DIFFERENT EFFECTS OF OIL PRICES ON NET PRIVATE SAVING GAP BEFORE AND AFTER THE 2001 TURKISH FINANCIAL CRISIS

Ahmet Sengonul
Department of Economics, Mersin University
Ciftlik Koy Campus 33342 Mersin/Turkey
e-mail: sengonul@mersin.edu.tr
telephone: +90.537.264 40 50

Suleyman Degirmen
Department of Economics, Mersin University
Ciftlik Koy Campus, 33342 Mersin-Turkey
and
Department of Economics, Hamburg University
Von Melle-Park 5 Room: 3111
20146 Hamburg/Germany
e-mails: suleyman.degirmen@wiso.uni-hamburg.de
suleymandegirmen@gmail.com
telephone: +90.537.288 93 56

Abstract

Starting with the liberalization of capital account in 1989, speculative capital inflows have significantly raised due to the increase in interest rates resulting from incremental budget deficits in Turkey. Because of the fact that current account deficit problem has been kept in agenda while the budget deficit in Turkey has got closer to balance, a new potential determinant of current account, namely the gap between private savings and investment, net private saving is proposed recently. Therefore, as a further step, the study explores the determination of net private saving, within the context of the effect of oil price shocks on private savings and investment gap before and after the 2001 crisis. Thus, the reason of introducing the oil price as an additional variable to the model is to explain the effect of oil prices on current account deficit thru the private savings and investment gap. For this purpose, the bound testing approach to cointegration, within an Autoregressive Distributed Lag (ARDL) framework and error-correction model (ECM) methodology, is applied for the period of 1990: Q1-2007: Q3. Expected empirical results provide evidence of the simultaneous effectiveness of Interest Rate for Deposit, GDP growth, and Oil Price on Net Private Savings Rate in both long run and short run.

Keywords: *Oil (Prices), Net Private Savings Ratio, Turkish Economy, Cointegration, and ARDL*

JEL codes: *C22, E21, G01, O13*

1. Introduction

Since 1980s, Neo-liberal approach dominated on economic policies, is based on the argument of that when financial liberalization is completed, developing countries in the need of funds will easily benefit from foreign funds (Ostry and Reinhart, 1995:16). In recent years, there has been extensive empirical research on savings, investment and economic growth relationship. In regard of the importance of fluctuations in oil prices for both developed and developing economies, the motivation of these studies is the increasing concern over the falling saving rates in the major OECD countries, the growing divergence in saving and investment rates between the developing countries, and the increasing emphasis of the important role of investment in the more recent economic growth literature. Foreign capital inflows are also receiving attention because of their potential to finance investment and promote economic growth, although they can be problematic for developing countries [such as Turkey] (Verma and Wilson, 2005:1). Thus, the relationship among oil price changes, saving and investment gap put itself into the agenda, which also give a reference for the picture of current account situation.

Turkey has recently experienced a series of macroeconomic shocks embedded in interest rate increases, exchange rate depreciations, chronic large budget deficits and current account deficits. Starting with the liberalization of capital account in the 1989, speculative short-term foreign capital inflows have significantly increased due to the increase in interest rates resulting from the growth in budget deficits. Turkey has also experienced current account deficits many years. By the Keynesian twin-deficits argument raised within the framework of Mundell-Fleming model, and the Ricardian Equivalence Hypothesis offers an alternative explanation to the twin-deficits story. Many studies have analyzed twin deficit (even triple deficits) issue in different aspect without considering the determinants of savings and investment along with current account deficit. In a recent study for Turkey, Sengonul (2008) provides evidence on the twin deficit hypothesis between the current account and private saving deficits in the long run, and budget deficits in the short run, while supporting the triple deficit proposition among the balances at contemporaneous period. As a potential long run determinant of current account deficit, this paper brings further research on explanation of private savings-investment gap by focusing private savings and investment equation and their

determinants. Therefore, research objective in the paper is to examine determinants of private savings and investment gap in Turkey, in light of oil price fluctuations. In methodology, two approaches will be followed: (i) descriptive approach, and (ii) the bound testing approach to cointegration, within an Autoregressive Distributed Lag (ARDL) framework and error-correction model (ECM) methodology. This paper will be particularly useful since Turkey needs to create funds necessary for investment and to manage public and private savings for its speedy development.

On the basis of the analysis thus far, the organization of the paper is as follows: Section 2 provides explanation on the policy environment and saving and investment behavior. Section 3 pictures the outlook for Turkish economy's oil usage. Section 4, summarizes the potential determinants of private savings and investment including theoretical explanations. Section 5 and 6 discuss the data and methodology used and presents the empirical results and their evaluations. The last section concludes along with test results.

2. Policy Environment and Saving and Investment Behavior in Turkey

2. 1 Until 1989-Financial Liberalization

An overview of the evolution of the Turkish economy will be helpful for analyzing the saving and investment behavior in Turkey in more than thirty years. In the post-1973 era, Turkey experienced a foreign-financed boom, and grappled with a severe debt crisis during the period of 1978-80. In early 1980, Turkey introduced liberalization of financial and external markets. In the post-1980 period, export oriented adjustments were observed. The post-1989 populism caused unregulated financial liberalization during the 1989-1993 periods. The 1994 crisis led to significant shifts in macroeconomic characteristics of Turkey (Ozcan et al., 2003:1408).

The 1978-80 debt crisis fell mainly on investment rather than saving-saving rate falling from 17% to 16% and investment rate falling from 24.6% to 21.8 %-as Ozcan et al. (2001) claims opposite. The post-1980 reform caused an increasing trend in aggregate saving that led by increase in public saving as private saving decreased. As the annual growth rate of the Turkish economy increased after 1985, public saving began to worsen

and private saving recovered (Ozcan et al. 2003:1408). Due to public saving gap (i.e., Sg < 0), and its effect on general price level, inflation increased in the 1980s. In this era, Turkish economy had incremental current account deficits (therefore, a huge external debt service), which widened budget deficit. Moreover, domestic borrowing resulted in higher interest rates, and hence in larger volumes of interest payments by the public sector.

