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DETERMINANTS OF GROSS DOMESTIC SAVING AND ITS TREND ANALYSIS IN TURKEY: A TIME-SERIES OUTLOOK

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Abstract

Saving is an engine for the growth and prosperity of a nation by creating capital accumulation and financial investments through resource mobilization. Turkey appears in the set of countries that have relatively low domestic saving rates and relatively high current account deficits. This study examined the determinants of Gross Domestic Saving and its trend in Turkey, using time series data (annual) ranging from 1980-2018. Data were collected from the World Development Indicators (WDI) 2019 database, World Bank and Central Bank of Turkey annual reports. The macroeconomic variables used in the model were Gross Domestic Saving rate to GDP ratio (GDS), Inflation Rate (INF), Deposit Interest Rate (DIR), Broad Money Supply to GDP ratio (M2R), Age-Dependency Ratio (ADR), and Growth of Gross National Income Per Capita (GNIPCG). The study has used Auto-Regressive Distributed Lag (ARDL) model and appropriate diagnostic tests for model specification. The results of the study have shown that the first lag of Gross Domestic Saving, Inflation Rate, Age-Dependency Ratio, and Broad Money Supply to GDP ratio have positive effects, whereas Gross National Income Per Capita Growth and Deposit Interest Rate have negative effects on Gross Domestic Saving rate in Turkey. Only the first Lag of Gross Domestic Saving rate and Deposit Interest rate have statistically significant effects on Gross Domestic Saving in Turkey at a 5 percent level of significance. The rest of all variables have statistically insignificant effects. The overall findings of the study underlined the importance of adopting strict fiscal and monetary policies to regulate inflation and money supply with manageable levels to improve the Gross Domestic Saving rate in Turkey.

Keywords: *Turkey, Gross domestic saving rate, inflation rate, deposit interest rate, broad money supply, growth of national income per capita, age dependency ratio, Auto-Regressive Distributed Lag Model.*

1. Introduction

Domestic saving is the difference between the gross domestic product and final consumption expenditure. The sum of the saving by the public sector, the private corporate sector, and the household sector in a country is called gross domestic saving. Domestic saving plays a noteworthy role in the economic growth of a country. It is an important factor that finances investment, creates job opportunities, improves the level of productivity, and maintaining high growth rates through its effect on capital formation in a country (Khan, 2017).

Saving is one of the main elements in a macro-economy that contributes to the growth of a nation, improve social welfare, increase per capita income (PCI), etc. It is, hence, one of the basic determinants of prosperity, growth, and wealth of a nation. From the perspective of devoting resources to the production of capital goods in the context of developing countries, saving is necessary to fund investment. Saving is not only a form of relationship but also a basic source of investment financing. Therefore, it would be vital to look at the factors which affect the level of domestic saving and improve economic growth.

Classical economists emphasized saving as a determinant of growth and economic development. Growth in capital stock is functionally related to the portion of additional output, which is preserved and not consumed (Polshikov, 1981). This portion, which is saved subsequently, becomes available for investment or an increase in capital. Thus, there is a link between saving and growth. It is the growth in saving as a crucial factor in capital formation that eventually determines the direction and level of economic development.

According to C.V. Rijckeghem (2010), Turkey appears or belongs to the set of countries that have relatively low domestic saving rates and relatively high current account deficits. Turkish saving rate is also much less than the Asian-tigers saving rate. A low saving rate leads to a low investment amount, which in turn hinders the economic

growth of the country. So, to achieve a superior rate of economic growth for Turkey, it requires a historically unprecedented level of saving, either from domestic or foreign sources.

Even though the external source of investment financing has some disadvantages as it makes the country highly sensitive to external shocks, it is recommended when the domestic resources are not much enough to finance domestic investment requirements.

Turkey's investment has been financed from foreign savings in addition to funds from internal sources. This shows the financial gap of the country to finance its investment. Therefore, to avoid this financial gap, and to improve its economic growth rate, domestic saving should be the primary alternative to the economy. Because of these facts, deep scrutiny of the dynamics behind saving and the possible policy options has an indispensable role to increase the national savings rate in line with the need of the economy.

The purpose of this paper is to identify the major determinants of gross domestic saving rate in Turkey and to suggest potential policy options by using time series annual data ranging from 1980-2018 drawn from World Development Indicators 2019 database.

2. Literature

2.1. Theoretical Literature

2.1.1. The Concept and Definition of Saving

Saving is defined as the difference between income and consumption at a specific period of time. Keynes (1936) agrees with this definition (Mithani, 2000). He defined saving as an excess of income over expenditure on consumption.

The above definition works for both individual and community cases. Symbolically, it can be represented as follows:

$$S=Y-C \quad \ldots\ldots \quad (1)$$

Where;-

S − denotes individual/community-saving.

