Do Private Savings Offset Public Savings in Turkey?

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ABSTRACT

The issue of whether public savings offset private savings, and visa vice, has important implications for the effectiveness of fiscal policy. This study examines long-run relationship between public and private savings rates using annual Turkish data for the period 1975-2005. The result of Engle-Granger cointegration test has shown that there is no long-run relationship between private and public savings ratios. However, once endogenously determined structural break is allowed, the test results confirm the existence of the cointegration relationship between private and public savings. Econometric estimation of the offset coefficients using both FMOLS and DOLS yields values of between -0.11 and -0.82. The results also indicate that the potency of fiscal policy significantly reduced with the liberalization of financial markets.

KEYWORDS
Savings, Offset Coefficient, Ricardian Equivalence, DOLS, FMOLS.

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Introduction

The relationship between private and public savings has been central issue in both the theoretical and the empirical literature. The importance of the subject stems from the fact that the effectiveness of fiscal policy is closely related to the responsiveness of private saving to changes in fiscal stance. The relationship between lower public deficits and national savings, however, remains controversial both theoretically and empirically. Theoretically, while Keynes (1936) assumes no relationship between private and public savings, Friedman (1957) and Modigliani (1946) develop models showing full substitution between private and public savings. Barro (1974) also introduced the notion of perfect substitutability between private and public savings, which is called Ricardian Equivalence Proposition (REP).

Although there area number of opposing views in the theoretical literature, ultimately, it is an empirical issue to determine the extent to which private savings offset public savings. In the empirical literature, the relationship between private and public savings is investigated for different countries using different econometric methodologies. However, there is no consensus over the size offset coefficient (for a survey see Seater, 1993, Holmes 2006 and Ricciuti 2007). Studies on advanced economies have shown that about half of the change in public savings is offset by an opposite change in private saving (Masson et. al. (1998); Hemming et. al. (2002); Holmes (2006); Mandal and Payne (2007); Seater and Mariano (1985); Leiderman and Razin (1988); Makin and Narayan (2009); De Castro andFernandez (2009)). Although empirical studies are limited in number, offset coefficients were found to be higher for developing countries than for developed countries (Loayza et. al. (2000); Lopez et. al. (2000); De Mello et. al.(2004); Edwards (1996); Masson et. al. 1998; Bulir and Swiston (2009)).

This study provides evidence on the validity of the REP by applying powerful econometric techniques of DOLS and FMOLS to time series data of a developing country, Turkey. This paper is organized as follows. Following section sets out the econometric methodology and the data employed in this study. Then, we presented the findings of the study in the empirical section. Last section concludes.

Methodology and Data

Empirical studies on testing the REP estimate the following model:

$$PSR_t = \alpha + \beta GSR_t + e_t \qquad (1)$$

where refers to private sector savings as a proportion of GDP, is public sector savings as a ratio to GDP; is the long-run public-private offset (substitution) coefficient is the intercept term and represents usual error term. takes value between 0 (no offset) and -1 (full offset). If , then a decrease in public sector savings is fully offset by an increase in private sector savings.

The data employed in our empirical analysis is an annual private and public sector as a percentage of GDP obtained from State Planning Organization (SPO) publications for the years 1975 and 2005. Before estimating the long-run offset function given in equation (1), we first need to investigate the time series properties of the private and public sector saving ratios. Results obtained from unit root tests which are performed to determine whether savings variables have a unit root are presented in Table 1a and Table 1b. While Table 1a presents the results obtained from the ADF, DF-GSL, PP, KPSS and ERS unit root tests, Table 1b shows the Ng-Perron unit root test results. Examination of the Tables show that the null hypothesis of unit root could not be rejected for both private and public sector savings ratios.

Table 1.a. Unit Root Test Results

	PSR		GSR	
	Constant	Constant and Trend	Constant	Constant and Trend
ADF	-1.432876	-1.133958	-1.473065	-2.322051
DF-GLS	-1.367547	-1.595668	-1.384922	-1.798766
PP	-1.454917	-1.253357	-1.479741	-1.480789
KPSS	0.538798	0.110454	9.029962	0.380299
ERS	8.002194	13.83224	8.084297	12.96383

Note: ADF, DF-GSL, PP, KPSS and ERS stand for Augmented Dickey-Fuller (1979), Phillips Perron (1988), Elliot, Rothenberg, and Stock (1996), Kwiatkowski, Phillips, Schmidt and Shin (1992), Elliot, Rothenberg, and Stock point optimal (ERS, 1996) unit root tests.