2.2 After 1989 to 2001 Crisis

After the financial liberalization starting from 1989, public saving gradually decreased from 4.7% in 1989 to -8.9% in 2001 along with increase in private saving from 17.4% in 1989 to 24.6% in 2001 while private (gross fixed) investment increased from 15% in 1989 and reaches up to 20.2% in 1997 and then, decreases to 12.6% in 2001. These figures enables that public saving gap was filled with private saving surplus as (see Kepenek and Yenturk, 1997:434-35). We can interpret this situation of that after the unregulated financial liberalization, financing public saving gap and current account deficit was eased with foreign capital inflows since the cost of this adjustment to the Treasury of Turkey was the acceleration of the interest burden on its borrowing instruments (Ozcan et al., 2003:1409). Therefore, this policy kept interest rate and inflation high. Toward the crisis, 1999 and 2000 pictured that private saving deficit, (i.e., Sp < 0), respectively is 12.3%, and 7.4% while public saving gap respectively is -13.2%, and -12%. This means total saving gap raised from -0.9% in 1999 to -4.6% in 2000. During these years, current account balance realized as of -0.7% in 1999 and -4.9% in 2000, which means that capital flowed in Turkey to finance current account balance and public saving gap. Based on the explanation, we conclude that the main reason of financial liberalization in 1989 was to reach the new resources to finance public deficits.

2. 3 Since 2001 Crisis

Turkish economy was caught 2001 crisis with high level of public deficit and current account deficit. Since 2001, with the implementation of the stability program after the economic crisis, fiscal discipline was established to a great extent and budget deficits dropped rapidly in subsequent years. Main aim of the program was to enable sustainable

growth along with price stability. By present day, the program has succeeded in keeping inflation at low level; however, the announced level of the targeting inflation rate was out the target in both 2006 and 2007. Moreover, each incumbent government has been also succeeded in lower the high level of public deficits, and in the application of structural reforms but both public deficit is still high and there was some delay in the reforms. Besides, Turkish economy has been successively experiencing high level of economic growth since the establishment of the program, but has not been in the track of sustainable growth yet.

One of the problems of the Turkish economy is gradually increase in current account deficit. Current account deficit means that Turkish economy has to use savings from abroad in addition to own savings. Though over valued YTL and higher (real) interest rate due to applied exchange and interest rate policies has been seen as a reason of higher and incremental current account deficits, the reason of the current account is directly not interest and exchange rate policies but the inadequacy of national savings. Another problem of the Turkish economy is dependency of its economic growth to domestic demand, which has long time financed by foreign capital inflows (TSRI, 2008:1-2). The decline in interest rates in recent years and the appreciation of the Turkish lira engineered capital-intensive quality of private sector production, thus leading to high-rated increases in productivity. On one hand, productivity increases raised capital yield and on the other encouraged investments. The public sector's tendency towards economic and social infrastructure activities and privatizations realized during recent periods also became key factors that enhanced the efficiency of the private sector in the economy. These favorable developments observed in the growth dynamics of the Turkish economy are raising the potential production level as well (CBRT, 2006).

Because an rapid increase in public/government spending income and keeping public consumption expenditure almost same led to decrease public saving gap more: from -8.9% in 2001 to -1.3% in 2004 while because of decrease in interest rates and decline in interest payments in recent years, public saving gap gave surplus from 2.6% in 2005, 5.3% in 2006, and 3.5% in 2007. This situation has reversed the development in inflation rate induced by public deficits in the economy and the usage of abroad borrowing and private saving. Therefore, as public saving gap turned to positive after

2005, private savings and investment difference has decreased from after the crisis: private savings decreased from 24.6 % in 2001 to 11.3% in 2006 and private investment increased from 12.6% in 2001 to 16.6% in 2006. Thus, private saving and investment difference turned to negative in 2006 and 2007.

In conclusion, the usage of abroad resources has increased in Turkish economy: while the usage of foreign borrowing has been switched to finance public deficits in earlier years but private deficit in recent years. That public saving gap has turned to surplus after 2005, and there has been a decline in the need of private savings to finance public saving gap caused a decrease in private saving rates. Private sector has changed investing its savings on treasury bonds, treasury bills, and on some other financial papers to on consumption and (physical) investment.

3. Turkish Oil (Usage) Outlook

Table 1 Different Indicators of Turkish Oil Usage

Years	The Share of in the World Oil Consumption (%)	(Total Export Coverage of Imported Oil) (%)	Total imported amount of Oil (1000 ton)	Share of Imported Oil in GDP (%)	Share of Imported Oil in Total Import (%)	Dependency Ratio (%) (Imported Oil Amount/Total Amount of Oil Needed)
1965	*0,35*	--	--	--	--	--
1970	*0,36*	*10,88*	*3.845*	--	--	--
1975	*0,49*	*57,32*	*(1974) 9.701*	--	--	--
1980	*0,50*	*132,51*	*12.053*	--	--	--
1985	*0,60*	*41,74*	*15.532*	*4,87*	*29,28*	*88,04*
1990	*0,74*	*27,05*	*20.062*	*2,30*	*15,72*	*84,37*
1995	*0,92*	*13,46*	*23.511*	*1,69*	*8,16*	*86,99*
2000	*0,93*	*15,12*	*21.671*	*2,09*	*7,71*	*88,74*
2005	*0,84*	*11,17*	*23.390*	*2,40*	*7,41*	*91,47*

Source: We prepared the table by benefiting from the figures in the tables on the pages of 52, 53, 59, 60, 65, 68, 70, and 71 in Kafkas (2007).

