“The Feldstein-Horioka relation in Turkey: an ARDL Bounds testing approach”

AUTHORS	Pelin Varol İyidoğan Eda Balıkçıoğlu

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Pelin Varol İyidoğan (Turkey), Eda Balıkçıoğlu (Turkey)

The Feldstein-Horioka relation in Turkey: an ARDL Bounds testing approach

Abstract

The degree of integration to the international capital markets is a crucial issue for the economic policy implementations in developing countries. A major determinant of the degree of international capital mobility is the saving-investment association. The degree of capital mobility through the domestic saving-investment interaction is first analysed by Feldstein and Horioka (1980) in a sample of OECD countries and 1960-1974 period. The empirical results of the paper supporting the dependency of domestic investments on the domestic savings are not consistent with the high capital mobility in OECD countries. This conflict is defined in the related literature as "Feldstein-Horioka Puzzle". In this study the validity of Feldstein-Horioka puzzle for Turkey is investigated by means of World Development Indicators (WDI) annual data from 1968 to 2008 and Pesaran et al. (2001) cointegration method.

Keywords: Feldstein-Horioka puzzle, saving-investment association, capital mobility, cointegration.
JEL Classification: C22, F32, F36.

Introduction

The upsurge in the financial integration through the world has attracted a great deal of attention to the relationship between the domestic saving and investment via the degree of capital mobility. The contributions concerning the determination of capital mobility through saving-investment association have arised from the seminal paper of Feldstein and Horioka (1980) which has recently led to a growing body of literature. Examining the saving-investment relationship, Feldstein and Horioka used the following cross-section regression over the 1960-1974 period in a sample of 16 OECD countries:

$$\left(\frac{I}{Y}\right)_{it} = \alpha + \beta\left(\frac{S}{Y}\right)_{it} + u_{it}, \quad (1)$$

where $\left(\frac{I}{Y}\right)_{it}$ and $\left(\frac{S}{Y}\right)_{it}$ denote the ratio of gross domestic investment and saving to gross domestic product, respectively, β is the Feldstein-Horioka (henceforth F-H) coefficient[1] indicating the degree of international capital mobility, i is the country and t is the time subscript and u_{it} are errors. The study highlights two extreme cases which are the perfect mobility and the non-mobility of the international capital represented by F-H coefficients equal to zero and unity, respectively. In the former case, since the capital can flow to the countries with higher returns, the domestic saving is not a determinant of the domestic investment while the latter reflects a closed economy exhibiting one-to-one saving-investment association. According to the empirical results, the estimation of F-H coefficients is so close to the unity that it lies in the range of 0.85 to 0.95. The evidence of low capital mobility for a sample of relatively open economies has remained as a puzzle[2] in the field of international economics during the last three decades. Even though the anomaly, so called F-H puzzle had led to a great deal of debate in the literature, no consensus has been reached yet.

The saving-investment interaction has a vital role in shaping the economic policies intended to generate high economic growth. The empirical results as of Feldstein and Horioka (1980) point out that saving promoting policies have significant effects on the level of investment, thus stimulate economic growth. Contrarily, the policies aiming to increase economic growth via domestic saving are ineffective in an open economy. Thus, it can be concluded that the motivation behind the efforts for solving the F-H puzzle stems from the desire of raising the performance of the economic policies.

Dooley et al. (1987), Coakley et al. (1998), Apergis and Tsoumas (2009) focus on the F-H relationship from a critical perspective and underpin the plausible solutions for the saving-investment puzzle via the related literature. Among these, sample selection bias concerning the issues of country size and the inclusion of industrialized economies are widely subject to criticism on the F-H empirical results since they cause an upward bias on the estimated β coefficients. Clearly, despite the high capital mobility through the world, a strong relationship between saving and investment can occur due to the considerable influence of large economies on the world interest rate and prices. That is, the lower domestic saving puts upward pressure on the domestic and world interest rates leading to lower investment.

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[1] Since the β coefficient denotes the proportion of domestic saving invested in the home country, it is renamed as saving-retention coefficient by Feldstein and Bacchetta (1989).

[2] Obstfeld and Rogoff (2000: 349) mention Feldstein-Horioka puzzle as one of the six major puzzles in international macroeconomics.

