

## Determinants of domestic saving rate in Turkey: A new generation econometric analysis

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**Abstract.** *In this study, the determinants of domestic savings rate in Turkey are investigated by Johansen cointegration test and DOLS method for 1975-2018 periods. At the end of the analysis, the most important determinants of savings are found to be per capita income, real interest rates, inflation, employment and economic risk perception (gold prices). Error correction mechanisms of the models operate. The causality relationships between the variables are examined by Breitung and Candelon (2006) frequency domain causality test. While no causal relationship from real interests and gold prices to savings is determined, permanent causality from national income and employment to savings and temporary causality from inflation to savings are found.*

**Keywords:** domestic saving rates; determinants of saving; frequency domain causality test.

**JEL Classification:** D91; E21; O16.

## 1. Introduction

Domestic savings constitute the most important source of financing for investment and consumption expenditures in a country. When savings within the country are not sufficient to finance investment and consumption expenditures, the savings of the citizens of other countries are borrowed in order to close this deficit. In this case, however, the country's external debt stock and interest payments are increasing, making the country more vulnerable to economic shocks.

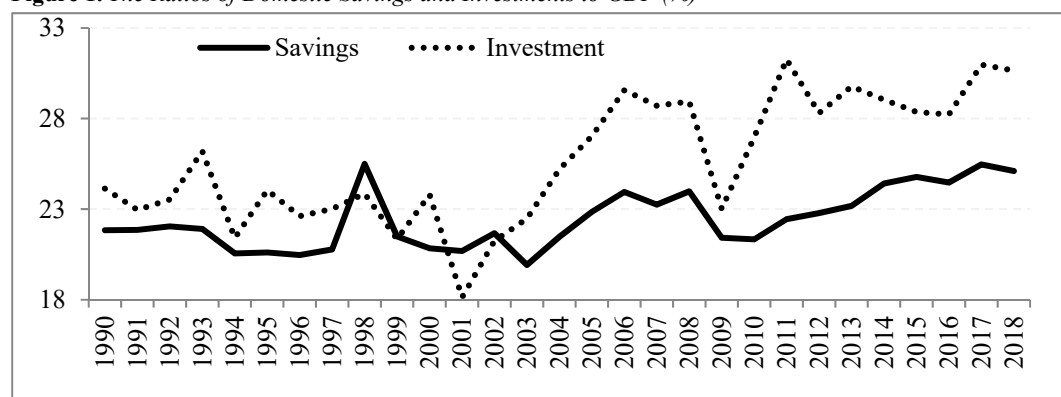
When the savings-investment gap is tried to be eliminated through external financing sources, the current account deficit of the country is also increasing. Increasing current account deficit is one of the most important leading indicators of economic crises (Ozbek, 2008; Yasar, 2011; Karagol, 2011). One of the most important reasons behind the 1994 and 2001 crisis in Turkey is the high current account deficit in those years.

As can be seen, the savings-investment gap has the potential to significantly affect the macroeconomic measures of the countries and cause economic crises. For this reason, it is useful to examine the subject in detail and keep it on the agenda.

In this context, the aim of the study is to analyze the determinants of savings behavior by econometric methods after savings-investment gap in Turkey is revealed with the help of graphs and tables. To do this, the data of Turkey's savings, real per capita income, real interest rate, inflation rate, employment rate and gram gold prices of 1975-2015 period is used to conduct new generation time series analysis methods. In the second part; Turkey's savings- investment deficit and current account deficit are investigated with the help of tables while the third part presents a summary of the related literature. In the fourth section, econometric analysis is carried out and the study is completed with results and recommendations. With this study, it is aimed to attract the attention of policy makers and economists on this issue. It is considered that the study will make a contribution to the literature due to the actuality of the subject and the analysis methods used.

## 2. Domestic savings in Turkey

While domestic savings was able to finance domestic investments in the 1990s in Turkey, it was unable to finance domestic investment in the period after 2000. The historical development of the ratios of domestic savings and investments to Gross Domestic Product (GDP) is shown in Figure 1.

**Figure 1.** *The Ratios of Domestic Savings and Investments to GDP (%)*

Source: IMF (2019).

As seen in Figure 1, in 1990, while savings were around 22% of GDP and investments were around 23% of GDP, savings rates in the post-2000 period began to decrease or increase relatively less, investments declined in the 2001 and 2009 crises and increased in general, except for those periods. The difference between savings and investments reached to 8.8% in 2011, and domestic savings inclined at a certain rate by the help of 25% state contribution to those who have been included in the Private Pension System as of January 1, 2013. However, by the end of 2018, there is still a difference of 5.5% between domestic savings and domestic investments. The distribution of savings and investments between public and private sectors is given in Table 1.