After the 1973 and 1979 oil crises, rather than using of its own domestic energy (or oil) resources, Turkey chose to be more dependent on imported energy (or oil). Kilic and Kaya (2007) and Yilmaz and Uslu (2007) and Demirtas (2001) note this change in Turkey's energy policy after the second half of the 1980's (see, Erdogdu (Nov. 2007)). Increasing dependency on imported oil price has affected the Turkish economy in both quantity and price of oil, which this section will briefly picture. Main reason behind this dependency could be insufficiency in domestic oil supply.

Table 1 tells this story of that Turkish economy is in need of oil import in different amount in different time periods. Turkey's share in the World Oil Consumption increases until 2000 and then due to the negative effects of 2001 crisis on the economy, it declines later. The rate of export coverage of imported oil states that while the income received from export did not far enough to meet the expenditure of imported goods in the 1980, the situation gets better for later years. On the other hand, starting from the trade liberalization period and following capital liberalization period, Turkey has been gradually used more imported oil including a decline during crisis period. While the share of imported amount of oil in total import has been declining in time, dependency ratio, which is the imported amount of oil to total amount of oil needed, has been increased since 1990. This means that the amount of oil relatively gets small share in the total import figures but this still is not enough to meet the needs of oil consumption. Thus, we get incrementally dependent foreign oil.

For the 1975-2005, Erdogdu (2007) concludes period that private sector fixed investment do explain the ratio of imports in total energy consumption[1]. Also it reaches that imported energy hurt national income (growth rate of GDP) but not industrial production (index). The time era of the following the financial account liberalization of Turkey since end-1990s, Alper and Torul (2008) indicate that negative response of real output to oil price increases have diminished since the early 2000s when they include their model global liquidity shock.

[1] According to EIA International Energy Annual 2006, oil makes 35 percent of the total Turkish energy consumption, while natural gas, coal, and hydroelectric and other renewables have respectively the share of 29 percent, 25 percent and 11 percent of it, in 2006.

4. Potential Determinants of Private Savings and Investment Gap

As we mentioned in the earlier section, many variables have potential effects on saving and investment. In addition, in the study of Ozcan et al. (2003), the major potential determinants of savings can be grouped in government policy variables, financial variables, income and growth variables, demographic variables, uncertainty measures, and external variables.[2] Shiimi and Kadhikawa (1999:8-9) mentions that a number of macroeconomic variables have been included in the saving and investment models: the rate of inflation, the standard deviation of inflation, the overall budget deficit as a ratio of GNP, government investment as a ratio of GDP, the standard deviation of the percentage changes in the real effective exchange rate, the stock of foreign debt as a ratio to exports, and broad money as a ratio of GDP.

Several studies have estimated the saving and investment function and have used national saving and investment figures while few focused on private savings and investment. However, it is great importance to determine factors that influence changes in private saving and investment. In this sense, the paper aims to outline the major potential determinants of savings and investment and thus, of saving and investment gap, which can be counted as a main contribution of the paper.

4.1 Oil Price

Benefiting from the feedback introduced earlier, changes in oil price create two transmission channels of oil price shocks: (i) supply side shock effect, and (ii) price shock effect. We expect that changes in oil price lead an effect in investment and therefore, production or supplied side. We also follow the similar root for savings which is that oil price changes creates inflationary effect in commodity prices and thus, effect on expenditure on consumption goods and in the end, on savings. Tang et al. (2009) puts in detail of these channels. Oil price shocks can, in the short-term, increase the marginal cost of production in many industries and thus reduce the production amount. Oil price shock will have long-term effect on output, which is carried out through Price/Monetary Transmission Mechanism (i.e., called Price Shock). Therefore, cost shock (supply side shock effect) in industries can be transmitted from producers and sectors to end-users

[2] For details see pp.6–12 of Ozcan et al. (2003).

(i.e., consumers via price shock effect). That can raise the overall cost for consumers and producers, thus reducing consumers' real balance. This transmission ends up with the reduction of consumption and the real output as well (Tang et al., 2009, p.6-7). When we stick to the transmission channels of the shocks, consumers are forced to decrease their consumed amount of goods and services due to less purchasing power of their real income, there is a probability of choosing more savings now to increase their consumption in the future. Supply shock effect has similar logic that oil price shock increases cost of production and amount of goods produced decreases and investment decreases as well. Brown and Yucel (2002) study has a parallel statement that classic supply-side effect of rising oil prices is indicative of the reduced availability of a basic input to production. Other channels of demand-side effect claims that oil price shock causes inflationary pressure and then monetary policy applies counter-inflationary policies, which aggravate losses in output (i.e., money is neutral). Of these channels, a classic supply-side effect best explains both slowing output growth and rising inflation.

4.2 Income and Wealth

There is a direct connection between saving and investment. In the Keynesian theory, saving is function of income. High incomes improve the per capita income of households to save more. Modigliani (1986) implies that faster growing countries should have a higher aggregate saving rate. However, while wealthier people save more, which makes up poorer people less saving, national saving consequently raises. Raising income is indication of business confidence, which in turn increase investment. There is indeed a 'vicious circle' going from higher economic growth to higher savings and to even higher growth (via higher investment ratio) (Ozcan et al., 2003: 1412).

4.3 Interest Rates[3]

The McKinnon Shaw model stipulates that in a repressed interest rates environment, the liberalization of interest rates will encourage saving and investment.

[3] Most of studies reach the result of the oil price shock has a smaller effect in inflation. More effect on it comes from variations in exchange rate, itself, and interest rate (see, Kibritcioglu and Kibritcioglu (1999), Alper and Ucer (1998), Isik (2003)). Thus, it is clearly expected that there should not exist any correlation between changes in oil prices and both interest rates used in the study.

