	5.64***	-3.15*	1.5935 [0.1850]
3	5.54***	-3.00*	1.4369 [0.2306]
4	6.69**	-3.46*	1.6212 [0.1786]
5	2.99	-2.31	1.4366 [0.2218]
6	2.47	-1.90	0.83619 [0.5286]
7	2.29	-1.84	2.4264 [0.0441]
8	1.52	-1.25	5.5055 [0.0003]

The *Fιv* statistics is used to test for the null hypothesis $\lambda_1 = \lambda_2 = 0$ and t statistics for the null hypothesis of $\lambda_1 = 0$ in equation (2). Asymptotic critical values for *Fιv* statistics are obtained from Table CI(iii) Case III: Unrestricted intercept and no trend, asymptotic critical values for t statistic are obtained from Table CII(iii) Case III: Unrestricted intercept no trend (Pesaran et al, 2001). Critical values for F statistics for the number of independent variable k=1, at %1 (%5) [%10] level: lower bound [I(0)] is 6.84 (4.94) [4.04] and upper bound I(1) is 7.84 (5.73) [4.78]. Critical values for t statistics for the number of independent variable k=1, at %1 (%5) [%10] level: lower bound is -3.43(-2.86)[-2.57] and upper bound is -3.82(-3.22)[-2.91] (Pesaran et al, 2001).

-* (**) [***] denotes the null hypothesis of no cointegration is rejected at %1 (%5) [%10] level.

Fιv and *t* statistics reject the null hypothesis of there is no level relationship at %5 level for lag 1 and 4 and at %10 level for lags 2 and 3. The null of no autocorrelation is also cannot be rejected for corresponding lag order.

Table 5: F and t statistics for testing the existence of cointegration relationship for PS-PI relation

P	$F_{\iota v}$	*t*	*F [prob]*
1(AIC, SIC)	3.26	-1.87	1.3622 [0.2467]
2	3.58	-1.90	1.9271 [0.0986]
3	3.82	-2.22	1.8560 [0.1116]
4	3.41	-1.84	1.8733 [0.1089]
5	5.47***	-1.92	0.22540 [0.9504]
6	5.35***	-2.10	0.15067 [0.9792]
7	5.31***	-2.15	0.39993 [0.8472]
8	3.39	-1.73	0.44400 [0.8161]

The *Fιν* statistics is used to test for the null hypothesis $\lambda_1 = \lambda_2 = 0$ and t statistics for the null hypothesis of $\lambda_1 = 0$ in equation (2). Asymptotic critical values for *Fιν* statistic are obtained from Table CI(iii) Case III: Unrestricted intercept and no trend, asymptotic critical values for t statistic are obtained from Table CII(iii) Case III: Unrestricted intercept no trend (Pesaran et al, 2001). Critical values for F statistics for the number of independent variable k=1, at %1 (%5) [%10] level: lower bound [I(0)] is 6.84 (4.94) [4.04] and upper bound I(1) is 7.84 (5.73) [4.78]. Critical values for t statistics for the number of independent variable k=1, at %1 (%5) [%10] level: lower bound is -3.43(-2.86)[-2.57] and upper bound is -3.82(-3.22)[-2.91] (Pesaran et al, 2001).

-* (**) [***] denotes the null hypothesis of no cointegration is rejected at %1 (%5) [%10] level.

For the selected lag 1, and fist four lag order both *Fιν* and t statistics reject the level relationship between TI and TS. For lag 5,6 and 7 *Fιν* and *t* statistics cannot reject the null hypothesis of there is no level relationship at %10 level. Also F statistics show that there is no serial correlation. As a result ARDL bound test results indicate some sort of evidence for level relation for higher lag order.

