



## INVESTIGATING THE LINK BETWEEN SAVINGS, INFLATION AND ECONOMIC GROWTH: AN ARDL ANALYSIS FOR THE CASE OF TURKEY

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### Keywords

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### ABSTRACT

The aim of this study is to investigate the short and the long-run relationship between saving, inflation, and economic growth in Turkey for the period 2003:1 to 2012:2. Since the data has different integration orders (i.e. I(0) and I(1)), the approach of the Autoregressive Distributed Lag (ARDL) was utilized for the analysis. Results showed that saving, inflation and economic growth are cointegrated and either inflation or economic growth has positive impacts on the savings in the Turkish economy. However, no statistically significant relationship found between the inflation and savings in the short-run and, the interest rates and savings in the long-run. In addition, findings revealed that, among the variables and time period in consideration, economic growth is the variable having the most explanatory power on the savings in the Turkish economy.

## 1. INTRODUCTION

Today, many developing countries try to form economic policies toward how to reach the low inflation rates, manageable balance of payments deficits, and the high rates of saving and investments to provide the economic growth, If the mix of suitable policies toward these aims are not determined and applied, the developing countries become more inclined to the less developed. We can exemplify Poland and Mexico having high inflation, low saving rates, low productivity, high import dependency, and worsening balance of payments to this.

When the above scenario is considered, the uncertainty in financial market, high inflation, insufficient savings, and the low economic growth, and the high current deficit depending on all of these are among the most important problems for Turkish economy. Especially the increases and decreases in the saving rates have a little more importance from the point of the developing counties like Turkey, because the most important problem in the front of development is not able to provide the sufficient amount of saving accumulation. The saving level that is 23.4% of GDP in 1990s in Turkey rose to 27% in 2001, but fell to 12% in 2012, continually decreasing in the progressing years.

In Turkey, the phenomenon of disinflation is experienced in the recent years; the rapidity of increase in the salaries and wages is below the disinflation rate. This situation falls the purchasing power of households. While the decrease of real income reduces the individual savings, as a result of decrease in the savings, financing the investments becomes difficult. Therefore, studying the relationship between saving, inflation, and economic growth is quite important. While the economic literature on the relationship between the saving, inflation, and economic growth is considerably wide, empirical literature is highly limited.

The effect of inflation on the saving level is unclear in both theoretical and empirical level. While some of the empirical findings on the relationship of inflation and growth are in the direction that inflation has negligible effects on the growth (Chari et al., 1996), some (Berber and Altan, 2004; Saaed, 2007; Erbaykal and Okuyan, 2008) show that it made a positive effect on it (Dholakia, 1995; Mallik and Chowdhury, 2001). Theoretically, the effect of inflation on the growth is evaluated in the frame of the insufficiently use of resources and the changing investment decisions. On the other hand, empirical findings put forward that via overheating of economy, the growth causes to the high inflation. In addition, in a closed economy having the limited resources, the higher growth may lead to the low inflation. Thus, the relationship between growth and inflation occurs in two directions. The relationship between inflation and saving is extremely important for policy makers in understanding these complex exchanges.

As seen above, inflation, saving, and economic growth are interrelated variables. Thus, they can be simultaneously determined in the system. However, there are a few scientific study analyzing the variables of interest in an only system (Chaturvedi et al., 2008; Igbatayo and Agbada 2012 ) In order to design the policies the policy makers will apply to promote economic growth, it is important for them to know by which factors the saving rates are determined. According to the literature, this factor is inflation rate (Chopra, 1988; Chaturvedi et al., 2008; Igbatayo and Agbada 2012). Does macroeconomic stability reflected by inflation plays an important role in promoting the saving and growth rates? For the answer of this question, policy makers should understand very well the dynamics between the growth, saving, and inflation rates in the system.