Thus, the effects of rates of return on saving have unclear results: first, higher real interest rates on saving raises future income and wealth, thus raising current consumption level *(i.e., income effect);* thus, decrease in savings. Second, higher returns on savings are expected to encourage economic agent to increase saving because postponing the current consumption would imply larger future consumption out of current income *(i.e., substitution effect)* (Shiimi and Kadhikawa, 1999:11). If the substitution effect of the rise in interest rates on saving dominates the income effect, saving could increase and vice versa. Fry (1978 and 1980) suggests that higher real interest rates have positive effects on saving. However, Giovannini (1983 and 1985) found the effects of real interest rates on saving to be negligible (Shiimi and Kadhikawa, 1999:11). These studies analyzing developing countries case do not provide clarity on determinants of saving.[4] Nasir and Khalid (2004) also found that saving behavior in Pakistan was insensitive to the interest rate (p.678).[5]

5. Theoretical Background of the Relation between the Deficits

Theoretical model that will be tested by the empirical analysis in the study is constructed starting with a simple Keynesian open macroeconomic model. In the national income identity shown in Equation (1), the national income (Y) is accounted for by the sum of private consumption expenditures (C), private investment expenditures (I), government spending (G), and net exports (X-M). The first three items represents domestic expenditures (demand) while the net exports shows foreign (external) expenditures, which is also defined as external (or trade) balance of the economy.

$$Y = C + I + G + (X - M) \qquad (1)$$

National income (Gross National Product = GNP) can be rearranged in terms of current account (CA), national savings (S) and investment (I) in Equation (2), to yield

[4] For industrial countries, Koskela and Viren (1982) observed that savings increase as real rates of interest increase. In fact, Balassa (1992) argued that the effect of real interest rates on savings is positive for developing countries (see Ozcan et al. (2003:1413)).

[5] Insignificance of interest rate can be explained by as business is made after cost and benefit analysis, it might be the case that increasing interest rates are matched with parallel increase in returns therefore making it insignificant. Thirdly it could suggest some estimation methodology problems as well. Largely investment is insignificant to interest rate for the case of Pakistan.

$$CA = S - I \tag{2}$$

where aggregate savings are equal to the difference between national income (Y) and the total of private consumption and government expenditures (C+G). After breaking down the aggregate investment and savings into their public and private categories and incorporating government taxes (TX) and transfer payments (TR) current account balance (CA) can be re-written in terms of private and government (public) saving-investment balances as follows

$$CA = \left(S^P - I^P\right) + \left(S^G - I^G\right) \tag{3}$$

where $\left(S^P - I^P\right)$ is the private saving-investment balance and $\left(S^G - I^G\right)$ is public saving-investment balance.

Private savings for a given period, S_t^P, on the other hand positively depends on real *gross national disposable income* $GNDI_t$ and real interest rate on *deposits (savings)*, RDR_t, while negatively depend on *oil prices*, OIL_t. Gross national disposable income is calculated by subtracting taxes TX_t and adding transfers TR_t to the real income Y_t. This is shown as $GNDI_t = Y_t - TX_t + TR_t$. Therefore, the private savings equation will be shown as;

$$S_t^P = c + s_1 GNDI_t + s_2 OIL_t + s_3 RDR_t \tag{4}$$

Private investment spending for a given period, I_t^P, positively depends on *real* GDP_t, i.e., Y_t, and negatively depends on *real prime lending rate*, LR_t, and *oil prices*, OIL_t, as given in Equation (5).

$$I_t^P = a + i_1 Y_t + i_2 OIL_t + i_3 LR_t \tag{5}$$

In order to obtain the gap between private savings and investment as a difference between them, the Equation (5) is subtracted from the Equation (4) and rearranged as follows,

$$S_t^p - I_t^p = (c - a) + \left(s_1 - i_1\right) Y_t - s_1\left(TX_t - TR_t\right) + \left(s_2 - i_2\right) OIL_t + \left(s_3 - i_3(1-k)\right) RDR_t \tag{6}$$

The assumptions used here is the real prime lending rate, LR_t is determined by banks as an addition of some lump sum rate (or mark-up rate), $(1+k_t)$, to the deposit rate RDR_t. That is $LR_t = RDR_t(1+k)$[6]

The econometric model estimated in the study will therefore be

$$NPSR_t = \alpha + \beta_1 Y_t + \beta_2 OIL_t + \beta_3 RDR_t + \beta_4 NTR_t + u_t \qquad (7)$$

The dependent variable for the net private saving equation is $NPSR_t = S_t^P - I_t^P / GDP_t$, which represents the private saving rate scaled by GDP. The term, $\alpha = (c-a)$, is the constant term represents the difference between the autonomous private savings and private investment. The first slope coefficient $\beta_1 = (s_1 - i_1)$ is the difference between the sensitivity (or elasticity) of private savings to disposable income and the sensitivity (or elasticity) of private investment to real income. If this coefficient is positive and significant then the conclusion will be that income (changes or economic growth holding the others constant) is more pronounced for private saving rather than for investment. The second coefficient $\beta_2 = (s_2 - i_2)$ is the relative sensitivity of private savings and investment to oil price changes. A positive coefficient shows the private savings is more sensitive to oil price changes than private investment is, or vice versa. If the coefficient is zero the effect of oil price changes on both private savings and investment are considered same. $\beta_3 = (s_3 - i_3(1-k))$ is the difference between interest rate sensitivity to savings and the product of interest rate sensitivity of investment and (1-markup rate). In order to interpret β_3 coefficient, consider two extreme cases: (i) If mark up rate is 100% (i.e., *k=1*) net private saving rate will be determined only by sensitivity of savings to deposit rate (s_3), which is equal to β_3. (ii) If mark up rate is 0% (i.e., *k=0*) net private saving rate will be determined by difference between the sensitivity of savings to deposit rate (s_3) and the sensitivity of investment to lending rate (i_3), $\beta_3 = (s_3 - i_3)$, which is empirical question. In general, as *k* (mark up rate) increases, net private saving

[6] This kind of connection between the lending and deposits rate is required to emphasize the fact that lending rates follows deposits rates with some distance, and the necessity of describing the lending rates in terms of deposit rates is born because of unavailability of the Turkish lending rates data.

rate will be dominantly determined by sensitivity of savings to deposit rate, (s_3): Therefore, the volume of savings held by banks in deposit accounts will not lend to investors which finally yield net private saving turning to positive. The last slope coefficient $\beta_4 = s_1$ is shows the sensitivity of net private savings to net tax ratio, $NTR_t = (TX_t - TR_t)/GDP_t$ which is also the sensitivity of private savings to disposable income in Equation (4).