**Table 1.** *The distribution of savings and investments between public and private sectors in Turkey (Ratio to GDP, %)*

Year	Public Savings	Private Savings	Public Investments	Private Investments
1990	2.6	22.1	5.2	16.0
1995	-0.1	24.6	3.1	19.6
2000	-3.4	24.2	5.0	17.3
2001	-7.0	27.7	4.6	13.5
2005	2.7	20.2	3.6	23.0
2009	-0.8	22.2	3.9	18.5
2010	1.5	19.8	3.9	20.8
2011	3.4	19.0	4.1	24.2
2012	2.6	20.1	3.8	23.5
2013	2.9	20.2	4.3	24.2
2014	2.7	21.8	3.9	25.0
2015	3.6	21.1	4.1	25.6
2016	2.7	21.7	4.1	25.3
2017	2.6	20.3	4.0	24.3
2018	2.4	20.1	3.8	24.1

Source: Ministry of Development, Economic and Social Indicators, 2019.

As can be seen in Table 1, public sector savings in Turkey is generally very low, in many periods also took negative values. In the 2001 crisis, while the public sector savings decreased to -7.1%, private sector has protected itself and increased its savings up to 27.7%<sup>(1)</sup>. After 2003, people prefer consumption rather than saving as the United States and also Turkey began to apply low interest rate policy, in addition to the political and economic stability atmosphere. The result was a substantial decrease in private sector

savings down to 19% of GDP in 2011. Although public savings inclined to 3.4% this year, total savings remained at 22.4% of GDP. When the investments are examined, it is seen that public investments are far below the private investments, after the 1994 crisis and in the period of 2005-2010 it has decreased to 3%. It is observed that the private sector's investments decreased especially in the economic crisis periods, decreased to 13.5% in 2001 and to 18.5% in 2009. The average economic growth of Turkey needs to exceed 5% to generate employment, which requires over 22% investment (TİSK, 2014). From this perspective, both public and private sector should increase their investments.

Because of the low level of domestic savings in Turkey, banks operating domestically cannot collect enough deposits from the public. In this case, banks use syndicated loans from foreign banks in order to meet the domestic credit demands and distribute the funds they provide to the domestic market. However, this time the external debt stock of the country increases rapidly. Changes in Turkey's external debt stock are given in Table 2.

**Table 2.** *External debt stock of Turkey (Billion Dollars)*

Year	Short Term	Public	CBRT	Private	Long Term	Public	CBRT	Private	Total
1990	9.5	0	0.9	8.6	42.9	33.3	7.5	2.1	52.4
1995	15.5	0.3	1.0	14.3	60.4	41.8	11.2	7.5	75.9
2000	28.3	2.5	0.7	25.2	90.3	47.6	13.4	29.2	118.6
2005	38.9	2.1	2.8	34.0	131.8	68.3	12.7	50.9	170.7
2006	42.9	1.8	2.6	38.5	165.3	69.8	13.1	82.3	208.1
2007	43.1	2.2	2.3	38.7	206.9	71.4	13.5	122.0	250.0
2008	52.5	3.2	1.9	47.4	228.4	75.1	12.2	141.2	280.8
2009	49.0	3.6	1.8	43.6	219.9	79.9	11.4	128.6	268.6
2010	77.2	4.3	1.6	71.4	214.6	84.8	10.0	119.8	291.7
2011	81.6	7.0	1.2	73.3	222.3	87.3	8.1	126.9	305.3
2012	100.2	11.0	1.0	88.1	239.5	93.0	6.1	140.5	342.1
2013	130.4	17.6	0.8	112.0	259.8	98.3	4.4	157.1	392.6
2014	131.7	17.9	0.3	113.5	271.0	99.8	2.1	169.0	405.7
2015	102.7	14.6	0.2	88.0	295.3	98.4	1.2	195.7	400.3
2016	101.3	19.7	0.110	81.4	307.9	103.6	0.711	203.5	409.2
2017	118.6	22.11	0.658	95.8	336.4	114.4	0.8	222	455
2018	116.8	21.3	5.4	89.9	331.6	115.6	0.8	215.9	448

**Source:** CBRT – EDDS, 2019.

Looking at the data in Table 2, Turkey's external debt stock jumped in the period after 2000, increased rapidly in the period after 2006 and it exceeded \$400 billion in 2014. When we look at the composition of debts in 2018; 26% of the debts are short-term debts and 68.2% of the total debt belongs to the private sector. In recent years, the international credit rating agencies also emphasize the highness of Turkey's external debt stock in their statements and, in particular, they point to the fragility of the private sector. For example; Fitch, a credit rating agency, declared in April 27, 2016; "In the emerging economies, risk arisen by private sector foreign exchange debt increases and the debt ratio is the highest in Turkey", (Yildirim, 2016). In this statement; in terms of external debt to GDP ratio of the private sector, it was also underlined that Turkey is located at the top. The total debt of the private sector reaches 1.1 trillion dollars<sup>(2)</sup>. The increasing savings gap also raises the current account deficit. Domestic saving gap and current account deficit data are presented in Table 3.

**Table 3.** Domestic saving gap and current account deficit data (Ratio to GDP, %)

Year	Saving-Investment Gap	Current Account Deficit
1990	-2.3	-1.2
1995	-3.4	-1.0
2000	-2.9	-3.6
2005	-4.1	-4.1
2006	-5.6	-5.6
2007	-5.4	-5.4
2008	-4.9	-5.1
2009	-1.5	-1.7
2010	-5.6	-5.7
2011	-8.8	-8.9
2012	-5.5	-5.4
2013	-6.5	-6.7
2014	-4.6	-4.6
2015	-4.3	-4.3
2016	-3.7	-3.8
2017	-5.5	-5.5
2018	-5.5	-5.7

Source: IMF, 2019.