In the studies carried out on Turkey, the non-linear relationships were not considered and the influencing channels of inflation the economic growth were ignored. In other words, the amount of saving was not considered as one of the influencing channels of inflation the growth. Thus, the number of the studies suggesting the interactions between saving, inflation, and economic growth is quite limited. Our study aims to eliminate the deficiency of interest even partially. In this context, in our study, using the data between the periods of 2003:1 and 2003:2, the relationships between saving, inflation, and economic growth were aimed to be analyzed by means of ARDL Boundary Test Approach.

## **2. LITERATURE SURVEY**

In the literature, while there are a number of study investigating the relationship between inflation -economic growth and between saving –economic, there are a few studies considering the triple relationship between these variables. In this study, the relationships between saving, inflation, and economic growth are considered specific to Turkey.

Mallik and Chowdhury (2001) tested the relationship between inflation and growth, utilizing the error correction model for four Asian countries (Bangladesh, India, Pakistan, and Sri Lanka). According to the findings obtained from the study, there is a positive relationship for four countries between inflation and growth and inflation is unavoidable for rapidly growing. In addition, there are important feedbacks between inflation and economic growth. These results are highly important for the suggestions of policy. Moderate inflation is helpful for the growth; however the rapid economic growth feeds back the inflation. Mallik and Chowdhury state this kind of economies being in balance on a knife-edge. As a result, that the economies realize a rapid growth without falling prey to the inflation are rather difficult.

Anoruo and Ahmad (2001) analyzed the relationship between saving rate and economic growth for Congo, Cote d'Ivoire, Ghana, Kenya, South Africa, and Zambia by means of VECM model and cointegration test. In the study, except for Nigeria, in all counties, it was identified that there was a cointegration between saving rate and economic growth. The results of causality test showed that economic growth was Granger cause of saving rates for Ghana, Kenya, Nigeria, and Zambia, in return to this, for Congo, that saving rate was Granger cause of economic growth. Finally, in Cote d'Ivoire and South Africa, there is a two directional causality between two variables.

Berber and Altan (2004) tested the relationship between inflation and economic growth for the period of 1987-2003 by means of Granger causality analysis. According to the findings obtained from the study, inflation affects the economic growth in the negative direction. That is, a 10 % of increase in the inflation rate reduces the economic growth in the rate of 1%. In addition, as a result of Granger causality analysis carried out, the relationship of one-directional causality was identified from inflation to economic growth.

Saaed (2007) analyzed the relationship of inflation and economic growth for Kuwait, using the data of GDP and CPI. The results point out that there was a potent and opposite directional relationship between GDP and CPI in Kuwait.

Erbaykal and Okuyan (2008) studied the relationship of inflation and economic growth for Turkey economy, using the data of the period of 1997 -2006. The long termed relationship between these two periods was tested by ARDL boundary test developed by Pesaran et al. (2001), while causality relationship by causality approach developed by Toda Yamamoto (1995). As a result of analyses carried out, in the period of interest, it was net with the existence of the relationship of both causality and cointegration in Turkey. According to the findings, in Turkey, while there is no causality relationship from the economic growth to inflation, there is a causality from inflation to the economic growth.

Ekinci and Gül (2007) analyzed the relationship between domestic savings and economic growth for Turkey by means of VECM model and cointegration test, using the data belonging to the period of 1960 -2004. According to the result of analysis, there is a long termed relationship between saving rate and economic growth. But, the results of Granger causality analysis, in contrast to the traditional view, shows that there is a one-directional causality in Turkey from economic growth to the domestic saving rates.

Mistzal (2011) analyzed the relationship between economic growth and saving by means of cointegration and causality tests in terms of 34 developed countries and 150 developing countries and transition economy. The results of analysis showed that there was a one directional relationship between economic growth and domestic savings in both developing countries and transition economies.

About the relationship between inflation, saving and economic growth forming the subject of this study, Chaturvedi et al. (2008) considered the relationship between economic growth, saving rate, and inflation for Southeast and South Asia, using the methods of panel data and least squares, in the frame of a concurrent equation. It was found that there was a two directional positive relationship between saving rate and growth. While the inflation had a negative effect on the growth, it makes a positive effect on the saving. While the inflation is not affected from current growth rate, it is determined by its past values and the saving rate also depends on the interest rate.