5. Long-run Coefficients

As we find that there is cointegration relationship we can get long-run coefficients from the following ARDL(*p*,*q*) model:

$$i_t = \alpha + \sum_{i=1}^{p} \beta_i i_{t-i} + \sum_{i=o}^{q} \varphi_i s_{t-i} + \upsilon_t \qquad (5)$$

$$i_t = \alpha + \beta_1 i_{t-1} + \beta_2 i_{t-2} + ... + \beta_p i_{t-p} + \varphi_0 s_t + \varphi_1 s_{t-1} + ... + \varphi_q s_{t-q} + \upsilon_t \qquad (6)$$

Thus long run relationship is $\tilde{i}_t = \dfrac{\alpha}{1-\left(\beta_1 + \beta_2 + ...\beta_p\right)} + \left(\dfrac{\varphi_0 + \varphi_1 + ...\varphi_q}{1-\left(\beta_1 + \beta_2 + ...\beta_p\right)}\right) s_t + \upsilon_t$

where $\left(\dfrac{\varphi_0 + \varphi_1 + ...\varphi_q}{1-\left(\beta_1 + \beta_2 + ...\beta_p\right)}\right)$ is long-run effect of s_t on i_t where *i= TI, PI and s= TS,PS*

To estimate long-run coefficients, firstly it is required to estimating equation (5) by OLS. Optimal number of lag is determined by AIC. The ARDL method estimates $(p+1)^k$ number of regressions to obtain optimal lag length for each variable, where *p* is the maximum number of lag to be used and k is the number of variables in equation.

The estimated order of ARDL (p,q) model were selected by searching across the $(8+1)^2=81$ ARDL models, spanned by p=0,1,2…9 and q=0,1,2…9 using the AIC information criterion. For both equation AIC select the ARDL (1,0).

Table 6: Long-run coefficients

Selected Model	Constant (*t prob*)	Slope (*t prob*)
ARDL(1,0) TS-TI	0.08 (0.01)*	0.69 (0.06)*
ARDL(1,0) PS-PI	0.21 (0.04)*	-0.12 (0.12)

* indicate significance at %1.
Estimated order of an ARDL (p,q) model in two variables (i,s) were selected by searching across the $(3+1)^2=16$ ARDL model, spanned by p=0,1,,,3 and q=0,1,,,3, using AIC.

The estimated coefficients are represented on Table 6. The long-run coefficient of total saving is found to be 0.69. On the other hand long-run coefficient of private saving is insignificant. These findings indicate that while there is strong relationship between total domestic investments and saving, this relation is disappear between private saving and investment. Finding some evidence of cointegrating relationship between private saving and investment may indicate that both variables are affected by a common factor. As Yentürk et al. (2007) found that growth induces both private saving and investment, growth seems to be a good candidate for this.

6. Short-run Dynamics

As we find significant long-run relationship between TI and TS we investigate the short run dynamics of corresponding relation. The short run dynamics of the model is shown in Table 8 which tabulates the estimates of error correction model (ECM) associated to ARDL (1,0).

Table 8: ECM Results (*1962-2007*)

ECM-ARDL (1,0)		
Regressor	*Coeff.*	*t value (t prob)*
Δs	*0.374*	*6.696 (0.00)*
EC_{t-1}	*-0.539*	*-7.264 (0.004)*
R^2= 0.384 F_{SC} = 0.938 [0.40] , X_N = 1.05[0.59] F_{FF}= 0.014 [0.90]		

Regressions are estimated by OLS. EC is error correction terms that are defined as EC = gi-0.08 - 0.69*gs. X^2_N, F_{SC}, and F_{FF} denotes Chi square statistics to test normality and F statistics for serial correlation and Ramsey Regression Equation Specification Error Test (RESET) test respectively. P values are given in [.].

The error correction term and short run coefficient of saving is significant. The value of EC is -0.54, indicate that 54 percent of disequilibria of the previous quarter come back to the long run equilibrium in the next quarter. The coefficient of Δs measures what extend a temporary annual shock to domestic saving pass thorough into domestic investment given long-run relation. It show that almost forty percent of the temporary shock in saving pass through into domestic investment.

From the view of FH argument, investment-saving relation indicates that there is capital mobility in Turkey however private investment-saving relation indicates the reverse.

One of the explanations of this conflicting result may come from balance of payment dynamics. As current account is equal to total national saving minus investment, public or private decision makers respond to balance of payment disequilibrium and this lead to close association between saving and investment. On the other hand governments can target the current account by using some policy instrument. Also Coakley et al (1996) argued that there is no theoretical reason to believe that the FH coefficients should be stable structural or reduced from parameters and including neoclassical growth theory and business cycles models many theories suggest that saving and investment has close association irrespective of whether there is free capital mobility or not. FH puzzle is not puzzle but just statistical artifact because solvency constraint. Solvency constraint on balance of payment leads to current account as a share of GNP a stationary process. Since current account is equal to total national saving minus investment, saving and investment rates should cointegrate with a unit coefficient. So it is solvency constraint that FH coefficient measures (Coakley et al. 1998).