As seen in Table 3, there is a very strong relationship between savings-investment deficit and current account deficit. The increasing savings-investment gap brings along the current account deficit. Especially in 2011, the current account deficit, approaching 10% of GDP, has made Turkey considerable vulnerable to economic crises. Indeed, in a report released in August 2013 by a US investment bank Morgan Stanley, the countries are evaluated according to current account deficit to GDP ratios and most vulnerable countries to capital inflows are determined. In the end, India, Brazil, Indonesia, Turkey and South Africa are named as "fragile five" (Morgan Stanley, 2013). Turkey, meanwhile, is said to be the most vulnerable country in this basket. According to the report, the basic economic problems of the countries mentioned are significant current account deficit due to the fact that their domestic savings are not sufficient to finance their investments, weak economic growth, inflation risk, the fact that their economic growth is largely dependent on foreign capital and, as a result, exchange rate risk (Gocer and Akin, 2016).

### 3. Literature summary

Rijckeghem and Ucer (2008), in their study that examines the development and determinants of private saving rates in Turkey, estimated the main determinants of private saving rates as public savings, inflation and real GDP per capita growth rate. Duzgun (2009) examines the determinants of private savings by OLS method in Turkey for 1987-2007 periods. At the end of the study, it is found that public savings, money supply, interest rate and inflation have negative impact on private savings, while foreign savings have a positive effect. Yarasir and Yilmaz (2011) investigated the determinants of private savings in OECD countries by using the Dynamic Panel Data Analysis Method for the period 1999-2007. As a result of analysis; it is determined that the savings rates of the previous year,

the loans given to the private sector, the current account balance and inflation affect private savings negatively while public sector savings and the elderly dependency ratio affect positively.

Sancak and Demirci (2012), which studied the importance of national savings in order to have sustainable economic growth in Turkey; stated that in spite of the relative improvement in public savings in recent years, there has been a significant decrease in private sector savings and national savings have a positive effect on the sustainability of economic growth in the short and long term. Ozcan and Gunay (2012), in the study examines the determinants of savings in Turkey for the period 1975-2006; found that one of the most important factors that determine the private savings is the savings inertia, the public savings have a decreasing effect on the private savings and increases in real interest rates and terms of trade positively impact the private savings. In addition, economic growth, financial depth and inflation have reducing effects on private savings. Young and old population dependency ratios and urbanization rates have a negative effect on private savings and women with higher education have a negative effect on private savings, while women's labor force participation rate and university graduate people have an increasing effect on private savings.

Colak and Ozturkler (2012) investigated the propensity of households to save in Turkey by OLS and quantile regression methods using the Household Budget Survey Micro Data Set 2010 prepared by TurkStat and found that the coefficient of house ownership and social security variables in the household with the lowest income of 20% are positive and the coefficient of the number of individuals with higher education diploma and the population living in the city are negative. In the household with the highest income of 20%, it was found that living in the city reduced the tendency to save. Karagol and Ozcan (2014), in their study that investigated the reasons for the decline in savings, revealed that the main causes of the decline in savings rate in Turkey is the increase in household consumption expenditures, low real interest rates, inadequacy of financial markets and low female employment. Özel and Yalcin (2013), in their study on domestic savings and private pension system in Turkey; stated that the 25% state incentives to the private pension system could increase domestic savings by 1.5 points, but the high operating expenses of the fund would limit the increasing effect of this change in the PPS. In other words, based on the current fund operating expense ratios, it would be more advantageous for the participants to evaluate their investments outside the system. It has been pointed out that their evaluation may be more advantageous for themselves. Therefore, measures to lower the operating costs of the fund in Turkey should be taken as soon as possible in order to provide development in PPS.

World Bank (2014) report, on the low level of savings in Turkey, stated that the low level of financial education, low women labor force participation rate, not having the households' savings planning, saving only for precautionary motive, having the ultimate goal of saving to buy a house and the absence of other long-term targets, the high transaction costs in the banking system and the low net returns are effective. Hamarat and Ozen (2015), in the study investigating the variables affecting savings preferences in Turkey by canonical correlation analysis method with for 23 provinces, determined that

population density, income, number of bank branches and number of enterprises have significant effects on saving preferences. Moreover, the per capita stock exchange amount, the per capita TL deposit amount and the TL deposit amount per account were among the most affected savings preferences, while the foreign exchange and gold preferences were less affected than the other preferences. Aksoy (2016) took the consumer and commercial loans as the determinants of the savings and analyzed by GECC method and the maximum likelihood estimator using the data of 1980-2014 period for 52 countries, 32 of them developed and 20 of them developing. In the study, it is estimated that public sector savings have a crowding-out impact on private savings. Moreover, 1% increase in public savings, consumer credits and commercial credits decline private savings by 0.60, 0.21 and 0.05%, respectively, while 1% increase in per capita income, terms of trade and CPI volatility improve private savings by 0.10, 0.06 and 0.12%, respectively.