Beside this point of view, Harberger (1980) points out that the saving-retention coefficient is higher for the large countries as they are able to finance the domestic investment through the domestic saving without the need of borrowing from abroad. The country-size effect on the F-H relation is empirically confirmed by Tobin (1983), Murphy (1984), Baxter and Crucini (1993). Moreover, the F-H results are criticized empirically with respect to the estimation methods and models, omitted variables bias and variables' measurement[1].

On the other hand, Tesar (1991), Coakley et al. (1996), Jansen (1996) attribute the long-run saving-investment association to the current account solvency rather than the degree of capital mobility F-H cross section regression captures. Since the current account is defined as the difference between investment and saving series which seem to be I(1) in the OECD countries, the solvency constraint implying the stationarity, in other words sustainability, of the current account balance reveals the cointegration relation between investment and saving irrespective of the degree of capital mobility. Another current account-based explanation to the F-H puzzle suggested by Summers (1986), Bayoumi (1990) points to the current account targeting followed by the governments by means of appropriate policy instruments. In this case, the high value of estimated saving-retention coefficient is explained by government targets for the current account rather than the degree of capital mobility.

In this paper, the validity of saving-investment relationship, affecting the performance of the economic policies substanially, for Turkey is investigated by employing Pesaran et al. (2001) bounds testing procedure. The plan of the paper is as follows. As the initial step, survey on the empirical literature of F-H relationship is illustrated. After describing the data and methodology, empirical results are reported. Eventually, the concluding remarks are presented.

1. Survey on the empirical literature of F-H relation

Several studies have researched the correlation between domestic investment and saving for various countries by means of different empirical methods. Among these, some recent studies reported in Table 1 such as Pelagidis and Mastroyiannis (2003), Payne (2005), Bolatoğlu (2005) find precise evidence supporting the F-H relationship while Ho (2002), Blanchard and Giavazzi (2002), Papadogonas and Stournaras (2006), Christopoulos (2007), Brahmasrene and Jiranyakul (2009) reject the validity of interaction between saving and investment reflecting the high capital mobility.

Table 1. Empirical literature on F-H relationship

Study	Data	Method	Result
Ho (2002)	Argentina, Australia, Canada, Denmark, France, Germany, Italy, Japan, Norway, Sweden, UK, USA (1950-1992)	Panel cointegration and panel unit root tests	There appears to be a low cerrelation between domestic investment and savings.
Blanchard and Giavazzi (2002)	OECD, EU, Euro area (1975-2001)	Estimation of F-H coefficient	F-H relation does not exist for the countries under study.
Pelagidis and Mastroyiannis (2003)	Greece (1960-1997)	Cointegration analysis (error correction model)	A significant long-run relationship between domestic saving and investment exists.
Özmen and Parmaksız (2003)	UK (1948-1998)	Cointegration analysis	Considering structural break, the long-run saving-investment relationship dies out.
Bolatoğlu (2005)	Turkey (1970-2003)	Pesaran et al. (2001) bounds testing of cointegration	There exists a long-run relationship between investment and saving rates.
Payne (2005)	Mexico (1960-2002)	Error correction model	Close relationship between national saving and national investment is found after the debt crisis in 1982 as an indicative of capital mobility.
Papadogonas and Stournaras (2006)	EU member states (Austria, Belgium, Denmark, Finland, France, Germany, Greece, İreland, Italy, Netherlands, Portugal, Spain, Sweden, UK) (1970-2003)	Estimation of F-H coefficient	A lower correlation between national saving and national investment after the financial integration is found for most of the countries under study.
Telatar et al. (2007)	Some European countries (Belgium, Denmark, Finland, France, Germany, Italy, Netherlands, Norway, Sweden, UK) (1970-2002)	Markov-switching model with heteroscedastic disturbances	Correlation coefficients are not invariant to policy regime changes.
Christopoulos (2007)	13 OECD countries (Argentina, Australia, Canada, Denmark, Finland, France, Germany, Italy, Japan, the Netherlands, Sweden, UK, USA) (1885-1992)	Panel cointegration tests	A low degree of capital mobility is found for the sub-periods of 1921-1992 and 1950-1992. These findings indicate the perfect capital mobility in the short run.

[1] For a detailed literature review regarding the above criticisms on the F-H results, see Apergis and Tsoumas (2009).