6. Data nd Empirical Study

The empirical analysis of the paper is for exploring the determinants of private savings-investment in which oil price is included as an alternative variable, given by Equation (7). Accordingly, the short and long term effects of these determinants on net private savings in Turkey will be test. Additionally the effect of oil price shocks to net private savings before and after the 2000-2001 Turkish Financial crisis will also be explored. The analysis is based on quarterly data for the period of 1990:Q1-2007:Q3. The series of Net Private Saving Rate (NPRS) and Net Tax Rate (NTR) are scaled with GDP, and all series are seasonally adjusted.[7] Percentage change in national income is measured as a natural logarithm of GDP (LNGDP). Real deposit (or saving) rate is calculated by deflating the annual average of 3-month nominal deposit rate with consumer price index. The price of crude oil imports of Turkey stands for oil price (OIL) and is also measured as a natural logarithm of OIL (LNOIL). The data used in this study is collected on quarterly basis from the Central Bank of Republic of Turkey electronic data delivery system (EVDS) (http://tcmbf40.tcmb.gov.tr/cbt.html). The other consolidated balance budget series, like taxes and transfers used in calculating private savings and disposable income, are taken from the Ministry of Finance.

[7] In obtaining the net private saving rate, private saving, is processed and calculated by subtracting private consumption expenditures and taxes from GDP and adding the (non-interest) transfer payments to the public while private investment is gross fixed capital investment made by private sector plus stock changes that represent output that has not been sold. Change (increase) in stocks represents the output produced but not sold. Since increase in stock requires the private savings (as a source of investment) that is also required for private investment, positive stock changes is considered as private investment spending.

For identifying the order of integration and structural changes, if any for each variable in Equation (7), augmented Dickey-Fuller (ADF) and Zivot and Andrews tests (ZA) are used and reported in Table 2. Unit root testing for the variables is also required to ensure that the variables are not I(2) stationary so as to avoid spurious regression. ZA test is, on the other hand helps us to find out the existence of unit root and structural breaks in series. Accordingly, the model could be extended by the dummy variables stands for the break date(s). The ADF results show that the series of the ratio of the Net private savings rate (NPSR), the log of GDP (LNGDP), the log of OIL (LNOIL), Real Deposit rate (RDR) and Net tax rate (NTR), are integrated with the order of I(1), I(1), I(1), I(0), I(1) respectively with the 1% significant level. However the ZA results, which additionally considers the structural breaks in both intercept and trend indicates that these series are with the order of I(1), I(1), I(1), I(0), I(0) respectively with the 1% significant level. ZA test results, which allow for break in both intercept and trend, also suggest adding a dummy variable into the model to account for the effects of 2000-2001 crises after 2001:Q1 on net private savings ratio.

Table 2: Unit Root Tests

	ADF test statistics (with intercept and trend)			**ZA test statistics (with intercept and trend)**		
Variables	**Level**	**First Dif.**	**Integration**	**t-value**	**t-critical**	**Integration**
NPSR	*-3.67 (0.03)***	*-5.67 (0.00)****	*I (1)*	*-4.96* [a]	*-4.82*	*I (1)*
LNGDP	*-2.55 (0.30)*	*-10.41 (0.00)****	*I (1)*	*-4.48* [aaa]	*-5.57*	*I (1)*
LNOIL	*-1.72 (0.72)*	*-7.46 (0.00)****	*I (1)*	*-4.83* [aaa]	*-5.57*	*I (1)*
RDR	*-6.37 (0.00)****	*-7.95 (0.00)****	*I (0)*	*-7.24* [aaa]	*-5.57*	*I (0)*
NTR	*-3.66 (0.03)***	*-10.58 (0.00)****	*I (1)*	*-6.17* [aaa]	*-5.57*	*I (0)*

*Notes: ***,**, and * shows the p-values at the 1%, 5%, and 10% significant levels, respectively.*

[aaa], [aa], and, [a] shows the t-values at the 1%, 5%, and 10% significant levels, respectively, according to the t-critical values (–5.57, -5.08 and –4.82) which are taken from Zivot and Andrews, (1992) for the model C, which allows both breaks in intercept and trend. If the estimated t-value reported in this Table is lower than the t-critical value given in Zivot ve Andrews (1992:254), the null hypothesis that there is a unit root for the relevant variable is rejected.

When the variables are integrated with mix of either order of I(0) or I(1), Engle and Granger (1987) and Johansen and Juselius (1990) cointegration tests requiring equal order of integration, are not applicable. Alternatively, in this situation, that is, when the regressors are mixed of integrated series or mutually cointegrated, in order to overcome this problem, ARDL bounds testing procedure for cointegration proposed by Pesaran et al. (2001) can be applied. ARDL model can also explore the different optimal lags of each variable in the model. Following Pesaran et al. (2001), the bound test procedure for checking the cointegration relationship between the variables in Equation (7) is conducted with the following ARDL model[8]:

$$\Delta NPSR_t = \alpha_0 + \sum_{i=1}^{p} \beta_i \Delta NPSR_{t-i} + \sum_{i=0}^{p} \sigma_i \Delta LNGDP_{t-i} + \sum_{i=0}^{p} \rho_i \Delta LNOIL_{t-i} + \sum_{i=0}^{p} \gamma_i \Delta RDR_{t-i} + \lambda_1 NPSR_{t-1} + \lambda_2 LNGDP_{t-1} + \lambda_3 OIL_{t-1} + \lambda_4 RDR_{t-1} + u_t \quad (8)$$

where Δ is the first difference operator and p is the optimal lag length. The coefficients of $\alpha, \beta, \sigma, \rho,$ and γ are the parameters that show the short run, whereas the λs show the long run dynamics of the model. The null hypothesis in the Equation (8) is $\lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = 0$ indicates that there is no cointegration among variables. Table 3 shows the F-statistic of cointegration relationships between the variables in Equation (7) as well as the Akaike's (AIC) and Schwarz's Bayesian (SBC) Information Criteria, and Lagrange multiplier (LM) statistics for testing no residual serial correlation against order 1 and 4. In determining the optimum lag length (p), the Equation (8) is estimated by Least Squares (LS)[9] starting from p=1 to the maximum order of lag, p=8.[10] After all, the bound test results are obtained and reported in Table 3. The results are found according to minimum AIC or SBC values that ensure there is no evidence of serial correlation, as indicated in Pesaran et al. (2001:311).