Igbatayo and Agbada (2012) studied the relationship between the relationship inflation, saving, and growths for Nigeria via VAR approach, using the data of the period of 1970 - 2010. In addition, in the study, method of least squares and Granger causality analysis were utilized. According to the results of analysis, while the inflation was in the tendency of reducing the growth, savings promote the growth. According to the results of Granger causality test, in the period considered, in Nigeria, a causality relationship was not identified between inflation and economic growth. On the other hand, there was a double directional relationship between saving rate and economic growth. According to the results of VAR analysis, economic growth reacts the changes in savings rather than the changes in inflation. As a result, in Nigeria, it is put forward that private savings can be used so that the growth performance of economy is increased.

Oktayer and Oktayer (2013) studied the relationship between government expenditure and economic growth in Turkey. The study tests the validity of Wagner's law by applying autoregressive distributed lag (ARDL) cointegration technique using annual data over 1950-2010 period. The test results of the five bivariate models examined regarding to Wagner's hypothesis indicates no long-run relationship between non-interest government expenditures and national income.

### **3. DATA ANALYSIS**

Globally, Inflation is one of the most important macroeconomic variables affecting both developed and developing countries. In an economy is a concept that draws the attention of the regulatory authorities due to results. In order to stabilize the prices of goods and services, encourage private savings for increasing investments is an initiative that enhances growth. In this context, monetary authorities implement inflation targeting policy. One of the main objectives of inflation targeting is to improve the country's international competitiveness in terms of GDP.

**Table-1: Changes in World Output, Prices and Savings (Percent) 2006-2012**

Countries	Output				Consumer Prices				Savings			
	2006	2008	2010	2012	2006	2008	2010	2012	2006	2008	2010	2012
U. States	2.65	-0.33	2.39	2.21	3.22	3.81	1.64	2.07	20.7	12.8	15.1	16.3
Japan	1.69	-1.04	4.65	1.99	0.24	1.37	-0.71	-0.03	25.2	25.9	23.5	21.8
Germany	3.89	0.80	4.02	0.86	1.78	2.75	1.15	2.13	23.3	25.6	23.7	24.7
France	2.46	-0.08	1.66	0.03	1.66	2.81	1.54	1.97	19.9	20.1	17.9	17.6
Italy	2.19	-1.15	1.72	-2.36	2.21	3.50	1.63	3.30	20.7	18.8	16.5	17.5
U.Kingdom	2.60	-0.96	1.79	0.16	2.30	3.62	3.33	2.84	15.7	15.8	12.3	10.9
Russia	8.15	5.24	4.50	3.40	9.67	14.10	6.85	5.06	34.5	35.0	26.1	26.5
China	12.67	9.63	10.44	7.80	1.46	5.90	3.32	2.65	47.8	52.0	52.2	51.0
Turkey	6.89	0.65	9.15	2.61	9.59	10.44	8.56	8.91	17.1	17.0	8.34	8.78

Source: World Economic Outlook Database, 2013

In the above table, changes in output, prices and savings are discussed on the basis of selected countries. GDP tends to decline on a global scale. The lowest savings rate also belongs to Turkey. Inflation rate has remained at very high levels in Turkey and Russia when looking at the table level. In many developing countries, high performance, strong domestic demand and with the implementation of a combination of fiscal and monetary policy in developed economies were studied deleting the effects of the global crisis in 2007. If we look at the specific case of Turkey, inflation rates are quite high due to growing based on domestic demand (consumption).

#### **4. DATA AND METHODOLOGY**

In this study, the relationship between saving, inflation, and economic growth is considered in terms of Turkish economy. In the analyses, quarterly data, drawn from Electronic Data Distribution System of Turkish Republic Central Bank on the period of 2003:1-2012:2, were utilized.

The ARDL model deals with single cointegration and is introduced originally by Pesaran and Shin (1999) and further extended by Pesaran et al. (2001). The ARDL approach has the advantage that it does not require all variables to be I(1) as the Johansen framework and it is still applicable if we have I(0) and I(1) variables in our set.