Table 1 (cont.). Empirical literature on F-H relationship

Study	Data	Method	Result
Murthy (2009)	14 Latin American and 5 Caribbean countries (Barbados, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Guyana, Honduras, Jamaica, Mexico, Nicaragua, Paraguay, Peru, Suriname, Trinidad and Tobago, Uruguay, Venezuela) (1960-2002)	Panel unit root test Pedroni cointegration test	Investment and saving rates are found to be correlated. Due to the small value of the estimated Feldstein-Horioka coefficient, the degree of capital mobility is high. The empirical results are interpreted consistent with the macroeconomic developments, such as deregulation of the financial sector, constraints on the capital controls, rising level of the capital inflows and the improvements in the degree of financial integration.
Brahmasrene and Jiranyakul (2009)	North Asia (South Korea and Taiwan), South Asia (Indonesia, Malaysia, the Philippines, Singapore and Thailand) India (1970-2007)	Pesaran et al. (2001) bounds testing of cointegration	Empirical results show the absence of relationship between saving and investment.
Esso and Keho (2010)	West African Economic and Monetary Union (UEMOA) member countries: Benin (1982-2005) Burkina Faso (1979-2005) Cote d'Ivoire (1965-2005) Mali (1967-2005) Niger (1980-2005) Senegal (1965-2005) Togo (1980-2005)	Pesaran et al. (2001) bounds testing of cointegration Toda and Yamamoto (1995) Granger causality test	Feldstein-Horioka relation cannot be generalized across the countries in the sample by virtue of the country-specific empirical findings. Capital immobility: Cenin, Cote d'Ivoire, Niger Capital mobility: Burkina Faso, Mali, Senegal and Togo.
Kaya (2010)	Turkey (1984: 1-2007: 3)	Pesaran et al. (2001) bounds testing of cointegration	The results concerning the long-run private saving-investment relationship are not consistent with the empirical findings of cointegration between gross saving and investment.

Among the studies in the latter group, Blanchard and Giavazzi (2002) and Papadogonas and Stournaras (2006) affirm that the results underpinning the high capital mobility arise from the higher financial integration of the countries in the sample. Besides, Murthy (2009) obtains conflicting results in the short and long-run, Esso and Keho (2010) come up with different findings concerning the degree of capital mobility among the countries in question and Kaya (2010) concludes that the results appear to be diversified regarding the seperate analysis of private and gross saving-investment interactions.

Some previous studies in the related literature account for the instability of the β-coefficient due to the structural breaks in the economy. In this regard, Özmen and Parmaksız (2003) investigate the long-run F-H relationship under a policy regime change by employing cointegration methods such as Gregory and Hansen (1996) and Perron (1997) which estimate an endogeneous structural break point. Since the results point out the weakening of saving-investment interaction after the break point date coinciding with the abolishment of foreign exchange controls and the liberalization of capital flows in 1979, the study propounds that F-H puzzle can be solved by considering this kind of policy regime changes in the economy. Telatar et al. (2007) also examine the relationship between investment and saving by considering the policy regime changes. According to the results of Markov-switching model with heteroscedastic disturbances, the savings-retention coefficients are not fixed that they differ among countries and through time. Payne (2005) attempts to test the existence of saving-investment relationship considering the structural instability of error correction model around 1982 which corresponds to the debt crisis in Mexico. The empirical results supporting the cointegration between saving and investment yield negative and statistically significant correlation coefficient as an indicator of capital mobility in the post-1982 period.

Among the studies applying cointegration techniques, Murthy (2009) investigates the validity of saving-investment association for a heterogeneous panel of 14 Latin American and 5 Caribbean countries over the period of 1960-2002, by favor of panel unit root tests and Pedroni cointegration procedure. The cointegration panel statistics developed by Pedroni reject the null of non-cointegration asserting the long-run relationship between saving and investment rates. As a complementary step of the analysis, F-H coefficient (β) is estimated by means of Pedroni group mean fully modified ordinary least squares (GMFMOLS). The relatively small value of the estimated coefficient indicates the evidence of moderate degree of capital mobility in the short-run for the countries in question. Christopoulos (2007), another study applying panel cointegration tests, suggests that investment is financed through the domestic saving in the long run. In contrast, empiri-

cal results support the existence of a low degree of capital mobility in the short run. In opposition to the other studies employing panel cointegration techniques, Ho (2002) finds empirical evidence of the absence of cointegration relation between investment and saving supporting high international capital mobility.