[8] A deterministic trend and intercept are also added in to the model. During computing the regressions, the lagged changes of the net tax ratio variable $\Delta NTR_{t-1}, \Delta NTR_{t-2}, ..., \Delta NTR_{t-8}$ and deterministic trend variable were insignificant in most regressions. Following to Pesaran et al. (2001:310), these variables are excluded from the model for the sake of parsimony and to avoid unnecessary over-parameterization.

[9] The estimations during the ARDL bound test process are run by E-views econometrics program.

[10] Since the study uses the quarterly data, number of maximum lag should have been taken 12 as Enders (1995) suggested. However, maximum lag is set as 8 and cannot be increased further given the relatively few number of observations.

Table 3: Selecting the Lag Order for the Bound Test

Number of Lags (p)	Model Selection Criteria		F-Statistics	Serial Correlation LM Test Statistics	
	AIC	SBC	Value	$\chi^2_{BGSC}(1)$	$\chi^2_{BGSC}(4)$
1	*-2.9284*	***-2.4751***	***4.2342***	*0.3785*	*0.3309*
2	*-2.9427*	*-2.3552*	*5.1140*	*0.0213*	*0.2019*
3	*-3.1399*	*-2.4159*	*2.7178*	*0.2355*	*0.0268*
4	*-3.1274*	*-2.2649*	*3.6407*	*0.0959*	*0.0632*
5	*-3.0344*	*-2.0309*	*2.0718*	*0.5729*	*0.1346*
6	***-3.2925***	*-2.1456*	***3.9720***	*0.1337*	*0.1806*
7	*-3.2918*	*-1.9991*	*4.7339*	*0.0336*	*0.0030*
8	*-3.4206*	*-1.9796*	*6.0720*	*0.0011*	*0.0000*

*Note: χ^2_{BGSC} is the p-values of the Breusch-Godfrey serial correlation LM statistics for testing no residual serial correlation against order 1 and 4 respectively. The symbols *, and ** denote significance at 0.05, 0.025 levels, respectively.*

The results indicate the optimal lag order selected by AIC and SBC are 6 and 1, respectively. The lags are selected by the minimum AIC and SBC with no serial correlation against order 1 and 4. At these lags, the minimum values of AIC and SBC, which are serially uncorrelated, are –3.2925 and –2.4751. The calculated F-statistics for the cointegration test, corresponding to the selected order of lags by AIC and SBC are 3.9720 and 4.2342. Since the model given in Equation (7) contains unrestricted intercept and no trend, the F-statistics are compared to the critical values given in Pesaran et al. (2001:300)[11]. The calculated F statistics (selected by AIC) are higher than the upper bound critical value (3.52) at the 0.10 significance while the calculated F statistics (selected by SBC) are higher than the upper bound critical value (4.01) at the 0.05 level of significance. These results indicate that the null hypothesis of no cointegration can be rejected at the 0.10 and 0.05 levels. Therefore, the results (especially suggest by SBC criteria) indicate that there is a cointegration relationship among the first four variables (including dependent variable) in Equation (8).

[11] The critical value belongs to the Table CI (iii), Case III: Unrestricted intercept and no trend) in Pesaran et al. (2001:300). The bound test was also replicated for restricted intercept and no trend, however the results were not changed significantly.

Once cointegration or long run relationships of the variables in the model of Equation (8) is established, ARDL model testing procedure continues with estimating the long run ARDL model given in Equation (9). The model includes two dummy variables in to the model to account for the effects of 2000-2001. The first dummy DUM1 is put according to the structural break in NPSR suggested by the ZA test and represents the period after the Turkish Financial crises. The second dummy (DUMLNOIL) is an interaction dummy, which is the product of natural logarithm of oil price and the value of 1 during and after the periods of 2001:Q1, to capture how much differentiation in the effect of oil price changes occurred between the periods of before and after the 2000-2001 Turkish financial crisis. Accordingly, the coefficient of LNOIL measures only the effect of oil price changes on NPRS before the mentioned crisis period.

$$NPSR_t = \alpha_1 + \sum_{i=1}^{p} \lambda_1 NPSR_{t-i} + \sum_{i=0}^{p_1} \lambda_2 LNGDP_{t-i} + \sum_{i=0}^{p_2} \lambda_3 LNOIL_{t-i} + \sum_{i=0}^{p_3} \lambda_4 RDR_{t-i}$$

$$+ \eta_1 DUM1 + \eta_2 DUMLNOIL + \upsilon_t \qquad (9)$$

Table 3: Long Run Model

Regressor	Coefficient	Standard Error	t-ratio	p-value
LNGDP	*-0.3958*	*0.1573*	*-2.5163*	*[0.015]*
LNOIL	*0.0895*	*0.0380*	*2.3532*	*[0.023]*
RDR	*0.2283*	*0.0559*	*4.0817*	*[0.000]*
INTERCEPT	*3.6161*	*1.4828*	*2.4388*	*[0.018]*
DUM1	*0.0550*	*0.0167*	*3.2868*	*[0.002]*
DUMLNOIL	*-0.0382*	*0.0113*	*-3.3560*	*[0.002]*
TREND	*0.0056*	*0.0017*	*3.1774*	*[0.003]*

The model is estimated by ordinary least squares by selecting the orders of the ARDL (p=**0**, p_1=**1**, p_2 =**0**, p_3 =**5**) model in the five variables according to SBC.[12] The estimated long run coefficients of the model given in Equation (9) are reported in Table 4.[13]

[12] The ARDL method searches across the $(p+1)^k = 8^4=4096$ number of regressions to obtain optimal number of lag for each variable, where p is the maximum number of lag (8 in this study) and k is the number of variables in the model in Equation (8).