#### 4. Econometric analysis

##### 4.1. Data set and model

In order to find the determinants of savings in the study, the ratio of Turkey's 1975-2018 period savings to GDP ( $S$ , %), real per capita income ( $Y$ , thousand TL), the real interest rate ( $R$ , %), inflation rate ( $\pi$ , CPI, %), employment rate ( $E$ , %) and gram gold prices ( $G$ , TL) are used. Data were compiled from TurkStat Statistical Indicators 1923-2013, Ministry of Development Savings Statistics, TurkStat Basic Labor Force Statistics and CBRT-EVDS. Real income per capita is obtained by deflating GDP per capita with CPI 2003=100 series. Real interest rate series is formed based on Fisher Equality<sup>(3)</sup>, by subtracting inflation rate from nominal interest rates. Gram gold prices are included in the study as a leading indicator of the economic crisis in Turkey because when an internal or external crisis risk arises in the economy in Turkey, gold prices react quickly in the direction of increase<sup>(4)</sup>. Similarly, the inflation rate serves as a control variable for the study<sup>(5)</sup>. The following models are used to determine the determinants of savings in the study:

$$S_t = \beta_0 + \beta_1 Y_t + \beta_2 R_t + u_t \quad (1)$$

$$S_t = \alpha_0 + \alpha_1 Y_t + \alpha_2 E_t + e_t \quad (2)$$

$$S_t = \gamma_0 + \gamma_1 Y_t + \gamma_2 \pi_t + \varepsilon_t \quad (3)$$

$$S_t = \theta_0 + \theta_1 Y_t + \theta_2 G_t + \epsilon_t \quad (4)$$

Here,  $R$ ,  $E$ ,  $\pi$  and  $G$  are included as control variables.

##### 4.2. Methodology

In the study, the stationarity of the series is controlled by Augmented Dickey-Fuller (ADF), Phillips-Perron (1988, PP), Kwiatkowski et al. (1992, KPSS) and Vogelsang and Perron (1998, VP) structural break unit root tests, the existence of the cointegration relationship is tested by Johansen (1991, 1995) method and long and short-term analyzes are performed using the Dynamic Least Squares (DOLS) method.

### 4.3. Unit Root Test

The stationarity of the series is tested with ADF, PP, KPSS and structural break ADF methods. ADF is used because it is the most widely used test, PP is because, especially in the trend-containing series, it is considered to be more powerful than the ADF (Perron, 1988), KPSS is because, unlike the ADF and PP test, its null hypothesis is "series are stationary", that is, it is a justification of ADF and PP. Since Turkey's economy faced many structural transformation and economic crisis during the analysis period, the study is extended with the structural break ADF test developed by Vogelsang and Perron (1998). The results are presented in Table 4.

**Table 4.** Unit Root Tests results

Variable	ADF	PP	KPSS	Structural Break ADF	Structural Break Date
<b>S</b>	-1.76 (0.39)	-1.84 (0.35)	0.30 (0.34)	-2.76 (0.80)	1998
<b>Y</b>	-0.53 (0.87)	0.77 (0.99)	0.77 (0.46)	-1.88 (0.98)	2004
<b>E</b>	-1.37 (0.58)	-1.36 (0.59)	0.70 (0.46)	-1.98 (0.98)	1991
<b>R</b>	-3.02** (0.04)	-3.11** (0.03)	0.43 (0.34)	-3.45 (0.40)	1994
$\pi$	-2.04 (0.26)	-2.05 (0.26)	0.41 (0.34)	-3.82 (0.22)	2002
<b>G</b>	-2.13 (0.23)	2.90 (1.00)	0.78 (0.73)	-1.29 (0.99)	2008
$\Delta S$	-7.26*** (0.00)	-7.18*** (0.00)	0.07*** (0.73)	-7.17 (0.00)	1999
$\Delta Y$	-3.83*** (0.00)	-6.04*** (0.00)	0.21*** (0.73)	-4.24* (0.08)	1988
$\Delta E$	-5.45*** (0.00)	-5.51*** (0.00)	0.21*** (0.73)	-6.63*** (0.00)	2004
$\Delta R$	-5.06*** (0.00)	-8.96*** (0.00)	0.12*** (0.73)	-6.73*** (0.00)	1996
$\Delta \pi$	-6.72*** (0.00)	-7.06*** (0.00)	0.17*** (0.73)	-7.03*** (0.00)	1996
$\Delta G$	5.59 (1)	-3.58** (0.01)	0.64*** (0.73)	-6.05*** (0.00)	2008

**Note:** The values in parenthesis are probability values in ADF and PP tests, and 1% critical values in KPSS test. \*\* and \*\*\* indicate that the related series is stationary at 5% and 1% significance level, respectively.