Beside the studies applying panel cointegration techniques, Esso and Keho (2010) explore the relationship between saving and investment rates for UEMOA countries by means of bounds testing procedure. According to the diversifying results across the sample, investment and saving rates are highly correlated for Benin, Cote d'Ivoire and Niger whereas the relationship weakens for the other four countries (Burkina Faso, Mali, Senegal and Togo). Moreover, results of the Toda and Yamamoto procedure support the evidence of unidirectional causality running from saving to investment for Benin, Cote d'Ivoire and Niger and the noncausality for the remaining countries. Employing bounds testing of cointegration, Brahmasrene and Jiranyakul (2009) find the absence of saving-investment interaction for the countries under study. Contrarily, Bolatoğlu (2005) provides precise evidence supporting the presence of the cointegration between the investment and saving rates and a relatively high saving-retention coefficient ($\beta = 0.52$) for Turkey in a sample of 1970-2003 period. Kaya (2010), further study using the bounds testing procedure for Turkey, obtains two contradictory results which are strong cointegration between saving and investment and the absence of interaction between private saving and investment, respectively. These findings are interpreted to arise from the current account targeting and/or solvency constraint.

The data and the bounds testing approach used in this study are illustrated in the succeeding section.

2. Data and methodology

All series examined in this study are obtained from World Development Indicators (WDI) database of the World Bank. The series used are the ratio of gross domestic capital formation to GDP and the ratio of gross domestic saving to GDP. The annual data spans the time period of 1968-2008 for Turkey.

The study examines the cointegration relation between saving and investment by means of the bounds testing approach developed by Pesaran et al. (2001). Contrary to the conventional methods as Engle and Granger (1987), Johansen (1991, 1995), this approach to cointegration tests the long-run relationship irrespective of the integration order of the series. The method is based on the estimation of a conditional error correction version of the Autoregressive Distributed Lag (ARDL) model. The conditional error correction model (ECM) derived from the Vector Autoregression (VAR) model is:

$$\Delta Y_t = \alpha_0 + \alpha_1 t + \beta_1 Y_{t-1} + \beta_2 X_{t-1} + \sum_{i=1}^{p} \delta_i \Delta Y_{t-i} + \sum_{i=1}^{p} \phi_i \Delta X_{t-i} + u_t, \quad (2)$$

where α_0 is the drift component, t is the deterministic trend, p is the order of the VAR system, Δ is the first-difference operator and u_t are white noise errors. Following Pesaran et al. (2001), existence of the long-run relationship is tested in two ways. One is an F-test for the joint significance of the coefficients β_1 and β_2 which tests the null of $H_0 : \beta_1 = \beta_2 = 0$, and the other one is a t-test of Banerjee et al. (1998) for the null hypothesis of $H_0 : \beta_1 = 0$. The asymptotic distributions of these statistics are non-standard. Both tests involve two sets of asymptotic critical values one of which refers to the purely I(0) regressors and the other to the purely I(1) regressors. Critical values for the I(0) and I(1) series are mentioned as lower and upper critical value bound, respectively. If the F- or t-statistic exceeds the upper bound, it would be concluded that there is evidence of a long-run relationship in levels between the variables in question. An F- or t-statistic beneath the lower bound provides evidence for the non-rejection of the null hypothesis of no cointegration. If the statistics lie between the bounds, inference would be inconclusive.

Following De Vita and Abbott (2002), the conditional long-run model for Y_t can be derived from the reduced form solution of (2) via $\Delta Y = \Delta X = 0$:

$$: Y_t = \Phi_0 + \Phi_1 X_t + u_t, \quad (3)$$

where $\Phi_0 = -\alpha_0 / \beta_1$, $\Phi_1 = -\beta_2 / \beta_1$ and u_t are errors.

3. Empirical results

Prior to the cointegration analysis, descriptive statistics for the variables are presented in Table 2. The first row of the table shows that annual average rates of investment and saving are about 0.20 and 0.17 with a standard deviation of 0.0389 and 0.0405, respectively. The small values of the standard deviation as well as the minor difference between minimum and maximum values of the series can be interpreted on behalf of the low volatility of the series. Since the kurtosis values are smaller than 3, both series are small-taled. Besides, they exhibit leftward skewness due to the positive values. According to the Jarque-Bera test statistics, the null hypothesis of normality is accepted for either of the series.