In the study, in presenting the relationships between inflation, saving, and economic growth, in the scope of ARDL boundary test, the analyses of stability and cointegration were referred to. An important advantage of ARDL boundary test is not to need to be pretested what the integration orders of series belonging to the variables are. However, for this approach to be able to give the healthy results, any series should not be I(2). In this direction, in order to be able to conduct a healthy analysis and to show whether or not the series is I(2), identifying that unit root exists has a great importance. For this

purpose, in the study, for testing the integration orders of series, in other words, whether or not they are stationary, unit root test of ADF and KPSS were utilized.

In order to test whether or not there is any cointegration relationship between the variables considered in the study, ARDL (boundary test) approach, developed by Pesaran et al. (2001), was used. In this direction, ARDL version of the relevant long-run model can be written as follows:

$$\Delta S_t = a_0 + \sum_{i=1}^p a_{1i} \Delta S_{t-i} + \sum_{i=0}^p a_{2i} \Delta G_{t-i} + \sum_{i=0}^p a_{3i} \Delta P_{t-i} + \sum_{i=0}^p a_{4i} \Delta R_{t-i} + \theta_1 S_{t-1} + \theta_2 G_{t-1} + \theta_3 P_{t-1} + \theta_4 R_{t-1} + u_t \quad (1)$$

In the above model, **S** represents saving rate, **G** the rate of economic growth, **P** inflation rate, and **R** interest rate. However,  $\Delta$  is a difference operator,  $p$  lag length, and  $u$  error term.

ARDL cointegration analysis consists of two parts. In this approach, firstly, null hypothesis that there is no cointegration relationship between the variables ( $H_0: \theta_1 = \theta_2 = \theta_3 = \theta_4 = 0$ ) is tested against alternative hypothesis that there is cointegration relationship between the variables ( $H_1: \theta_1 \neq 0, \theta_2 \neq 0, \theta_3 \neq 0, \theta_4 \neq 0$ ). Test operation is established on an F-statistics. Since asymptotic distribution of F-statistic of interest does not depend on whether the variables are I(0) or I(1), Pesaran et al. (2001) developed two set table of critical value encompassing all possible alternatives. One of these two tables of critical values, assuming that all variables are I(0), the other, that all of them is I(1), form a limit containing all possible classifications. If the calculated F-statistics remains below the limit value, then, accepting the null hypothesis, the conclusion that there is no cointegration is reached.

After the existence of cointegration relationship becomes definite, the prediction of error correction model (ECM) is preceded. Error correction model of interest can be formulated as follow.

$$\Delta S_t = \alpha + \sum_{i=1}^p \omega_k S_{t-i} + \sum_{i=0}^p \lambda_k G_{t-i} + \sum_{i=0}^p \delta_k P_{t-i} + \sum_{i=0}^p \beta_k R_{t-i} + \varpi EC_{t-1} + u_t \quad (2)$$

In the above equation,  $\varpi$  represents error correction coefficient, EC, error term, obtained from Equation (1).

Cointegration relationship predicted via ARDL approach does not have any output about at what measurement the relationship of interest is stable. Hence, following the cointegration analysis, it is necessary to test the stability of parameters being subject of the cointegration. For this purpose, in the study, the approaches of CUSUM and CUSUMSQ, developed by Brown et al. (1975), were utilized.

## 5. EMPIRICAL RESULTS

The results of stationary analysis of the series carried out in the scope of ARDL model are summarized by means of Table-1. Accordingly, any of the series is not I(2) and that

cointegration orders of series are different from each other. Hence, ARDL approach selected for cointegration analysis is a correct selection.