Table 1.b. Ng-Perron Unit Root test Results

	MZa	MZt	MSB	MPT
PSR	-3.24375	-1.25975	0.38836	7.53622
GSR	-3.23349	-1.27022	0.39283	7.57531
Asymptotic critical values*:				
1%	-13.8000	-2.58000	0.17400	1.78000
5%	-8.10000	-1.98000	0.23300	3.17000
10%	-5.70000	-1.62000	0.27500	4.45000

Note: The number of lags used in Ng-Perron (2001) unit root test is determined by Schwarz Information Criteria(SIC) and turned out to be zero for all specifications.

Having established that private and public savings ratios are I(1) variables, we need to test for cointegration between private and public savings to avoid spurious regression. To determine whether there is long-run relationship among these variables, the Engle-Granger (1987) methodology is employed. Testing for cointegration within this methodology involves extracting the residuals from equation (1) and testing for unit root in residuals. The Engle-Granger bivariate cointegration equation and the ADF tests applied to residuals are reported in Table 2. The optimal lag determined by using Schwarz and Akaike information criteria turned out to be zero. The cointegration test statistic is -2.086 with a probability value of 0.251 implying non-rejection of the null of unit root in residuals. Hence, there appears to there is no long-run relationship between private and public sectors savings ratios.

Table2. Engle- Granger Cointegration Test

Dependent Variable	Constant	GSR
PSR	20.157	-1.009
	(0.531)*	(0.101)*
ADF test statistics (probability):	-2.086 (0.251)	
Test Critical values:	1% level	-3.671
	5% level	-2.964
	10% level	-2.621

Note: The values in parenthesis are standard errors. * indicate significant at 1% level.

Furthermore, we employed Johansen multivariate cointegration tests to explore if there is a long run relationship between private and public savings. The number of lags used in the underlying the vector auto regression (VAR) model were determined as one for the model according to both the Schwarz Bayesian Criterion (SBC) and Akaike's Information Criterion (AIC). The corresponding values of SBC and AIC criterion are 9.160 and 8.867 respectively.

The cointegration test results obtained from the Johansen and Juselius (1990) method for the model (1) is presented in Table 3. The examination of the table indicates that the null hypothesis of no cointegration cannot be rejected by both the maximum eigenvalue and the trace statistic for the model implying that there is no long-run relationship between private and public savings.

Table 3. Johansen-Juselius Maximum Likelihood Co integration Tests

Trace Test				Maximum Eigenvalue Test			
Null	Alternative	Statistic	Critical Values	Null	Alternative	Statistic	Critical Values
r = 0	r ≥ 1	11.946	15.494	r = 0	r = 1	10.065	14.264
r ≤ 1	r ≥ 2	1.881	3.841	r ≤ 1	r = 2	1.8810	3.8415

Notes: Asterisks (*) denotes statistical significance at 5%. R stands for the number of cointegrating vectors.

However, the cointegration tests have a low power in the presence of a structural break (Gregory and Hansen, 1996). For this reason, we applied Gregory-Hansen cointegration procedure to test whether there is long-run relationship among private and public savings. Specifically, Gregory and Hansen (1996) provide the following three structural break alternatives given by equations (2a-2c):

$$PSR_t = \alpha_0 + \alpha_1 D + \beta GSR_t + e_t \quad (2a)$$

$$PSR_t = \alpha_0 + \alpha_1 D + \delta t + \beta GSR_t + e_t \quad (2b)$$

$$PSR_t = \alpha_0 + \alpha_1 D + \beta GSR_t + \beta_1 (D * GSR) + e_t \quad (2c)$$

where D represents a dummy variable equal to 0 if is less than or equal to unknown timing of change , otherwise it is equal to one; is time trend; other variables are defined as before. The first co integration regression (2a) is allowed to have a level break, the second model includes level shift and time trend and third model includes regime shift variable.