Table 2. Descriptive statistics of the series

	I/Y	S/Y
Mean	0.1954	0.1637
Median	0.19	0.16
Maximum	0.27	0.26
Minimum	0.12	0.11
Standard deviation	0.0389	0.0405
Skewnesss	0.0841	0.3622
Kurtosis	2.0744	2.1244
Jarque-Bera	1.5118	2.2067
Probability	0.4696	0.3318

Prior to the implementing of bounds testing procedure, the integration order of the variables is discussed below. Although the results of the unit root tests are not critical for bounds testing approach to cointegration, they are commonly embedded to rationalize the usage of the bounds testing.

Table 3 presents the order of integration for the series by means of 3 different types of unit root tests. While KPSS procedure developed by Kwiatkowski, Philips, Schmidt and Shin (1992) tests the null hypothesis of stationarity; ADF test of Dickey and Fuller (1979) and the PP test due to Philips and Perron (1988) treat stationarity as the alternative hypothesis.

Table 3. Unit root tests

	ADF	PP	KPSS
I/Y	-2.63(0)*	-2.51(2)	0.46(4)**
S/Y	-1.58(2)	-1.92(2)	0.47(5)**
Δ(I/Y)	-8.49(0)***	-8.50(1)***	0.09(2)
Δ(S/Y)	-5.63(1)***	-5.89(15)***	0.22(13)

Notes: The parantheses indicate the appropriate lag length for the ADF regressions and the appropriate bandwidth for the PP and KPSS regressions. The lags are determined by Schwarz Bayesian Criteria (SIC). *, ** and *** denote that the test statistics are significant at the 10%, 5% and 1% level, respectively. The critical values from Mackinnon (1991) are used. Since no trend in the series is detected, all results of the unit root tests are in the case of intercept.

According to the PP test results, both variables are found to be integrated of order one at all the levels of significance. Even though the findings of ADF tests support the evidence of the non-stationarity of S/Y series, I/Y appears not to have a unit root at 10% significance level. Moreover, the stationarity of S/Y and I/Y is accepted at 1% significance level with respect to the KPSS test. Obviously, there exists an uncertainty in the order of integration due to the different testing procedures and significance levels. Since the order of integration for the variables cannot be determined efficiently, the cointegration between investment and saving is analyzed by means of bounds testing approach developed by Pesaran et al. (2001) which involves the levels of the variables irrespective of whether they are purely I(0), purely I(1), or mutually cointegrated.

The conditinal ECM[1] for the Feldstein-Horioka relationship based on (1) is as follows:

$$\Delta I_t = \alpha_0 + \beta_1 I_{t-1} + \beta_2 S_{t-1} + \sum_{i=1}^{p} \delta_i \Delta I_{t-i} + \sum_{i=1}^{p} \phi_i \Delta S_{t-i} + u_t, \quad (4)$$

The first step in the bounds testing procedure is to determine the appropriate lag length (p) by means of the selection criterion and Lagrange Multiplier (LM) statistics. As shown in Table 4, Akaike Information Criteria (AIC) and Schwarz Bayesian Criteria (SBC) select the lag length p = 1 which is also suggested by χ^2_{SC} statistics.

Table 4. Statistics for lag order selection

p	AIC	SBC	χ^2_{SC} (1)
1	4.814	5.028	0.275
2	4.937	5.239	0.451
3	4.959	5.351	0.035
4	5.108	5.592	0.288
5	5.140	5.718	0.109

Notes: p is the lag order of the VAR representation for the conditional ECM. χ^2_{SC} (1) denotes LM statistics testing the first order serial correlation. Since none of the lags suffer from serial correlation, the criterion are determinant in the selection of the appropriate lag length.

As the succeeding step of the methodology, the computed t- and F-statistics for the estimated conditional ECM are compared with the lower and upper bounds presented in the Table 5.

Table 5. T- and F-statistics for bounds tests

		1% significance level		5% significance level	
K		Lower bound	Upper bound	Lower bound	Upper bound
1	-2.017 (t-statistics)	-3.43	-3.82	-2.86	-3.22
	3.121 (F-statistics)	6.84	7.84	4.94	5.73

Notes: The case of unrestricted intercept and no trend is used to obtain the estimates of the t- and F-statistics and the asymptotic critical value bounds.