According to ADF test results; while real interest is stationary at level, saving, income, employment and inflation are stationary in the first difference; gold prices are not stationary at the level or the first difference. The study is expanded with PP test. In the PP test, real interest is stationary at the level values and the other series are found to be stationary at the first difference. This time, KPSS test is used in the study. As result of the KPSS test, all series are not stationary at the level and become stationary at the first difference. The study is also extended by VP structural break unit root test. In the structural break ADF test, the series are not stationary at the level values but stationary at the first differences, that is I(I). Looking at the structural break dates of the structural break ADF test; the crises of 1994, 2001 and 2008 appear clearly. On the other hand, period of high inflation in 1996, the 1998 Russian economic crisis and its impact on Turkey is also revealed by the test method.

### 4.4. Cointegration Test

In the study, there are more than one explanatory variable in each model and in such cases, Engle-Granger (1987) method is considered to be weak. Therefore, cointegration relationship between the series is examined by Johansen (1991, 1995) method and results are given in Table 5.



**Table 5.** *Johansen Cointegration Test results*

		Eigenvalue	Trace Statistic	0.05 Critical Value
<b>Model 1</b>	None *	0.450	42.40	42.91
	At Most 1	0.33	24.27	25.87
	At Most 2	0.17	6.73	12.51
<b>Model 2</b>	None *	0.47	22.14	21.87
	At Most 1	0.11	3.81	15.001
	At Most 2	0.02	0.61	2.70
<b>Model 3</b>	None *	0.32	27.89	24.27
	At Most 1	0.27	11.47	12.32
	At Most 2	0.01	0.73	4.12
<b>Model 4</b>	None *	0.52	34.16	32.06
	At Most 1	0.12	7.84	16.16
	At Most 2	0.0015	0.09	2.70

**Note:** Optimum lag length is taken as 1 according to Akaike, Schwarz and Hannan-Quin criteria in all models.

According to the results in Table 5, it is evaluated that the series are cointegrated in all models, that is, they move together in long term and regression analysis performed with the level values of this series will not have spurious regression problem.

#### 4.5. Long Term Analysis: Estimation of Cointegration Coefficients

The cointegration coefficients are estimated by DOLS method and the findings obtained are presented in Table 6.

**Table 6.** *Cointegration Coefficients Estimation results*

	Model 1	Model 2	Model 3	Model 4
<b>Y</b>	-0.19*** [-5.01]	1.19*** [2.43]	0.007 [0.09]	1.21*** [2.81]
<b>R</b>	0.18** [2.23]	---	---	---
<b>E</b>	---	1.84** [2.12]	---	---
<b><math>\pi</math></b>	---	---	0.13*** [3.50]	---
<b>G</b>	---	---	---	-0.62*** [-4.48]
<b>Constant</b>	28.84*** [10.74]	-93.32** [-2.21]	9.55** [2.96]	-4.95 [-0.71]
<b>R<sup>2</sup></b>	0.59	0.78	0.88	0.83
<b><math>\bar{R}^2</math></b>	0.45	0.51	0.71	0.72
<b>JB</b>	0.64	0.32	0.88	0.05

**Note:** The square brackets are the t statistics for the corresponding parameter. \*, \*\* and \*\*\* implies 10%, 5% and 1% significance levels, respectively. JB shows probability value of Jarque-Bera normality test.

According to the results in Table 6, when the real national income per capita inclines, it is seen that the saving rate decreases. This situation supports Keynesian approach for money demand that increased income will increase demand for money. With increasing demand for money, savings rates are also declining. Indeed, with increasing per capita income, the savings rate in the period after 2002 has dropped significantly in Turkey. In this model, it is determined that the increase in real interest rates increases the domestic saving rate. This situation supports the idea of Keynes that savings are an increasing function of interest. The results obtained about the real interest rate are compatible with Duzgun (2009); Ozcan and Gunay (2012); Karagol and Ozcan (2014). In Model 2, it is observed that the increase in per capita income has an increasing effect on savings. Similarly, it is found that the increasing employment rate improves the saving tendencies of the people. This finding supports the Lifetime Income Hypothesis of Modigliani. To keep their consumption for life, people save a portion of the income they earn while working. The results obtained are compatible with the studies of Rijckeghem and Ucer (2008); Aksoy

(2016). In Model 3; it is seen that increasing inflation led people to the participate in the financial system instead of keeping cash which cause increases in the savings. In fact, in the 1990s when inflation ranged between 70% to 130% in Turkey, domestic savings remained above 20% of GDP. This result is compatible with Rijckeghem and Ucer (2008); Yarasir and Yılmaz (2011); Ozcan and Gunay (2012). In Model 4, it is seen that the per capita income increases the savings, but the increase in the gold prices ascends the risk perception of the people causing the fact that the savings are taken out of the financial system. Here, the precautionary money demand approach of Keynes can also come to mind.

#### 4.6. Short term analysis: Error correction model

Short-term analysis, based on the error correction model, is carried out as follows with stationary series created by taking first difference and one period lagged of the error term series obtained from long-term analysis ( $ECT_{t-1}$ ):

$$\Delta S_t = \beta_0 + \beta_1 \Delta Y_t + \beta_2 \Delta R_t + \beta_3 ECT_{t-1} + u_t \quad (5)$$

$$\Delta S_t = \alpha_0 + \alpha_1 \Delta Y_t + \alpha_2 \Delta E_t + \alpha_3 ECT_{t-1} + e_t \quad (6)$$

$$\Delta S_t = \gamma_0 + \gamma_1 \Delta Y_t + \gamma_2 \Delta \pi_t + \gamma_3 ECT_{t-1} + \varepsilon_t \quad (7)$$

$$\Delta S_t = \theta_0 + \theta_1 \Delta Y_t + \theta_2 \Delta G_t + \theta_3 ECT_{t-1} + \epsilon_t \quad (8)$$

Short-term analyzes are performed by DOLS method and the findings are presented in Table 7.

