The causality between saving, economic growth, and non-oil economic growth in the short run and long run in Iran

1Mohammad Sadeghi and 2Mohammad Daneshnia

1MA of Economics, Shiraz Branch, Islamic Azad University, Shiraz, Iran;
2Expert of Local Trade, Fars Organization of Industry, Mine & Trade- Jahrom Office, Iran.

ABSTRACT

Background: To achieve high and stable economic growth rate is an essential issue in each country and the economic growth is known as a major component of economic development. Objectives: Since savings is one of the important variables affecting economic growth, this study examines the relationships among savings, economic growth and non-oil economic growth, and also tests the short and long term causality among these variables in Iran's economy. Method: For this purpose the annual data for the period of 1350 to 1388 and Autoregressive Distributed Lag Model (ARDL) method with wide intervals were used. Results: The results of this study demonstrate the positive and significant impact of savings on the economy, and this impact on economic growth exists without in a non-oil economy, as well. Economic growth has a positive and significant impact on savings and non-oil economic growth has the same impact on savings.

© 2014 AENSI Publisher All rights reserved.

To Cite This Article: Mohammad Sadeghi, Mohammad Daneshnia, The causality between saving, economic growth, and non-oil economic growth in the short run and long run in Iran. Adv. Environ. Biol., 8(11), 1522-1531, 2014

INTRODUCTION

Economic growth is regarded as a key component of economic development and the two terms are occasionally considered synonymous. However, economic growth is important since it has changed into a main objective of economic policy-makers and decision-makers. Moreover, nowadays a great part of the economic literature deals with economic growth, which indicates the special attention paid to the issue by economists and scholars. Therefore, it could be generally concluded that the issue of economic growth is of high importance and must be investigated in terms of its influencing factors so that they can be boosted.

One of these factors is savings, which, according to classical economists, is the necessary and sufficient condition for investment. In other words, as savings grow, investment increases, which eventually contributes to economic growth.

The correlation between savings and economic growth is obvious to economists. However, the regression analyses investigate the dependence of one variable on others and they do not necessarily indicate causality. The main focus of the present study is to investigate the two-way causality between savings and economic growth in the long and short runs, which distinguishes this study from the previous ones.

The study was conducted using the time series of savings, GDP, and non-oil GDP for Iran and adopting the ARDL method during 1971 to 2009. The study is organized as follows:

In the second section, a literature review is provided. In the third section, the theoretical framework and the main theories are presented. The fourth section introduces the methodology, variables, statistical resources, the main study model, and the model estimation method. In the fifth section, the model is estimated. And finally, conclusion and suggestions are provided.

2- Literature Review:

Tinaromm (2005) investigated the correlation between savings and economic growth in North Africa using the VECM during 1946-1992. He found that the savings of the private sector affect economic growth both directly and indirectly. They directly affect economic growth through the investment rate of the private sector. Also, he found that economic growth positively affects the savings rate of the private sector.
Dipendra (2009) investigated the correlation between savings and economic growth in India. His purpose was to study the long-term relationships between GDP and savings. It was conducted using the Granger-Engel co-integration test and revealed that the gross savings of the private sector are more important than gross domestic savings in determining the GDP and that gross domestic savings are co-integrated with GDP. However, the causality test among gross domestic savings, private sector's gross savings, and GDP revealed no causality among these variables.

Mohan (2006) studied the causality between savings and economic growth in 13 countries with different economic conditions. It was conducted using the Granger causality test and revealed that the causality and its direction are different among countries with different income levels. The countries were classified into low, average, higher than average, and high income levels. For 5 countries the causality was low-way. Generally, low income countries confirmed the theory of Keynesian, which considers savings as a function of economic growth. However, countries with high and higher than average incomes confirm the theory of Solow, which states that saving growth contributes to economic growth.

Hemmi et al (2007) investigated the relationship between precautionary savings and economic growth. They tried to demonstrate the influences of shocks on precautionary savings and economic growth and used the Autoregressive Conditional Heteroskedasticity (ARCH) and the statistics gathered during 1955-1990. They concluded that the changing behaviors of savors (saving more) can contribute to sustainable development; on the other hand, the influences of shocks on precautionary savings contribute to increased savings.

Sajid and Sarfaraz (2008) investigated the influence of savings on economic growth in Pakistan using the seasonal data during 1973-2003. They used co-integration technics and the VECM and investigated the causality between savings and economic growth and found a one-way causality relation from savings to economic growth. The long-term results revealed the importance of savings in the investment structure of Pakistan. According to the short-term results, there is a relationship between GDP and domestic savings and there is a causality relationship from national savings to GDP. Therefore, the long-term and short-term results confirm the Keynesian theory, which states that savings are a function of income.