Table 4 presents the long run results of the model. By the model given in Equation (9), the long run test statistics indicate that percentage change in real GDP has a positive and highly significant impact on the net private saving/GNP ratio (NPRS). This suggests, in the long run, for a 1 percent increase (decrease) in the real GDP, the net private savings rate, on average, decreases (increases) by about 0.39 percent. This negative correlation between them provides evidence that the growth rate in investment created by 1 percent increase in real GDP is more by 0.39 percent than the growth rate in savings created by 1 percent increase in real GDP, in the long run. This result is consistent with the fact of lower marginal propensity to save, which makes the effect of income changes on savings smaller, in developing countries. On the other hand, the effect of investment on income due to multiplier effect is greater than that of savings, which supports the Keynesian critics on saving and investment equality.

The estimated coefficient of real deposit rate (RDR), is found positive and significant, as the theoretical model of the paper expects, and also significant effect on net private savings rate. In the long run, for a 1 percent increase (decrease) in RDR, the net private savings rate, on average, increase (decreases) by about 0.22 percent. This positive correlation indicates evidence that the growth rate in investment created by 1 percent increase in RDR is more by 0.22 percent than the growth rate in savings created by 1 percent increase in RDR, in the long run. As mentioned earlier, RDR is used for a proxy for the determinant of savings and investment: i.e., it is a proxy for the rate of return of alternative to savings and since lending rate (for investors) follows the same path/trend with RDR with the inclusion of a markup rate, and is also proxy for lending rate. Therefore, an explanation for the significance of RDR on NPSR could be that time inconsistency between the *nominal* effects of the higher interest rates on the private saving as well as *reel effect* on the private investment spending saving. Moreover, investment instruments could depend on other variables: exchange rate, rate of return on different financial assets, and expectations in the sense of 'animal spirit'.

[13] The result are obtained from the estimated model selected by the SBC criteria by using maximum lag order of 8, but not that of AIC since the orders of ARDL (p, p_1, p_2, p_3) selected by AIC varied significantly depending on given maximum lag, and the results also failed to pass the diagnostic tests particularly serial autocorrelation and normality.

The main guestion to be answered in the model of the study is whether the impact of oil price shocks on NPRS exists and if so, how much differentiation in the effect of oil price changes occurred between the periods of before and after the 2000-2001 Turkish financial crisis. In order to answer this guestion, the coefficient of LNOIL and DUMLNOIL should be in interpreted together in a way of introducing of the dummy variable in the interactive, or multiplicative, form (D multiplied by X) enables us to differentiate between slope coefficients of oil price change (LNOIL) of the two periods. By using interaction dummy (DUMLNOIL) the differantiating of effect of oil price changes on net private saving rate (NPRS), the estimated coefficients of LNOIL and DUMLNOIL are significant while the effect of oil price shocks on net private saving rate has been smaller after the 2000-2001 crisis. According to the coefficients, depending on 1 percent increase (decrease) in the price of oil imported by Turkey, the net private savings rate, on average, increases (decreases) by about 0.089 percent before the 2000-2001 crisis. Since the theoretical (mathematical) coefficient is derived from the Equations (4) and (5), it is concluded that estimated coefficient, 0.089, indicates the sensitivity of savings to price of oil increases is 8.9 percent higher than the sensitivity of investment to price of oil increases in the long run, i.e., investment has lower sensitivity to price of oil increases than that of savings. However the magnitude of this effect has been reduced by 0.038 (by the coefficient of DUMLNOIL) after the 2000-2001 crisis. This means a 1 percent increase (decrease) in the price of oil imported by Turkey, the net private savings rate, on average, increases (decreases) by about 0.051 percent after the 2000-2001 crisis. Therefore, the effect of oil price shocks to net private saving rates in Turkey has been smaller after the crisis period. These empirical findings may be explained by stylized facts for Turkey as shown in the Table 1, Turkey has been oil-importing country for consumption and production purposes all over the period. This reflects incremental dependency for oil import. However, this dependency may vary whether the oil import has been used for production and consumption purposes. After the crises, Turkey experienced higher real interest rate to attract foreign short-term capital inflow along with globalization of capital in the world. Accordingly, Turkey financed its investment spending and thus, its growth by this short termed foreign capital and, hence intermediate and capital goods such oil. Therefore, it is plausibly presumed that the producers are

more oil dependent than consumers have been. By this reason, when oil price shocks emerge, since the price elasticity of oil demand for producers higher than that of consumers, consumers decreased their oil consumption more than that of producers. Finally, saving investment gap has reduced by 0.05 percent as a response of 1 percent increase in oil price after the 2001 Turkish financial crisis.

The dummy variable (DUM1), capturing the structural break in NPSR caused by unexplained reasons within the model and taking the value of 1 during the crises periods and after the periods of 2001:02 has also significant positive effect by 0.055 on NPSR in the long run, which implies, saving gap has been higher after the periods of 2001:Q1.

7. Conclusion

As a case study for Turkey, this paper has employed the ARDL approach to cointegration to examine determinants of net private saving ratio in light of oil price shocks and other determinants in the model. Contrary to earlier works, we used different approach to analyze to determine what factors would affect the net private saving rather than analyzing the determinants of savings and investment individually. In these studies, the determinants of savings and investment and their effects on the savings-investment gap cannot be identified jointly. This study's contribution is to fill the gap and the results found therefore, are important because the potential determinants of private savings and investment decision have also impact on the difference between them in favor of private savings.