**Table 7.** Short Term Analysis results

	Model 1	Model 2	Model 3	Model 4
$\Delta Y$	0.58 [1.25]	0.24* [1.44]	0.92** [1.89]	0.29* [1.63]
$\Delta R$	0.016 [0.15]	---	---	---
$\Delta E$	---	-0.37 [-0.75]	---	---
$\Delta \pi$	---	---	0.12 [0.89]	---
$\Delta G$	---	---	---	-0.023 [-0.10]
$ECT_{t-1}$	-0.27** [-2.10]	-0.35** [-2.11]	-0.62*** [-2.74]	-0.48** [-1.95]
<b>Constant</b>	-1.39 [-1.06]	-0.73* [-1.45]	-1.73** [-1.91]	-0.58 [-0.97]
$R^2$	0.68	0.25	0.62	0.23
$\bar{R}^2$	0.58	0.23	0.45	0.14
<b>JB</b>	0.58	0.92	0.32	0.94

**Note:** The square brackets are the t statistics for the corresponding parameter. \*, \*\* and \*\*\* implies 10%, 5% and 1% significance levels, respectively. JB shows probability value of Jarque-Bera normality test.

According to the results in Table 7, error correction mechanism of all models operates. In the long run, the deviations in the short run between the series moving together disappear and the series converge again to the long term equilibrium value. This situation also proves that the long-term analyzes are reliable.

#### 4.7. Frequency domain causality test

Conventional causality tests give the relationship between the series for one test statistic, while frequency distribution causality analysis generates different test statistics for different frequencies. Therefore, the frequency distribution causality test considers the relationship between the series to be short, medium and long term (Adiguzel et al., 2013: 59; Senturk et al., 2014: 160). In addition, this test is able to reveal whether the

relationship between the series is permanent or temporary (Bozoklu and Yilanci, 2013: 877).

Geweke (1982) and Hosoya (1991) established the following VAR model by creating two-dimensional time series vector,  $z_t = [x_t, y_t]'$  where  $t = 1, \dots, T$ , in order to analyze causality relationship:

$$\theta(L)z_t = \varepsilon_t \tag{9}$$

Here,  $\theta(L) = I - \theta_1 L - \dots - \theta_p L^p$  and  $L^k z_t = z_{t-k}'$ . Then the causality for different frequencies is defined as follows:

$$M_{y \rightarrow x}(\omega) = \log \left[ \frac{2\pi f_x(\omega)}{|\psi_{11}(e^{-i\omega})|^2} \right] = \log \left[ 1 + \frac{|\psi_{12}(e^{-i\omega})|^2}{|\psi_{11}(e^{-i\omega})|^2} \right] \tag{10}$$

If  $|\psi_{12}(e^{-i\omega})| = 0$ , no causality relationship exists from y to x in  $\omega$  frequency. If Z's components are stationary at first-order and cointegrated, this series has unit root. Subtracting  $z_{t-1}$  from both sides of Equation (5) (Breitung and Candelon, 2006: 365):

$$\Delta z_t = (\theta_1 - I)z_{t-1} + \theta_2 z_{t-2} + \dots + \theta_p z_{t-p} + \varepsilon_t = \tilde{\theta}(L)z_{t-1} + \varepsilon_t \tag{11}$$

$$\tilde{\theta}(L) = \theta_1 - I + \theta_2 L + \dots + \theta_p L^p \tag{12}$$

Breitung and Candelon (2006) assumes  $\varepsilon_t$  has White Noise process and defines  $E(\varepsilon_t, \varepsilon_t') = \Sigma$  where  $E(\varepsilon_t) = 0$  and  $\Sigma$  is positive. Defining  $G$  as sub triangle matrix of Cholesky decomposition,  $G'G = \Sigma^{-1}$ ,  $E(\eta_t \eta_t') = I$  and  $\eta_t = G\varepsilon_t$ . If the system is stationary,  $\psi(L) = \phi(L)G^{-1}$  and MA indication of it is:

$$z_t = \phi(L)\varepsilon_t = \begin{pmatrix} \phi_{11}(L) & \phi_{12}(L) \\ \phi_{21}(L) & \phi_{22}(L) \end{pmatrix} \begin{pmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{pmatrix} = \begin{pmatrix} \psi_{11}(L) & \psi_{12}(L) \\ \psi_{21}(L) & \psi_{22}(L) \end{pmatrix} \begin{pmatrix} \eta_{1t} \\ \eta_{2t} \end{pmatrix} \tag{13}$$

When this impression is used for the spectral density of  $x_t$ :

$$f_x(\omega) = \frac{1}{2\pi} \{ |\psi_{11}(e^{-i\omega})|^2 + |\psi_{12}(e^{-i\omega})|^2 \} \tag{14}$$

Breitung and Candelon (2006) conducts an F test and compares obtained test statistic with F(2, T-2p) table value to test the null hypothesis that there is no causality relationship from Y to X, under the linear constraint of  $\beta = [\beta_1, \dots, \beta_p]'$ . In this study, the frequency domain causality test developed by Breitung and Candelon (2006) is performed and the results are presented in Table 8.