Since both t- and F- statistics are far below the lower bound critical values, the null hypothesis of no cointegration cannot be rejected. Thus, there is no evidence of a long-run saving-investment relationship supported by the data. The result in favor of capital mobility is confirmed by the estimated long run β coefficient following the study of De Vita and Abbott (2002). The coefficient asserts that only a small fraction (39%) of the national

[1] Since the variables are found not to be trended, conditional ECM with an unrestricted intercept and no trend is used for obtaining the statistics for bounds testing procedure.

investment is financed through the national saving. In short, the domestic saving cannot be supposed as a long-run determinant of the domestic investment in Turkey.

Concluding remarks

Using bounds testing procedure and 1968-2008 sample for Turkey, this paper explores the validity of a level relationship between saving and investment rates irrespective of the integration order of the series. The results of the cointegration analysis asserting the absence of the long-run relationship are also supported by the low value of β coefficient of the F-H regression. That is, capital mobility weakens the dependency of the national investment on the domestic saving and the F-H puzzle does not exist for Turkey. Thus, the policies aiming to raise economic growth through the stimulation of domestic saving are inefficient. However, since the saving-investment association is so complicated that cannot be simply come down to Feldstein-Horioka relationship, some other aspects of the related interaction should also be considered. Firstly, as the domestic saving and investment have two components containing public and private sector, it makes sense to examine the saving-investment interaction seperately for these sectors rather than at the national levels to deduce the efficiency of the saving promoting policies. Secondly, since the result of no cointegration can be an indicator for the unsustainability of currrent account deficits rather than the evidence of capital mobility, the saving-current account balance interaction should also be investigated. In this framework, the presence of cointegration indicates the weakness of saving-investment relationship. Concerning the existence of a long relationship between current account balance and saving, it can also be asserted that the domestic saving is contributed to the financing of the current account deficits. In such a case, it can be asserted that the domestic saving generates economic growth through the impovement of current account balance rather than a rise in domestic investment. As the third point, the non-existence of the interaction could depend on the global saving glut during 2000s and the relatively high interest rates of Turkish economy leading to a rise in capital inflow. As indicated in the Appendix, even though having a descending trend except 2003 and 2007, real interest rates of Turkey are far above of the developing countries leading to the movement of excess global saving supply to Turkey. Moreover, small or developing country effect generating the relatively low saving-retention coefficient should also be considered for Turkey. Finally, the invalidity of the Feldstein-Horioka relation could reflect the structural breaks in the series due to the liberalization policies in Turkey aiming to raise the openness of the economy which are the liberalization of the foreign trade regime by the new economic stabilization programme in January 1980 and the current account liberalization as a result of the law came into effect in 1989, decree no.32, exposing Turkish economy to the external shocks. Even though examining the saving-investment relationship under these circumstances is beyond the scope of this paper, it is worthy of further research.