Y − stands for individual/community income, and

C − stands for individual/community consumption.

According to Keynes (1936), saving is the function of income, i.e., $S = f(Y)$. As income increases, saving also increases, and vice versa. Saving depends on the propensity to save which is a stable function of income in a short period. It follows that the consumption function (the propensity to consume), which can be derived from a propensity to save, would also be a stable function of income. However, saving is an increasing function of income. Thus, the marginal propensity to save ($\Delta S/\Delta Y$) is always greater than zero, but less than unity. Symbolically, $0 < \Delta S/\Delta Y < 1$ (Mithani, 2000).

2.1.2. Theories on the Virtue of Saving

Saving is one of the main sources of financing investment in the country. Saving with financial intermediaries facilitate the flow of funds to investors and make investment possible. There is circular causation among saving, investment, and growth. Hence, promoting investment can be a solution to the economic problems of developing countries (Lewis, 2000).

The virtue of saving is debatable among scholars. Classical economists, consumption theorists, and Keynesians have different thoughts about saving. While classical economists consider saving as an advantage of having a surplus, consumption theorists argue saving on the bases that saving will decrease consumption. Classical economists suggest that saving is a virtue and the act of saving is virtuous because individual savings will add up to national saving which is a source of investment. However, consumption theorists like G.A. Hopson and Albert Aftalion vehemently oppose the classical theory of saving. They argued that there is no virtue involved in the act of saving because an increase in aggregate saving would lead to growing under-consumption, which would cause an overall decrease in demand and ultimately lead to over-production, which in turn reduce price and profit of the firm, which make firms draw from investing and reduce national investment (Mithani, 2000).

On the other hand, Keynes in his book (1936) titled by the "General Theory of Money, Interest, and Employment" took a middle position between the classical and the proponents of the consumption theory. In his opinion, it was not so important whether an individual saves or not but what is more important was what use he made to his saving.

According to him, saving is a positive virtue but a public vice. Saving is a positive virtue since every individual induces to save owing to the instinctive fear of future uncertainty and insecurity and therefore as a precaution has saved to safeguard against future contingencies.
According to Keynes, when aggregate saving in a community increases through general reduction of consumption by the community as a whole, it leads to decrease in aggregate demand in consumer goods which in turn leads to a decrease in the price of consumption and capital goods, and then producers will decrease their investment in production.

2.1.3. Sources of Saving and Subjective Motives for Saving

There are three main sources for domestic saving in any country. These are:

i. Household saving: it is the difference between disposable personal income and consumption expenditure at an individual level.
ii. Firm or corporate saving: it refers to profits or gross income less dividends and business taxes.
iii. Government or public saving: it is the difference between public revenue and current expenditures.
iv. The total saving amount is the sum of private savings (which includes household and firms saving together) and public saving.

Individuals or households, firms, and government are induced to save more when there are strong subjective factors which motivate them to save. Individuals induced to save more when they want to build up a reserve for future uncertainties, to earn additional income from interests and then to smoothen up lifetime consumption, to build up power and self-confidence through capital accumulation, to have new business plans, and so on. Likewise, firms induced to save more when they want to purchase capital goods, to solve liquidity problems, to invest in different financial markets, etc. The government used saving as an instrument to narrow the gap between government expenditure and revenue, to reduce higher import rates, to stabilize price and financial markets, and so on (Mithani, 2000).

2.1.4. Trends of Gross Domestic Saving in Turkey

Economic growth is largely related to the rate of investment which in turn related to saving. It is therefore important to pay close attention to this phenomenon if a country wants to achieve rapid economic growth.
Turkey has a low national saving rate compared to countries with similar levels of income and it has been declining since 1988. From 1988 to 2002, the private saving rate displayed a stable path while the public saving rate exhibited a trend decline that results in a declining national saving rate. However, these patterns changed radically after 2002. Public saving rates marked a considerable increase due to the fiscal austerity measures, whereas private saving rates showed a striking decline, rendering a quite low national saving rate by international standards (E.P. Matur et.al, 2012). When it is compared with other equally performing countries, as Rijckeghem (2010); Turkey's national saving rate is much lower than its Asian tiger counterparts. However, it is comparable to that of Central and Eastern Europe and it is not much lower than that in the EU. Turkey's saving rate is similar to that in Eastern European countries, which have also experienced "credit booms" during the last two decades.
According to IMF (2005), unadjusted private saving has been roughly stable at around 20% of GDP for emerging markets excluding China, East Asia, and oil producers. Turkey's private saving rate was almost similar in comparison to this set of countries until 2002: saving unadjusted for inflation lay somewhat above comparator countries while saving adjusted for inflation lay somewhat below. From 2002 onwards, however, Turkish private savings declines dramatically. The rapid decline in national saving rates and the fact that the decline in the recent period was primarily driven by the private sector causes concerns about the sustainability of growth in Turkey. This is also reflected in the increasing current account deficit. Moreover, the dependence on large foreign capital inflow as a major source of investment and growth makes the economy fragile to sudden stops or huge capital outflow. The memories of past crises driven by internal or external factors, such as the 1994 crisis, the 2001 crisis, and finally the 2008-2009 global financial crisis aggravates these concerns.