7. Conclusion

FH argued that the association between domestic saving and investment is perfect in closed economy but the presence of capital mobility breakdown this relation. However the empirical findings of close saving investment correlation in OECD countries, considered as a puzzle. In this regard, we analyze the saving investment relation in Turkey. To do this we use two different data set; total saving- total domestic investment and private saving-investment during the period 1984Q1-2007Q4 by employing ARDL bound testing approach. The previous studies for Turkey take into account the full capital account liberalization at 1989 exogenously in Turkey. We argued that if FH final statement is true, instead of taking the effects of corresponding dates in Turkey exogenously, one can find structural break endogenously in saving investment relation. However by employing Bai and Perron (1998, 2003) structural break test we find that there is no significant structural break on corresponding relations. After that analyzing the S-I relation on whole periods we find different results for different data set. Using total saving and domestic investment we find that saving and investment are cointegrated, and the long run coefficient of saving is 0.69. From FH point of view this almost strong relation can be regarded as no capital mobility in Turkey. We also employ error correction model to investigate the short dynamics and find that more than half of the previous period shock corrected in next period and more than one third of change in domestic saving pass thorough domestic investment. In analyzing same relation by using private data we find that while there is some evidence of level relation, the long run coefficient of private saving is not significant. So following FH statement, this finding indicates that there is free capital mobility in Turkey. This two conflicting results may because of the balance of payment dynamics or solvency constraint. It may the public responds to balance of payment or target of balance of payments leads to close association between saving and investment and the effect of solvency constraint is stronger in overall saving investment variables than private ones.

8. References

Abbott, A. and De Vita, V., 2003. Another Piece in the Feldstein-Horioka Puzzle', *Scottish Journal of Political Economy* 25, 69-89.

Bai, J. and Perron, P., 2003. Computation and Analysis of Multiple Structural Change Models, *Journal of Applied Econometrics*, 18, 1-22.

Bai, J. and Perron, P., 1998. Estimating and Testing Linear Models with Multiple Structural Changes, *Econometrica*, 66, 47-78.

Coakley, J., Kulasi, F. and Smith, R., 1994, 'The Saving-Investment Association Birkbeck College', Working Paper Number 10:94, Department of Economics, Gresse St., London,.

Coakley, J., Kulasi, F., and Smith, R., 1996. Current Account Solvency and the Feldstein-Horioka Puzzle, *The Economic Journal*, 106, 620-627.

Coakley, J., Kulasi, F., and Smith, R., 1998. The Feldstein-Horioka Puzzle and Capital Mobiliry: A Review, *International Journal of Finance and Economics*, 3, 169-188.

Coakley, J., Hasan, F. and Smith, R., 1999. Saving, Investment and Capital Mobility in LDCs, *Review of International Economics*, 7, 632-640.

Coakley, J., Smith, F. and Smith, R. P., 1998. The Feldstein-Horioka Puzzle and Capital Mobility: A Review, *International Journal of Finance and Economics*, 3, 169-188.

Dooley, M., Frankel, J. A. and Mathieson, D., 1987. International Capital Mobility in Developing Countries Vs. Industrial Countries: What Do the Savings-Investment Correlations Tell Us?, *IMF Staff Papers*, 34, 503-529.

Elliott, G., Rothenberg, T.J. and Stock, J.H., 1996, fficient Tests for an Autoregressive Unit Root, *Econometrica*, 64, 813-836.

Engel RF and Granger CWJ, 1987. Cousality in the Long-run, *Econometric Theory*, 11, 530-536.

Feldstein, M. (1983) 'Domestic Saving and International Capital Movements in the Long-Run and the Short-Run', *European Economic Review*, 21, 129-151.

Feldstein, M. and Bachetta, P., 'National Saving and International Investment' in D. Bernheim and J. Shoven (Eds.), *National Saving and Economic Performance*, Chicago: University of Chicago Press, 1991, 201–26.