References

1. Apergis, N., C. Tsoumas (2009). "A Survey of the Feldstein-Horioka Puzzle: What Has Been Done and Where We Stand", *Research in Economics*, 63, 64-76.
2. Banerjee, A., Dolado J.J., Mestre R. (1998). "Error-Correction Mechanism Tests for Cointegration in a Single-Equation Framework", *Journal of Time Series Analysis*, 19-3, 267-283.
3. Baxter, M., Crucini, M. (1993). "Explaining Saving Investment Correlations", *American Economic Review*, 83-3, 416-436.
4. Bayoumi, T. (1990). "Saving- Investment Correlations: Immobile Capital, Government Policy or Endogenous Behaviour?", *IMF Staff Papers*, 37: 360-387.
5. Blanchard, O., Giavazzi, F. (2002). "Current Account Deficits in the Euro Area: The End of the Feldstein-Horioko Puzzle?", *Brookings Papers on Economic Activity*, 2, 147-209.
6. Bolatoğlu. N. (2005). "Türkiye'de Yurtiçi Yatırım ve Yutiçi Tasarruf Oranları Arasındaki İlişki", *Ekonomik Yaklaşım*, 56-16.
7. Brahmasrene, T., Jiranyakul, K. (2009). "Capital Mobility In Asia: Evidence From Bounds Testing of Cointegration Between Savings and Investment, *Journal of the Asia Pacific Economy*, 14-3, 262-269.
8. Christopoulos, D.K. (2007). "A Reassesment Of The Feldstein-Horioka Hypothesis Of Perfect Capital Mobility: Evidence From Historical Data", *Empirica*, 34: 273-280.
9. Coakley, J., Kulasi, F., Smith, R. (1996). "Current Account Solvency and the Feldstein-Horioka Puzzle", *The Economic Journal*, 106-436, 620-27.
10. Coakley, J., Kulasi, F., Smith, R. (1998). "The Feldstein-Horioka Puzzle and Capital Mobility: A Review", *International Journal of Finance and Economics*, 3, 169-188.
11. De Vita G., Abbott A. (2002). "Are Saving and Investment Cointegrated? An ARDL Bounds Testing Approach", *Economics Letters*, 77, 293-299.
12. Dickey, D.A., Fuller, W.A. (1979). "Distribution of the Estimators for Autoregressive Time Series with a Unit Root", *Journal of the American Statistical Association*, 74, 427-431.
13. Dooley, M., Frankel, J. ve Mathieson, D.J. (1986). "International Capital Mobility: What Do Saving-Investment Correlations Tell Us?", *International Monetary Fund*, 34-3, 503-530.

14. Engle R.F., Granger C.W.J. (1987). "Causality in the Long-Run", *Econometric Theory*, 11, 530-536.
15. Esso, L.J., Keho, Y. (2010). "The Savings- Investment Relationship: Cointegration and Causality Evidence From UEMOA Countries", *International Journal of Economics and Finance*, 2-1, 174-181.
16. Feldstien, M., Bacchetta, P. (1989). "National Saving and International Investment", *National Bureau of Economic Research (NBER)*, Working paper no. 3164.
17. Feldstien, M., Horioka, C. (1980). "Domestic Saving and International Capital Flows", *Economic Journal*, 90-358, 314-329.
18. Gregory, A.W., Hansen, B.E. (1996). "Residual-based Tests for Cointegration in Models with Regime Shifts", *Journal of Econometrics*, 70, 99-126.
19. Harberger, A. (1980). "Vignettes on the World Capital Market", *American Economic Review*, 70, 331-337.
20. Ho, T. (2002). "A Panel Cointegration Approach To The Investment-Saving Correlation", *Empirical Economics*, 27: 91-100.
21. Jansen, W.J. (1996). "Estimating Saving-Investment Correlations: Evidence for OECD Countries Based on an Error-Correction Model", *Journal of International Money and Finance*, 15, 749-781.
22. Johansen, S. (1995). Likelihood-Based Inference in Cointegrated Vector Autoregressive Models, Oxford University Press, Oxford.
23. Johansen, S. (1991). "Estimation and Hypothesis Testing of Cointegrating Vectors in Gaussian Vector Autoregressive Models", *Econometrica*, 59, 1551-1580.
24. Kaya, H. (2010). "Saving-Investment Association", *30th Annual Meeting of the Middle East Economic Association*, January 3-6, Atlanta.
25. Kwiatkowski, D., Philips, P.C.B., Schmidt, P., Shin, Y. (1992). "Testing the Null Hypothesis of Stationarity Against the Alternative of a Unit Root", *Journal of Econometrics*, 54, 159-78.
26. Mackinnon, J. (1991). "Critical Values for Cointegration Tests", In: Engle, R.F., Granger, C.W.J. (Eds.), *Long-run Economic Relationships*, Oxford University Press, Oxford.
27. Murphy, R.G. (1984). Capital Mobility and the Relationship Between Saving and Investment Rates", *Journal of International Money and Finance*, 3, 327-342.
28. Murthy, N., R., V. (2009). "The Feldstein-Horioka Puzzle In Latin American and Caribbean Countries: A Panel Cointegration Analysis", *J Econ Finan*, 33, 176-188.
29. Obstfeld, M., Rogoff, K. (2000). "The Six Major Puzzles in International Macroeconomics: Is There a Common Cause?", NBER Macroeconomics Annual, 15: 339-390.
30. Özmen, E., Parmaksız, K. (2003). "Policy Regime Change and the Feldstein-Horioka Puzzle: the UK Evidence", *Journal of Policy Modeling*, 25: 137-49.
31. Papadogonas, T., Stournaras, Y. (2006). "Financial Integration, National Savings and National Investment In The EU Member-States", *Applied Economics Letters*, 13: 953-956.
32. Payne, J.E. (2005). "Saving- Investment Dynamics in Mexico", *Journal of Policy Modeling*, 27: 525-534.
33. Pelagidis, T., Mastroyiannis, T. (2003). "The Saving-Investment Correlation in Greece, 1960-1997: Implications for Capital Mobility", *Journal of Policy Modeling*, 25: 609-616.
34. Perron, P. (1997). "Further Evidence on Breaking Functions in Macoeconomic Variables", *Journal of Econometrics*, 80, 355-385.
35. Pesaran M.H., Shin, Y., Smith R.J. (2001). "Bounds Testing Approaches to the Analysis of Level Relationships", *Journal of Applied Econometrics*, 16, 289-326.
36. Philips, P., Perron P. (1988). "Testing for a Unit Root in Time Series Regression", *Biometrica*, 75, 335-46.
37. Summers, L. (1986). "Tax Policy and Internaional Competitiveness", *NBER Working Paper Series*, Working paper No. 2007.
38. Telatar, E., Telatar, F., Bolatoğlu, N. (2007). "A Regime Switching Approach To The Feldstein-Horioka Puzzle: Evidence From Some European Countries, *Journal of Policy Modeling*, 29, 523-533.
39. Tesar, L. (1991). "Saving, Investment and International Capital Flows", *Journal of International Economics*, 31, 55-78.
40. Tobin, J. (1983). "Comment on Domestic Saving and International Capital Movements in the Long Run and the Short Run", *European Economic Review*, 21, 157-159.
41. Toda, H.Y., Yamamoto, T. (1995). Statistical Inference in Vector Autoregressions with Possibly Integrated Processes", *Journal of Econometrics*, 66, 225-250.