**Table 8.** Frequency Domain Causality Test Results

Null Hypothesis	Long Term (Permanent Causality)		Medium Term				Short Term (Temporary Causality)	Decision
	0.01	0.05	1.00	1.50	2.00	2.50		
$Y \Rightarrow S$	5.12*	5.09*	1.48	1.95	0.84	2.58	There is a permanent causality from national income to savings. In accordance with the Keynesian theory, an important determinant of savings is income.	
$R \Rightarrow S$	0.66	0.66	1.05	1.34	2.47	0.60	There is no causality relationship from real interest to savings. So saving behavior in Turkey are formed independently of real	

Null Hypothesis	Long Term (Permanent Causality)		Medium Term		Short Term (Temporary Causality)		Decision
$E \rightarrow S$	18.64*	18.78*	14.92	0.43	0.79	7.30*	interest rates. This case is considered to be due to very low real interest rates in Turkey which causes liquidity trap. There is a permanent causality relationship from employment to savings. In other words, increased employment affects the saving behaviors by increasing the income of individuals.
$P \rightarrow S$	1.99	1.98	5.60*	9.71*	7.41*	2.58	There is a causality relationship from inflation to savings in the short and medium term. Thus, increased inflation may affect the consumption and saving behaviors in the short term by panicking individuals.
$G \rightarrow S$	1.78	2.33	0.39	1.54	1.06	1.17	There is no causality relationship between gold prices and savings.

**Note:** Critical value used to compare test statistics at 5% significance level is  $F(2, 17) = 3.59$ .

According to the results in Table 8, the most important determinants of savings in Turkey are income and employment. Looking at the determinants of the savings with the help of figures<sup>(6)</sup>.

**Figure 2.**  $Y \rightarrow S$  Causality Relationship

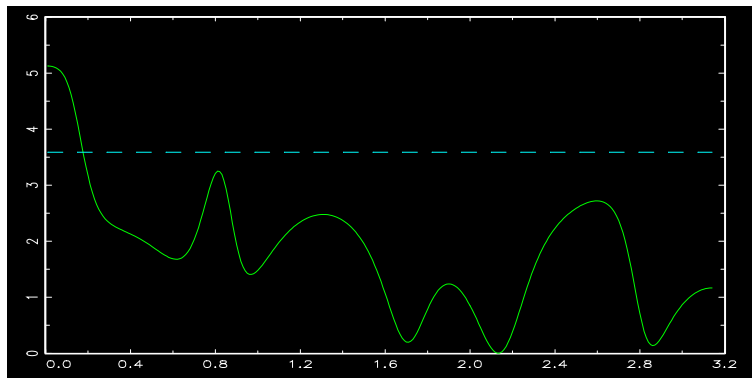


Figure 2 shows that there is a long-term causality relationship from national income to savings. So, saving behavior in Turkey is influenced by national income.

**Figure 3.**  $R \rightarrow S$  Causality Relationship

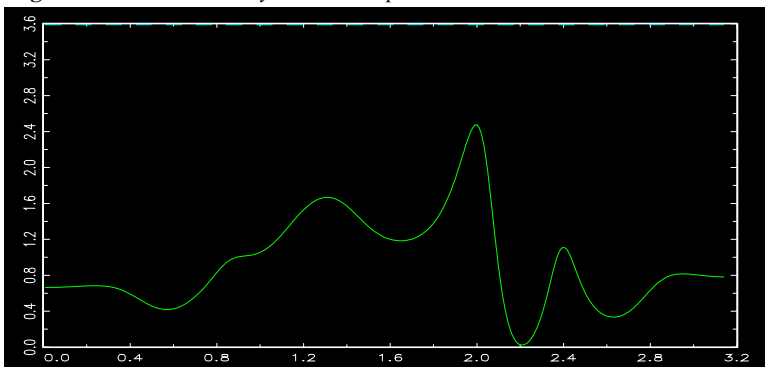


Figure 3 shows that there isn't any causality relationship from interest to savings.