2.1.5. Determinants of gross domestic saving

Economic and demographic factors like income growth, age-dependency ratio, inflation rate, interest rate, and money supply are major determinants of domestic saving (Mithani, 2000; Abu, 2005; Mahmoud, 2008; Kidane, 2010; and Kıvanç, 2015). According to the Life Cycle Hypothesis (LCH), expectations of individuals about lifetime income matters the amount of their consumption and saving ratio in a certain period. The theory classified the individuals' lifetime into working and retirement periods. Individuals are assumed to produce more than their consumption during their working period. So, they are net savers during this period. In the retirement period, individuals are assumed to be dis-savers. In this context, saving performance may have a positive relationship with income growth.

LCH clearly stated that demographic factors like age-dependency ratio and population growth influence the saving performance of a country. The theory implies that the net effect of population growth is theoretically unclear. The reason is that even if an increase in population growth increases the number of productive workers (net savers), it may be offset by an increase in the young age-dependency ratio (Mahmoud, 2008). So, the net effect of population growth on gross domestic saving depends on the dominant factor of the two (i.e. amount of saving increased due to new productive workers versus the amount of saving decreased due to an increase in the young age-dependency ratio). The LCH implies that the real effect of inflation on saving performance is almost negligible because of a lack of money illusion. However, individuals who worried about their future will increase their savings while the inflation rate goes up. On the other hand, individuals increase their savings rate with the rate of inflation in order to preserve the value of their wealth which will be diminished over time (Mahmoud, 2008).

The degree of financial sector development influences the willingness and amount of individuals' saving. People in many countries having good accessibility of bank facilities are motivated to save more since the cost to bank transactions are too low. If access to banking service is not enough, people prefer to capture their savings in non-monetary terms like jewelry and real-estate.

2.2. Empirical Literature

Kıvanç (2015) examined the determinants of saving in thirteen Middle East countries for the period 2000-2013 using the panel data method. Results showed that income, money supply, and government expenditures had a negative impact on saving rate whereas the young population and inflation influences saving positively. Old population, urban and rural populations had no significant effect on saving. Loayza et al. (2000) analyzed the driving factors of private saving across the world by using a large, cross-country, time-series data set. In this study, instrumental-variable techniques were used to correct for endogeneity and heterogeneity. The results showed that the growth of real per capita income, inflation, and fiscal policy had positive impact on saving, whereas dependency ratio and financial liberalization had a negative effect on saving in the long-run. Abu (2005) examined the determinants of gross domestic saving in Ethiopia for the period 1960 - 2002 by using a Vector Auto Regression (VAR) method of estimation technique. The results showed that the growth rate of income per capita, investment rate, inflation rate, and real interest rate had a positive effect on gross domestic saving rate whereas, public consumption, import intensity, openness, and term of trade had a negative effect on it.

Agrawal et al. (2007) examined the saving behavior in South Asia by taking five countries; India, Pakistan, Bangladesh, Sri Lanka, and Nepal by using co-integration, error correction, and dynamic OLS model for the period 1960 - 2004. The result showed that per capita income, access to banking institutions and interest rate had a positive effect on saving while dependency ratio and foreign saving rate had a negative impact on the domestic saving rate.

Mahmoud (2008) analyzed the determinants of domestic saving in Egypt for the period 1975-2006 by using the OLS regression model. The study showed that growth of per capita income, money supply (M2/GNP), inflation, and real interest rate had positive effects on saving, whereas budget deficit ratio and current account deficit had negative effects on domestic saving.

3. The Methodology of the Study

3.1. Data Type and Data Sources

This study employed annual data ranging from 1980 – 2018. The data set comprises Inflation rate (INF), Deposit interest rate (DIR), Gross national income per capita growth (GNIPCG), Broad money supply to GDP ratio (M2R), Age-dependency ratio (ADR), and Gross domestic saving rate to GDP ratio (GDS). The data was drawn from the

World Development Indicator 2019 database, Central Bank of Turkey (TMB) annual report, and World Bank annual reports.

3.2. Methods of Data Analysis

Different econometrics and statistical tools were employed for data analysis. These include diagnostic and model stability tests, descriptive statistics, correlations, unit root tests, co-integration tests, and Auto-Regressive Distributed Lag models were employed.