Feldstein, M. and Horioka, C. 1980. Domestic Saving and International Capital Flows, *Economic Journal*, 90(358), 314-329.

Golub, S., 1990. International Capital Mobility: Net versus Gross Stocks and Flows, *Journal of International Money and Finance*, 9, 424-439.

Helliwell, J., 2004. Demographic Change and International Factor Mobility, in Global Demographic Change: Economic Impacts and Policy Changes, Kansas City, MO: Federal Reserve Bank of Kansas City, 369-420.

Isaksson, A., 2001. Financial Liberalization, Foreign Aid, and Capital Mobility: Evidence from 90 Developing Countries, *Journal of International Financial Markets, Institutions and Money*, 11, 309-338.

Johansen, S., 1991. Estimation and Hypothesis Testing of Cointegrating Vector in Gaussian Vector Autoregressive Model, *Econometrica*, 95, 1551-1580.

Johansen, S., 1995. Likelyhood Based Inference in Cointegrated Vector Autoregressive Models, Oxford University Pres, Oxford.

Kasuga, H., 2004. Saving-Investment Correlations in Developing Countries, *Economics Letters*, 83, 371-376.

Leachman. L., 1990. Causality between Investment and Savings Rates: Inferences for the International Mobility of Capital among OECD Coutries, *International Economic Journal*, 4(3), 23-39.

Murphy, R. G., 1984. Capital Mobility and the Relationship Between Saving and Investment in OECD Countries, *Journal of International Money and Finance*, 3, 327-342.

Ng, S., Perron, P., 2001. Lag Length Selection and the Construction of Unit Root Test with Good Size and Power, *Econometrica*, 69, 1519-54.

Obstfeld, M., 1986. Capital Mobility in the World Economy: Theory and Measurement, *Carnegie-Rochester Conference Series on Public Policy*, 24, 55-104.

Ozmen, E., 2005. Macroeconomic and Institutional Determinants of Current Account Deficits, *Applied Economics Letters*, 12, 557-560.

Payne, J. and Kumazawa, R., 2005. Capital Mobility, Foreign Aid, and Openness: Further Panel Data Evidence from Sub-Saharan Africa, *Journal of Economics and Finance*, 29, 123-127.

Penati, A. and Dooley, M. P., 1984. Current Account Imbalances and Capital Formation in Industrial Countries: 1948-1981, *IMF Staff Papers*, 31, 1-24.

Pesaran, M. H and Smith, RP.,1998. Structural Analysis of Cointegrating VARs . *Journal of Economic Surveys*, 12, 471-505.

Pesaran, M. Hasem and Shin, Y., 1999. An Autoregressive Distributed Lag Modelling Approach to Cointegration Analysis, In S. Strom, A. Hollly and P. Diamond (Eds.), *Econometrics and Economic Theory in the 20th Century: The Ranger Frisch Centennial Symposium*. Cambridge, Cambridge University Press.

Pesaran, M.H., Shin, Y. ve Smith, R.J., 2001. Bounds testing approaches to the analysis of level relationships, *Journal of Applied Econometrics*, 16 (3), 289-326.

Phillips P C B and Perron P., 1988. Testing for a Unit Root in Time Series Regression, *Biometrika*, 75, 335-346.

Shrestha, M. B., 2005. ARDL modelling approach to cointegration test, New Zealand Association of Economists The 46th Annual Conference. Available at: http://www.nzae.org.nz/conferences/2005/13-SHRESTHA.PDF.pdf

Sinn, S., 1992. Saving-Investment Correlations and Capital Mobility: On the Evidence from Annual Data, *Economic Journal*, 102, 1162-1170.

Tesar, L. L., 1991. Saving, Investment and International Capital Flows, *Journal of International Economics*, 31, 55-78.

Wong, D. Y., 1990. What Do Savings-Investment Relationships Tell Us About Capital Mobility?, *Journal of International Money and Finance*, 9, 60-74.

Yenturk, N., Uluengin, B. and Cimenoğlu, A., 2007. An analysis of the interaction among savings, investments and growth in Turkey, *Applied Economics*, 1-13,

Yildirim, J., 2001. Saving-investment correlation: Evidence from Turkey, *Yapi Kredi Economic Review*, 12, 35–42.