The ARDL long run results indicate that net private saving gap is more explained by a negative relationship with reel gross domestic product, and a positive relationship with real deposit rate, and oil price changes. Negative relationship between net private saving gap and reel GDP is consistent with the Turkish experience, as discussed earlier, with the fact of lower marginal propensity to save in developing countries. The effect of investment on income due to multiplier effect is greater than that of savings, which supports the Keynesian critics on saving and investment equality. Positive correlation between net private saving rate and real deposit rates indicates the growth rate in

investment created by an increase in RDR is more than the growth rate in savings created increase in RDR, in the long run.

In the regard of the main contribution of the paper, the time varying impact of oil price shocks on NPRS is explored. Transmission channels of supply and demand shock effect ends up with the reduction of consumption [induced by the demand side shock effect] and the real output [induced by supply side shock effect] as well (Tang et al., 2009, p.6-7). When we follow the procedure of the transmission channels of the shocks, consumers are forced to decrease their consumed amount of goods and services due to less purchasing power of their real income, there is a probability of choosing more savings now to increase their consumption in the future. Supply shock effect has similar logic that oil price shock increases cost of production and amount of goods produced decreases and investment decreases as well. In conclusion regarding this relationship, oil price changes always increased private savings rates more than private investment whereas the net private saving gap has declined after 2001 Turkish financial crisis, which supports that the magnitude of these two effects may differ before and after the crisis. This differentiation before and after the crisis may have also potentially been due to the structural changes such as higher interest rates, excess amount of short-term capital inflows and necessity of using this kind finance for investors and economic growth.

References

[1] ALPER, C. E., TORUL, O. Oil Prices, Aggregate Economic Activity and Global Liquidity Conditions: Evidence from Turkey. *Economics Bulletin*. 2008, Vol. 17, No.4, pp.1-8.

[2] BROWN, S. P. A., YUCEL, M. K. Energy Prices and Aggregate Economic Activity: An Interpretative Survey. *The Quarterly Review of Economics and Finance*. 2002, Vol.42, pp.193-208.

[3] CENTRAL BANK OF REPUBLIC OF TURKEY. 74th Shareholders' Ordinary General Meeting of the Central Bank of the Republic of Turkey Opening Speech by Erdem Bascı on April 13, 2006. Access from: <http://www.tcmb.gov.tr/yeni/announce/2006/74_2006_ shareholders_ing.pdf>

[4] ENDERS, W. *Applied Econometric Time Series*, John Wiley & Sons, Inc., 1995.

[5] ENGLE, R. F., GRANGER, C. W.J. Cointegration and Error Correction: Representation, Estimation and Testing. *Econometrica*. 1987, Vol.55, pp. 251-276.

[6] ERDOGDU, O. S. The Effects of Energy Imports: The Case of Turkey. *Munich Personal RePec Archive, MPRA Paper No.5413)*. Nov. 2007. Access from: <http://mpra.ub.uni-muenchen.de/5413>.

[7] KAFKAS, S. M. Existing State of Crude Oil and Effect on Inflation: An Application on Turkey (in Turkish). Erciyes University Social Science Institute Graduate Thesis. July 2007.

[8] KEPENEK, Y., YENTURK, N. *Turkish Economy*, (in Turkish). Remzi Publication, 9th Edition. 1997.

[9] NASIR, S., KHALID, M. Saving-Investment Behavior in Pakistan: An Empirical Investment. *The Pakistan Development Review*. 2004, vol.43:4, Part II (Winter), pp.665-682.

[10] OSTRY, D. J., REINHART, C. M. Saving and Real Interest Rate in Developing Countries. *Finance and Development*. Dec. 1995, Vol. 32 No. 4, pp.16-18.

[11] OZCAN, K. M., GUNAY, A., ERTAC, S. Determinants of Private Saving Behavior in Turkey. *Applied Economics*. 2003, vol. 35, pp.1405-1416.

[12] OZCAN, K. M., VOYVODA, E., YELDAN, E. Dynamics of Macroeconomic Adjustment in a Globalized Developing Economy: Growth, Accumulation and Distribution, Turkey 1969-1999. *Canadian Journal of Development Studies*. 2001, Vol. 22, pp.219-253.

[13] PESARAN, M. H., PESARAN, B. *Working with Microfit 4.0: Interactive Econometric Analysis.* Oxford University Press. 1997.

[14] PESARAN, M. H., SHIN, Y., SMITH, R. J. 2001. Bounds Testing Approaches to the Analysis of Level Relationships. *Journal of Applied Econometrics. 2001,* Vol.16, pp.289-326.

[15] SHIIMI, W., KADHIKAWA, I., KADHIKAWA, G. Savings and Investment in Namibia. *Bank of Namibia Occasional Paper*. April 1999, No.2, pp.1-29.

[16] SENGONUL, A. Different Twin Deficits in Different Time Intervals: Evidence from Turkey. *Asian-African Journal of Economics and Econometrics*. 2008, Vol. 8, No. 1, 29–42.

[17] TANG, W., WU L., ZHANG, Z. X. Oil Price Shocks and Their Short- and Long-term Effects on the Chinese Economy. *(Munich Personal RePec Archive, MPRA Paper No.5413)*. Nov. 2007. Access from: <http://mpra.ub.uni-muenchen.de/14703>.

[18] TURKISH STRATEGIC RESEARCH INSTITUTE (TSRI). Main Problem of the Economy: Saving Gap, (in Turkish). Nov. 2006. Access from: <www.turksae.com/sql_file/310.doc>

[19] VERMA, R., WILSON, E. J. Savings, Investment, Foreign Inflows and Economics Growth of the Indian Economy 1950-2001. *University of Wollongong Economics Working Paper Series 2005, No. WP 05-23*, Oct. 2005, pp. 1-27.

[20] ZIVOT, E., ANDREWS, D. W. K. 1992. Further Evidence on the Great Crash the Oil Price Shock and the Unit-Root Hypothesis. *Journal of Business and Economic Statistics*. 1992, Vol.10, no.3: 251–270.