3.3.Model Specification

In this study, the Auto Regressive Distributed Lag (ARDL) model was used to analyze the major determinants of gross domestic saving in Turkey. As many economic theories and previous studies on saving clearly described that domestic saving has a fundamental functional relationship with many macroeconomic variables including, inflation rate, deposit interest rate, age dependency ratio, broad money supply, GNI per capita growth rate, GDP, population growth, and so on (Girma, 2017). Therefore, the functional relationship between domestic saving and its determinants can be expressed as follows:

$$GDS = f(INF, DIR, ADR, M2R, GNIPCG, U) \ldots\ldots (2)$$

Based on this functional relationship, the following specific econometric model was generated:

$$GDS_t = \beta_0 + \beta_1 INF_t + \beta_2 DIR_t + \beta_3 M2R_t + \beta_4 ADR_t + \beta_5 GNIPCG_t + U_t \ldots\ldots (3)$$

where:-

- GDS, INF, DIR, M2R, ADR, and GNIPCG refer Gross domestic saving to GDP ratio, Inflation rate, Deposit interest rate, Broad money supply to GDP ratio, Age dependency ratio, and Gross national income per capita growth rate respectively.
- β0 − is an intercept function that shows a change of GDS when there is not an independent variable.
- β1 to β5 − refers to slope coefficients.
- U − refers to the error term which holds variables that affect GDS but not included under the model.
- t − refers to the time period.

3.4.Auto-Regressive Distributed lag (ARDL) Model

Auto-Regressive Distributed Lag (ARDL) model is the one that contains both lagged values of the dependent and independent variables (R.C Hill et al, 2008). Using the ARDL model for time series data analyses has a number of advantages in which others might not have. Firstly, the ARDL model doesn't need the same order of integration for variables in the model. The variables in the model can have a different order of integration but should be less than I (2). Secondly, for small and finite sample data size, the ARDL model is relatively efficient than other models and can yield unbiased estimates of the long-run model. Thirdly, it is possible to have different lag lengths for variables while using the ARDL model (T. Nigusse et al, 2019). In its general form, the ARDL (p, q) model can be written as follows:

$$Y_t = \alpha + \alpha_0 X_t + \alpha_1 X_{t-1} + \alpha_2 X_{t-2} + \cdots + \alpha_q X_{t-q} + \beta_1 Y_{t-1} + \beta_2 Y_{t-2} + \cdots + \beta_p Y_{t-p} + U_t \ldots\ldots (4)$$

where:- Y and X − refers to the dependent and independent variables respectively, p and q − refers to the maximum lag length of the dependent and independent variables respectively, α − refers the intercept term, α1 to αq and β1 to βp − refers to coefficients, U − refers to the error term, and t − is the time period.

3.5.Unit Root Test for Stationarity

All the macroeconomic variables used for the empirical analysis of this study are time series. However, the problem of non-stationary is the main challenge in the practice of econometric analysis. In regressing of a time series variable on another time series variable, a very high R2, significant t-values and F-statistics can be obtained although there is

no meaningful relationship between the variables. This problem is referred to as spurious regression (Gujarati, 1995). The problem arises because if both the time series involved exhibit strong trends (sustained upward and downward movement). The high R2 observed is due to the presence of the trend, not a true relationship between the variables. Therefore, it is very important to find out if the relationship between economic variables is true or spurious. This is done by first identifying stationary and non-stationary variables. A time-series variable is said to be stationary if its mean and variance are constant over time and the value of covariance between the two time periods depends on distance or lag. If the mean, variance, and auto-covariance of the individual time series are not time-invariant, these time series are not stationary. Stationary variables contain deterministic (fixed) trends, while non-stationary variables contain stochastic (i.e. random) trend (Harris, 1995). However, using ARDL models for econometric analyses can accommodate those problems arising from unit root variables even though performing the test is mandatory to ascertain that no variable is integrated of order 2. In this study, the Augmented Dickey-fuller test, which becomes popular over the past several years were applied to identify whether the variables are stationary at the level and/or at first difference. Augmented Dickey-fuller test designed with three different options to take account of the intercept term. It can be applied without constant term and trend, with constant but no trend, or with constant and trend. The suitable ADF test has been selected based on the behaviour of variables found in the model.