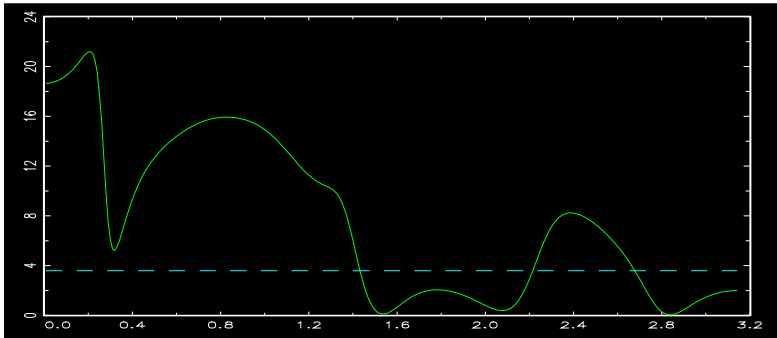
**Figure 4.**  $E \rightarrow S$  Causality Relationship

Figure 4 shows that there is a causality relationship from employment to savings both in the long-term and short-term. In other words, saving behavior in Turkey is significantly affected from employment. Based on this information, it is also considered that the recent rise in unemployment is a cause of fall in saving rates in Turkey.

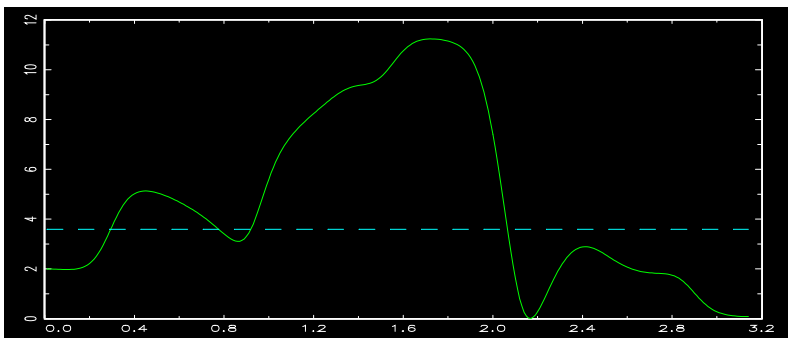
**Figure 5.**  $\pi \rightarrow S$  Causality Relationship

Figure 5 indicates that there is a causality relationship from inflation to savings in the medium term. So saving behavior in Turkey is affected from inflation at a certain rate.

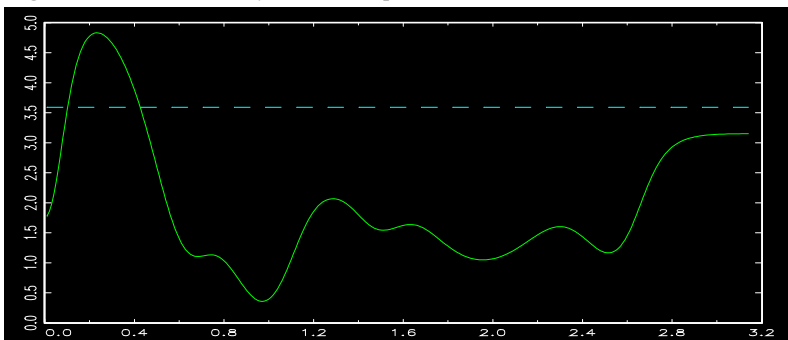
**Figure 6.**  $G \rightarrow S$  Causality Relationship

Figure 6 provides evidence of a long-term causality relationship from gold prices to savings. So, although not a very powerful relationship exists, saving behavior in Turkey is slightly affected from the price of gold.

### Conclusion and recommendations

Domestic savings are the most important source of financing of countries' investments, and, for a sustainable high growth level, high savings rate is of great importance. As Solow (1956) stated; for high economic growth, there is a need for a continuous increase in the fixed capital stock per labor. To provide this, the increase of investments is required and the savings must incline to increase the investments.

Behind the current account deficit, one of the most important problems of Turkey's economy in recent years lays the insufficiency of domestic saving to finance investment. When it is not possible to finance investments with domestic savings, foreign savings are used, which increases the country's external debt stock, external debt interest payments and fragility to economic shocks.

In this study, the determinants of domestic savings rate in Turkey is investigated by using real national income per capita, real interest rate, inflation rate, employment rate and price of gram gold for the period of 1975-2018. As result of the analysis, the most important determinants of savings are estimated to be per capita national income, real interest rates, inflation, employment and economic risk perception (gold prices). Error correction mechanisms of the models operate.

Based on the findings of the study; policy makers willing to increase savings in Turkey has to pay attention to increase the disposable income of people, to provide high real interest rates and to incline employment rate. Banks are also required to cut their transaction fees from savings owners and try to offer higher real returns to them. Households should not try to consume first and save then, but to save first and then spend remaining money and to try to save more for the future of family and country.

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### Notes

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- (1) This is a good example of Money Demand for Precautionary Motive of Keynes.
- (2) It is the total debt of the private sector consisting of domestic debts, foreign debts, bank credits, checks and bills and is calculated by (Yildirim, 2016).
- (3) Fisher equation is  $R = i - \pi$ .
- (4) In fact, although the most responsive indicator is stock market indexes, because BIST established in 1986 in Turkey and start trading in 1987, data belong to the period before that date are not available.
- (5) When the inflation rate increases, the national currency rapidly depreciates, in which case the household converts the money into gold or foreign currency, or if the real interest rates are above zero, they invest in time deposits or spend as soon as possible.
- (6) In the figures, it is decided that there is a causality relationship in periods when the graph exceeds the critical value line. For more detailed information on the interpretation of graphics, see Breitung and Candelon (2006).

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