Appendix

Table 6. Real interest rates of Turkey, 2002-2009 (%)

Year	Real interest rate
2002	8
2003	14
2004	13,3
2005	8,7
2006	7,8
2007	9,3
2008	7,5
2009	4

Notes: Real interest rates are computed by means of the data from Central Bank of Republic of Turkey (CBRT) and Turkish Statistical Institute.

Table 7. Real interest rates in selected developed economies, 2007-2009 (%)

Real inerest rate	US	Japan	Euro area	Turkey
2007	2	0,5	2	9,3
2008	-1,5	-0,5	1	7,5
2009	0,5	-1	1,5	4

Notes: Real interest rates indicated above are calculated by means of the data from the CBRT Financial Stability Report.

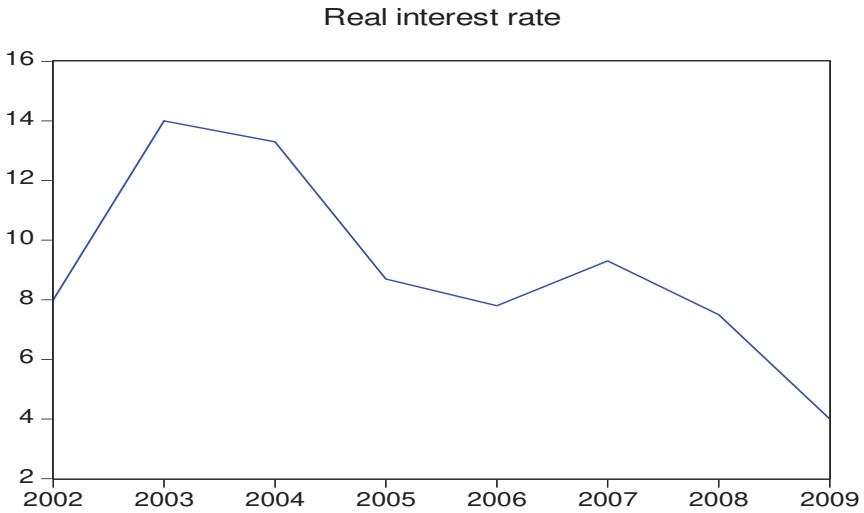

Fig. 1. Real interest rates of Turkey, 2002-2009 (%)