3.6.Co-integration Test

The Co-integration test is applied to examine whether there is a long-run equilibrium relationship among variables. If there is co-integration, both dependent and independent variables follow a similar stochastic trend and do not go in different directions. For this study, the ARDL bounds test for co-integration is applied to examine whether there is a long-run relationship among variables. The null hypothesis of this test is that there is no long-run relationship among variables, and the alternative is that there is a long-run relationship among variables. If there is co-integration among variables, the conditional ARDL long-run model can be estimated as follows:

$$\Delta GDS_t = \alpha + \sum_{i=1}^{p} \beta_{1i}\, \Delta GDS_{t-i} + \sum_{i=0}^{q1} \alpha_{0i}\, \Delta INF_{t-i} + \sum_{i=0}^{q2} \alpha_{1i}\, \Delta DIR_{t-i} + \sum_{i=0}^{q3} \alpha_{2i}\, \Delta ADR_{t-i} + \sum_{i=0}^{q4} \alpha_{3i}\, \Delta GNIPCG_{t-i} + \sum_{i=0}^{q5} \alpha_{4i}\, \Delta M2R_{t-i} + e_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

where: α − refers a constant term; $\beta 1$ and p − refers the coefficient and lag length of dependent variable GDS respectively; $\alpha 0$, $\alpha 1$, $\alpha 2$, $\alpha 3$, and $\alpha 4$ − are coefficients and q1, q2, q3, q4 and q5 are lag lengths for independent variables INF, DIR, ADR, GNIPCG and M2R respectively; Δ − refers first difference operator.

3.7.Error Correction Mechanism

J.D. Sargan was the first economist who had used the Error Correction Mechanism (ECM) for correction of disequilibrium. This method of correction was later popularized by Engle and Granger. It is a method of making short-run behavior of a variable consistent with its long-run behavior. The Granger representation theorem states that if two variables are said to be co-integrated, their relationship can be expressed by ECM. If there is a long-run relationship among variables, the error correction model representation can be specified as follows:

$$\Delta GDS_t = \alpha + \sum_{i=1}^{p} \beta_{1i}\, \Delta GDS_{t-i} + \sum_{i=1}^{q1} \alpha_{0i}\, \Delta INF_{t-i} + \sum_{i=1}^{q2} \alpha_{1i}\, \Delta DIR_{t-i} + \sum_{i=1}^{q3} \alpha_{2i}\, \Delta ADR_{t-i} + \sum_{i=1}^{q4} \alpha_{3i}\, \Delta GNIPCG_{t-i} + \sum_{i=1}^{q5} \alpha_{4i}\, \Delta M2R_{t-i} + \theta ECM_{t-1} + e_t \quad \ldots\ldots\ldots\ldots (6)$$

Where: α…refers a constant term; β1 and p…refers the coefficient and lag length of dependent variable GDS respectively; α0, α1, α2, α3, and α4…are coefficients and q1, q2, q3, q4 and q5 are lag lengths for independent variables INF, DIR, ADR, GNIPCG and M2R respectively; Δ…refers first difference operator; θ…refers the speed of adjustment; ECM…refers the error correction term; and et…refers the error term.

4. Results and Discussion

4.1.Results from Unit Root Test

As discussed in the previous section, the ADF test was applied to ascertain that no variable(s) in the model are integrated at order 2. Table 4.1 below shows that three variables namely, Gross domestic saving to GDP ratio (GDS), Inflation rate (INF), and Deposit interest rate (DIR) are non-stationary at level forms, but they are stationary at the first difference (i.e. I (1)). Whereas, variables like the Age-dependency ratio, Broad money supply to GDP ratio (M2R), and GNI per capita growth rate are stationary at level (i.e. I (0))

Table 4.1 Results of unit root test based on ADF test statistics

Variables	ADF result at level		ADF result at first difference	
	With constant	With constant and trend	With constant	With constant and trend
INF	-2.418 (-2.964)	-2.736 (-3.548)	-7.865** (-2.966)	-7.740** (-3.552)
DIR	-1.719 (-2.964)	-2.822 (-3.548)	-7.585** (-2.966)	-7.747** (-3.552)
ADR	-11.199** (-2.964)	1.928 (-3.548)	-0.392 (-2.966)	-4.270** (-3.552)
M2R	-1.232 (-2.964)	-3.846** (-3.548)	-8.691** (-2.966)	-8.566** (-3.552)
GNIPCG	-6.734** (-2.964)	-7.181** (-3.548)	-11.702** (-2.966)	-11.527** (-3.552)
GDS	-2.003 (-2.966)	-1.692 (-3.552)	-5.515** (-2.969)	-5.742** (-3.556)
Residuals	-4.425** (-2.964)	-4.366** (-3.548)		

Note:- (**) denotes 5% level of significance, and values in the parenthesis are tabulated values at 5% level of significance.

The above ADF test result confirms that none of the variables are integrated of order 2. In other words, some of the variables are integrated at order 1 (i.e. stationary at level), while some others are integrated at first difference (i.e. non-stationary at level but stationary at first difference). Since the variables are integrated at different levels and the study has small sample size, Auto Regressive Distributed Lag (ARDL) model is more appropriate for the analysis of long-run relationships among variables.