**Table- 2: Unit root test results**

	H <sub>0</sub> : Series contain unit root		H <sub>0</sub> : Series does not contain unit root	
	ADF		KPSS	
Variables	Constant	Constant – Trend	Constant	Constant – Trend
S	-2.603 (0.11)	-2.945 (0.16)	0.403	***0.097
G	-19.501 (0.00)	-19.499 (0.00)	0.243	*0.138
P	-1.241 (0.64)	-1.430 (0.83)	0.257	**0.182
R	5.159 (0.00)	-5.858 (0.00)	***0.779	0.089
ΔS	-12.149 (0.00)	-12.014 (0.00)	**0.500	***0.500
ΔG	-16.991 (0.00)	-16.717 (0.00)	0.146	*0.145
ΔP	-7.337 (0.00)	-7.164 (0.00)	0.164	0.104
ΔR	-6.631 (0.00)	-6.587 (0.00)	*0.370	**0.150

<sup>a</sup> While Δ is a first difference operator, the values in parentheses are probability values.

<sup>b</sup>\*\*\* significant at 1% level ; \*\* significant at 5 % level ; \* significant at 01% level

The results of cointegration analysis take place in Table-2 introduce that there is a cointegration relationship at the significant level of 1% between the variables concerning F-statistics calculated. All of short and long-run parameters predicted, in consistent with the theory, have a positive effect on the savings, but between inflation and saving rates and in the short-run and between interest rates and saving rates in long-run, any statistically significant relationship could not be found. In addition, findings show that the independent variable having the most determinative power on the savings was economic growth in both short and long-run. Finally, a result of diagnostic control and stability test, it was concluded that there is no statistical error related to model and that the parameters predicted are stable.

**Table- 3: Cointegration test results (Dependent variable: S)**

Panel A: Cointegration tests	
F-stat	6.66
Error Correction parameter	-0.802 (0.00)
Panel B: Long-run Coefficients	
G	1.032 (0.03)
P	0.004 (0.76)
R	0.335 (0.08)
Panel C: Short-run Coefficients	
G	0.570 (0.01)
P	0.013 (0.09)
R	0.269 (0.10)
Panel D: Diagnostic Checking	
Adjusted -R2	0.20
Serial Correlation <sup>a</sup>	9.783 (0.04)
Heteroscedasticity <sup>b</sup>	2.577 (0.10)
Functional Form <sup>c</sup>	2.950 (0.08)
Panel E: Stability Checking	
CUSUM	S
CUSUMQ	S

The critical values for F-stat was identified as (2.72-3.77), for the confidential range of 10%, as (3.23-4.35) for the confidential range of 5%, and as (4.29-5.61) for the confidential range of 1%. In obtaining the critical values, “CI(iii) Case III” Table was utilized in the study of Pesaran et al. (2001).

a: The Breusch–Godfrey LM test statistic for no serial correlation.

b: The White’s test statistic for homoscedasticity.

c: The Ramsey’s Reset test statistic for regression specification error.

The values in parentheses are probability values.

S represents a stabilized model.

## 5. CONCLUSION

In this study, the relationship of saving, inflation, and economic growth in the Turkish economy was examined covering the period of 2003:1-2012:2. In the model predicted, the variables, whose effects on the savings are gross domestic product and interest rate. The unit root tests conducted introduced that some of the variables in the model are I(0), and that some of them are I(1). Therefore, for the analysis of long-run relationship between the relevant variables, the approach of ARDL was used. As a result of the analysis carried out, it was proven that there was a cointegration relationship between saving, inflation rate, and economic growth in Turkey. In addition, according to the results of analysis, all



variables considered have a positive effect on the savings, but between the inflation and saving rates in short-run and interest rates and saving rates in the long-run, no statistically significant relationship found. Finally, the findings show that in both short and long-run, the variable having the most determinative power on the savings is economic growth.

Findings of the present study are consistent with the findings of existing literature (e.g. Chaturvedi et al., 2008; Igbayato and Agbada, 2012). First, in all studies examined, while inflation is in tendency of reducing the growth, savings promote the growth. Second, the variations in inflation do not sufficiently stimulate the savings. Finally, saving rate is not also affected from the interest. In this scope, the results obtained for Turkish economy are quite related to the developmental policies and strategies. As a result, in order to provide the accumulation of savings, it must be given weight to the policies fostering the rate of growth and reducing inflation.

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