Given that the structural break point is unknown, Gregory-Hansen procedure involves computing the cointegration test statistics for each possible break and taking the minimum test statistics (ADF test) across all possible break points. That is, the break point is unknown and determined by finding the minimum value for the ADF statistic. The Akaike Information criterion (AIC) is used to determine the number of lags of the change in the residual used in computing the ADF statistic and turned out to be zero for all three models. The results of the Gregory-Hansen Cointegration procedure for all specifications indicate that the null of no cointegration is rejected with an endogenous break year of 1989. The ADF statistics for equations (2a-2c) are -5.082, -5.34836 and -5.15361 respectively and they are statistically significant at 5 percent level.

Empirical Results

Having found evidence of co integration and having established that private and public saving are I(1), the equations (2a-2c) are estimated using the Dynamic OLS (DOLS) proposed by Stock and Watson (1993) and the FMOLS proposed by Phillips and Hansen (1990).In the estimation of equations (2a-2c) with the Dynamic OLS (DOLS), we used two lead and lag terms. The number of lead and lag-terms are determined by using AIC and SBC criterion. The results obtained from FMOLS and DOLS estimators are presented in Tables 4a-4c. Examination of the Tables indicates that while the FMOLS coefficients of offset (betas) ranges between -0.82 and -0.46, the DOLS coefficients of betas ranges from -0.74 to -0.11 yielding a partial offset. For models (2a) and (2b), coefficient on government savings is statistically significant at 1% level. However, the offset coefficient is insignificant in the model (2c). The long-run offset coefficient estimated by FMOLS (DOLS) is -0.458 (-0.11) but they are both statistically insignificant. However, there was statistically significant (at 5% level) change in the slope coefficient, , after 1989 for DOLS estimates. Thus allowing for the slope change in the regime shift specification in the DOLS case, the long-run coefficient is -0.72 (. The structural break dummy, D, is significant across alternative estimates implying the presence of structural break in the data. Taken together, the results show that a structural break did occur in the long-run relationship between private and public saving in 1989.

Table 4.a. FMOLS and DOLS Estimates for Level Shift Model, 1975-2005

	FMOLS	DOLS
Constant	16.129	15.734
	(1.002)*	(0.682)*
GSR	-0.709	-0.741
	(0.129)*	(0.0967)*
D	5.112	5.377
	(1.268)*	(0.891)*

Note: *, **, *** indicate significance at 1%, 5% and 10% level of significance respectively. The values in parenthesis are standard errors.

Table 4.b. FMOLS and DOLS Estimates for Level Shift with trend Model, 1975-2005

	FMOLS	DOLS
Constant	18.263	13.892
	(1.310)*	(1.393)*
GSR	-0.819	-0.577
	(0.124)*	(0.148)*
D	7.320	4.693
	(1.503)*	(1.049)*
TREND	-0.193	0.137
	(0.084)**	(0.088)

Note:Seethenote in Table3.a.

Table 4.c. FMOLS and DOLS Estimated for Regime Shift Model, 1975-2005

	FMOLS	DOLS
Constant	14.571	11.685
	(2.977)*	(2.263)*
GSR	-0.458	-0.109
	(0.462)	(0.349)
D	6.627	9.355
	(3.032)**	(2.318)*
DGSR	-0.268	-0.613
	(0.483)	(0.322)**

Note:Seethenote in Table3a.

Concluding Comments

This study examines the long-run relationship between private and public sector saving ratios using FMOLS and DOLS methodologies. Empirical findings of this study can be summarized as follows: First, there is no long-run relationship between private and public savings unless endogenous structural break in the cointegration relationship is allowed in Turkish case. Secondly, the extent of offset coefficients ranges from -0.82 to -0.11 supporting weak form of Ricardian equivalence. Statistically significant change in the slope coefficient in DOLS case also shows that the substitution (offset) between private and public savings are stronger after 1989. This point is particularly worth mentioning because financial repression in Turkish economy was fully removed at this date. Thirdly, the results of the paper suggest that the effectiveness of fiscal policy implementations by the government has decreased significantly after achieving financial liberalization in 1989.The statistically significant and relatively large coefficient () on regime shift variable can be taken as an evidence for this argument.

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