4.2. ARDL Bounds Test for Co-Integration

There are different methods for the selection of optimal lag length for variables in the model. Akaike information criterion (AIC) and Bayesian information criterion (BIC) are the most common methods for optimal lag length selections by many researchers. Selecting too large lag length may affect the power of the test, while selecting too small lag length may offer remaining residuals to serially correlated and then yield biased results. However, the BIC tends to select more parsimonious specifications (Pesaran and Smith, 1998) as cited in Ayalew (2013). So, based on the BIC, a maximum lag of 1 is selected for this study. F-statistics was used for hypothesis testing. As stated above, the null hypothesis of the ARDL bounds test for co-integration is that there is no long-run relationship among variables, and the alternative is that there is a long-run relationship among variables. If the calculated F-statistics is greater than the upper bound critical value at a 5% level of significance (i.e. in our case, 3.79), we can reject the null hypothesis of no long-run relationship among variables, which implies that there is co-integration among variables. If the calculated F-statistics is lower than the lower bound critical value at a 5% level of significant (i.e. in our case, 2.62), we couldn't reject the null, which implies that there are no long-run relationships among variables. If the calculated F-statistics is between the lower and upper bound critical values at a 5% level of significance, the test result is considered inconclusive. As we can see below in table 4.2, the calculated F-statistics is fall below the lower bound critical value at a 5% level of significance. This result implies that there is no long-run relationship (no co-integration) among variables.

Table 4.2 ARDL Bounds Test Result

F-statistics	Critical values	Lower bound	Upper bound	Decision
2.167	1%	3.41	4.68	No co-integration
	5%	2.62	3.79	No co-integration
	10%	2.26	3.35	No co-integration

When we failed to reject the null hypothesis in ARDL bounds test for co-integration at 5% level of significant, i.e. when there is no long-run relationship among variables, we couldn't estimate ECM model and our estimation should focus only on short-run model, which is the ARDL model.

4.3. Model Stability and Diagnostic Tests

Before doing any analysis, it is important to verify the efficiency of the model using some diagnostic tests. The main problem in time series data is the problem of autocorrelation. Breusch-Godfrey LM test and Durbin-Watson d statistics method of autocorrelation tests were used for this study. As shown below from the STATA result, there is no any evidence to reject the null, which states that there is no serial correlation since the value of Durbin-Watson d statistics is approximately 2, and this result is supported by the Breusch-Godfrey LM test in which the p-value associated with the test is greater than the critical value of the standard 5% level of significant (i.e. 0.0509 > 0.05).

```
. dwstat

Durbin-Watson d-statistic(  7,    38) =  1.900311
```

```
. bgodfrey

Breusch-Godfrey LM test for autocorrelation
```

lags(*p*)	chi2	df	Prob > chi2
1	3.811	1	0.0509

H0: no serial correlation

Ramsey's RESET test was used for test of model specification error (i.e. test of model functional form). The result of the test revealed that the null hypothesis, which states that the model has no omitted variable, couldn't be rejected (i.e. 0.0544 > 0.05).

```
. ovtest

Ramsey RESET test using powers of the fitted values of GDS
       Ho:  model has no omitted variables
                  F(3, 30) =      3.03
```

For test of hetroscedasticity, both the Breusch-Pagan/Cook-Weisberg test and white test were applied. The result of those tests showed that the null hypothesis, which states that there is a constant variance, couldn't be rejected (i.e. 0.1133 > 0.05). This result confirms that there is no hetroscedasticity problem in the model.

```
. hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of GDS

         chi2(1)      =     2.51
         Prob > chi2  =   0.1133
```

```
. imtest, white

White's test for Ho: homoskedasticity
         against Ha: unrestricted heteroskedasticity

         chi2(20)     =     18.28
         Prob > chi2  =    0.5688

Cameron & Trivedi's decomposition of IM-test
```

Source	chi2	df	p
Heteroskedasticity	18.28	20	0.5688
Skewness	5.75	5	0.3308
Kurtosis	2.08	1	0.1491
Total	26.12	26	0.4566

Cumulative Sum of recursive residuals (CUSUM) test and Cumulative Sum of Squares of recursive residuals (CUSUMSQ) tests were applied to check the stability of the model. If the CUSUM as well as the CUSUMSQ line crosses the upper and/or lower critical limits and never returns back, the null hypothesis which states that there is model stability, should be rejected. But if the line goes between the critical limits, we may fail to reject the null.

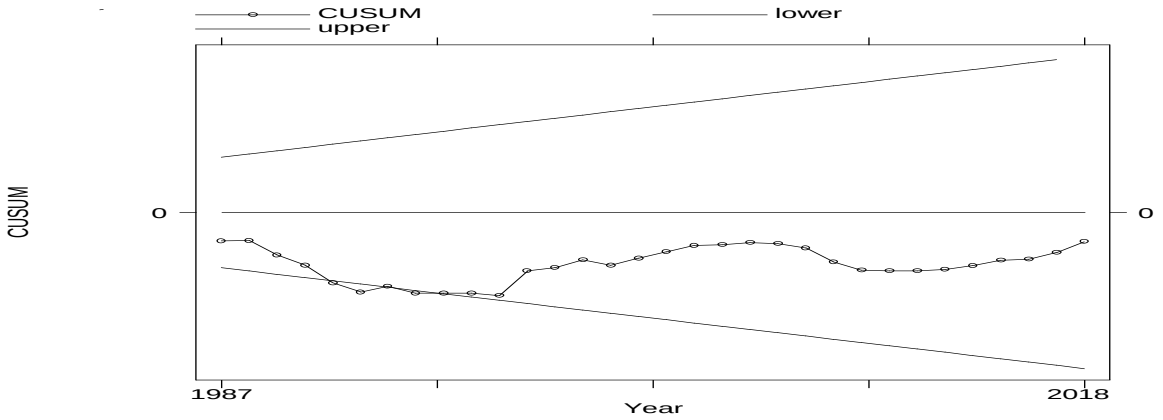

Fig. 1. Cumulative Sum of recursive residuals (CUSUM)

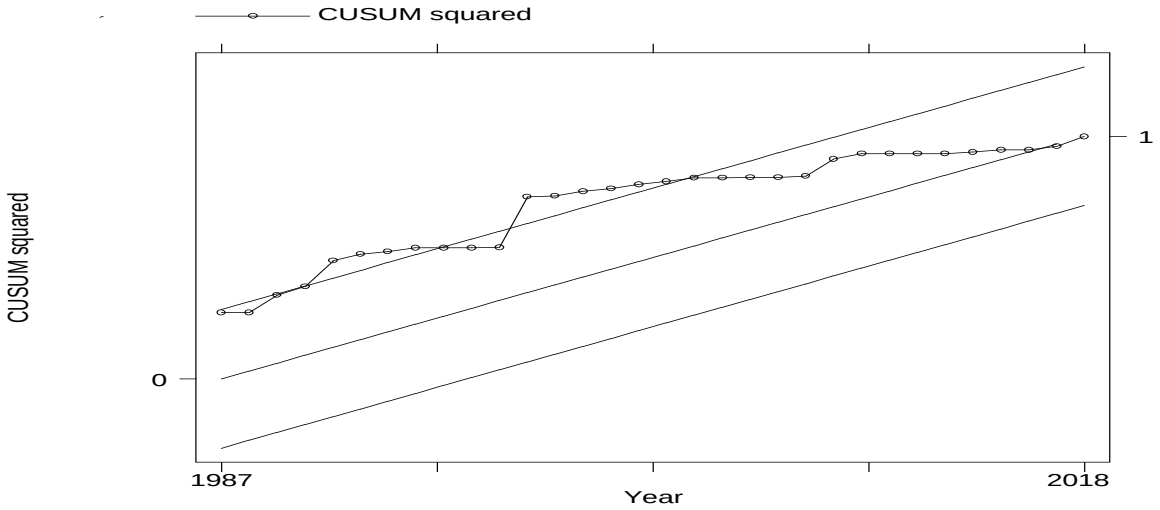

Fig.2. Cumulative Sum of Squares of recursive residuals (CUSUMSQ)

As shown from the above graphs, the CUSUM line comfortably lies between the upper and lower critical limits. Likewise, the CUSUMSQ line finally goes between the two critical limits, which generally imply stability of the model and absence of structural breaks.

4.4. ARDL model estimation

After verifying the absence of long-run relationships among variables in the model, the upcoming step is running the appropriate ARDL model to find out the short-run coefficients which are reported as follows:

Table 4.3 Short-run coefficients of the ARDL model

Variables	Coefficients	Standard err.	T-statistics	Prob.
GDS(-1)	0.419	0.190	2.21	0.035**
INF	0.055	0.037	1.50	0.145**
DIR	-0.113	0.053	-2.13	0.041
ADR	0.319	0.176	1.81	0.079**
GNIPCG	-0.037	0.135	-0.27	0.786
M2R	0.177	0.139	1.27	0.213
-Cons.	-9.183	14.212	-0.65	0.523

F (7, 30) = 8.23 R-squared = 0.6143
Prob > F = 0.0000 Adj. R-squared = 0.5397

The goodness of fit of the model is measured by the coefficient of determination (R-squared). The regression result above showed that the coefficient of determination is 0.6143 which implies that about 61.43% of the variation in gross domestic saving is explained by the explanatory variables incorporated in the model. The F-statistics result (i.e. 8.23) and the corresponding P-value (i.e. 0.0000) confirms the overall significance of the model.

As shown above, the first lag of GDS has a positive and statistically significant effect on gross domestic savings in the short run. A unit increase in the first lag of GDS is associated with a 0.419 unit increase in GDS on average, ceteris paribus at a 5% level of significance. It is observed that the inflation rate, measured as a consumer price index, as a proxy of macroeconomic instability, has a positive but statistically insignificant effect on GDS in the short-run. Regardless of its statistical significance, this result supports the argument of precautionary motive which suggests that increased macroeconomic instability induces people to save a large portion of their incomes. The result is consistent with the findings of Ayalew (2013), and Kıvanç (2015). The coefficients of gross national income per capita growth are negative and its effect on gross domestic saving is statistically insignificant at a 5% level of significance in the short-run. This result is not consistent with many economic theories. However, Kıvanç (2015) suggested, income growth can have a negative impact on saving if there is disequilibrium in income distribution.

The Age-dependency ratio which is the ratio of total persons under age 15 plus persons aged 65 and above to the labor force (ages 15-64) has a positive and statistically insignificant effect on gross domestic saving at a 5% level of significance. This result is also not consistent with expectations.

Another striking result that emerged from this analysis is that the negative and statistically significant effect of deposit interest rate (which is measured as the annual interest rate of bank deposits) on gross domestic savings in the short-run. A unit increase in deposit interest rate reduces the level of gross domestic saving by 0.113 on average, ceteris paribus at a 5% level of significance. This result is possible when the income effect of interest rate dominates its substitution effect (Mahmoud, 2008). Life Cycle Hypothesis introduced that if households are net lenders, an increase in interest rate will increase lifetime earnings, which in turn increases consumption and reduce saving. This refers to the income effect of the interest rate. So, a negative effect of deposit interest rate on gross domestic saving has an implication of a higher consumption rate rather than higher saving rate. This result is consistent with the findings of Girma (2017) and Loayza et al (2000). Broad money supply to GDP ratio has a positive but statistically insignificant effect on gross domestic saving in the short-run. The positive coefficient for money supply was expected as many economic theories suggest that an increase in the money supply can revive the overall economic conditions.

5. Conclusion and Recommendations

Saving is an engine for the growth and prosperity of a nation by creating capital accumulation and financial investments through resource mobilization. Most growth models like Harrod-Domar and Solow-Swan growth models are in favor of this idea. Many newly developing and newly industrialized countries in the world like Japan, Korea, Taiwan, Singapore, and Hong Kong have been attained their maximum economic growth and development through their high saving performance and good saving habits. This study has used time series data ranging from 1980 – 2018 which was drawn from the World Development Indicator 2019 database, Central Bank of Turkey and World Bank annual reports. It examined the impact of five independent variables namely Inflation Rate, Deposit Interest Rate, Age-dependency ratio, Broad Money Supply to GDP ratio and Growth of Gross National Income per Capita on Gross Domestic Saving in Turkey. Auto-Regressive Distributed Lag model with appropriate diagnostic tests was used for the data analyzing process. Results obtained from this study have shown that the first lag of Gross Domestic Saving has a positive and statistically significant effect on the Gross Domestic Savings rate at a 5 percent level of significance. Broad Money Supply to GDP ratio has also a positive effect on gross domestic savings in Turkey. This result is consistent with expectations that money supply can revive economic conditions and stimulate competitiveness even though its effect is statistically insignificant at 5_percent level of significance. Gross national income per capita growth has a negative and statistically insignificant effect on the Gross Domestic Savings rate at a 5 percent level of significance. Inflation Rate and Age-Dependency Ratio have both positive and statistically insignificant effects on Gross Domestic Saving rate, whereas Deposit Interest Rate has a negative and statistically insignificant effect on Gross Domestic Saving in the country at a 5 percent level of significance. A negative effect of deposit interest rate on saving had a policy implication that an increase in interest rate will not lead to a rise in gross domestic savings in Turkey. In general, the significance of a higher Gross Domestic Saving rate to the real economic

growth of Turkey may warrant policy intervention. Managing fundamentals that underline the improvement of the Gross Domestic Saving rate should top the policy agenda to reduce excessive volatility impinging on it. So, the government and any other concerned bodies should emphasize controlling severe inflationary cases in the economy through policy intervention because high inflation may the cause for losing the momentum of the economy in the long-run. The negative relationship between Gross National Income Per Capita Growth and Gross Domestic Saving rate may imply the income inequality in the country. Therefore, policymakers have to give attention to solve the problem. Besides, emphasis should be given to create awareness in the society to save part of their income by reducing the extravagant consumption since many people in developing countries have a trend of spending their additional income for further lavish consumption purposes rather than saving it for future investment.

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