Odhiambo (2008) investigated the correlation between savings and economic growth in South Korea. The author's objective was to investigate the causality among savings, economic growth, and financial gap. He used the panel data during 1991-2005. According to the author, the significant of the study lies in the fact that the previous studies mostly focused on the one-way causality between variables and did not take into account the two-way causality. He concludes that there is granger causality between economic growth and savings until savings result from the development of the financial sector in Korea.

In another study conducted in South Africa, Odhiambo (2009) investigated the causality between savings and economic growth. He used the multivariate causality test during 1950-2005. The results indicated that there is causality between the entrance of foreign investment and savings rate. Also, economic growth is the Granger cause of foreign investment; therefore, in the short run, policies must be directed toward increasing savings and economic growth, which is facilitated by increasing investment. In long run, the country must focus on increasing economic growth, which is the result of increased domestic savings and investment.

Abu (2010) investigated the correlation between economic growth and savings in Nigeria. He used Granger causality and co-integration technics to analyze the relationship between the two variables during 1970-2007. The results indicated a co-integration relationship between the variables, which shows a long-term balance relationship between them. Also, the granger test revealed that the causality is from economic growth to savings.

Peters et al (2010) investigated the correlation between savings and economic growth in Mexico. They used the VAR and the time-series statistics of 1960-1996 and found that savings positively affect economic growth.

Singh (2010) studied the causality between savings and economic growth in India. The purpose of the author was to investigate the long-term and short-term relationships. He used the annual data during 1950-2002. The results showed a two-way causal relation between savings and economic growth. Generally speaking, more savings contribute to greater economic growth.

Mojtahed and Karami (2003) investigate the factors influencing national savings in the Iranian economy. The investigated the influences of economic growth, inflation, dependency burden, and revolution-resulted changes on savings rate in Iran. The results of the study, which was conducted using the ARDL and the time series of 1959-2000, showed that economic growth and per capita income have positive influences on savings rate and that the influence of inflation rate on savings rate is negative. On the other hand, the influence of dependency burden on savings rate is negative.

Abrishami and Rahmi Zadeh Namvar studied the factors determining private savings using the Johansen-Juselius co-integration method. They studied the role of the financial system and savings in the Iranian economy during 1959-2002. The results demonstrated that economic growth has positive influences on savings. Also, the development of the financial system limited to the quantitative development of bank indexes negatively affects savings.

Bahrami and Aslani (2004) investigated the factors influencing private sector savings in Iran during 1969-2001. They adopted the ARDL approach and found that the private sector's personal disposable income,
improved income distribution, and developed financial markets positively affect the savings of the private sector. On the other hand, increased social costs have negative influences on the savings of the private sector.

Hooshmandi [9] investigated the factors influencing national savings in Iran. He used the OLS, ARDL, and ECM to investigate these factors during 1959-2005. He found that the rate of national savings is a positive function of the rate of national savings with an interval period and that economic growth positively affects the rate of national savings while oil incomes negatively affect it. Uncontrollable oil price fluctuations and the dependence of the country on the oil price have negative influences on the economic functioning of the country and the macroeconomic variables including national savings rate. The net ratio of exports to GDP positively affects national savings rates.

3- Theoretical Framework:

3-1 Economic Growth and Savings:

Economic growth has been defined by many scholars. Schumpeter defines it as "the gradual and long-term changes in economic conditions as a result of gradual increase in savings rates and population". According to Kindleberger, economic growth means more production. It not only increases production through raw materials, but it also entails increased production efficiency and greater amounts of the products relative to the scale of raw materials used. Simply put, savings involves a part of income which is not spent. However, in macroeconomic analyses, the true sense of savings must be understood from the circulation of income and domestic product. Since any income entails production of goods or services, avoiding spending the whole income means that some parts of the goods or services are not consumed. From a macroeconomic perspective, this unconsumed part is called savings.

3-2 Theories of Savings and Economic Growth

Classical economists believed that savings are the necessary and sufficient condition of investment and that the price which guarantees these two is interest rate. In other words, they believed that, based on the law of supply and demand, if savings increase, investment should also increase and this will lead to economic growth. According to Keynes, the classicists' assumption which unifies investors and savors by a shared incentive for saving and investing is not a proper one. He believes that investors and savors are two distinct groups who save or invest for different reasons. Unlike neoclassicists, he holds that savings are a direct function of domestic product and under the condition that the final capital return is fixed, investment is a direct function of interest rate.

Since economic growth has been particularly taken into account by many economists, a wide range of theories has been proposed as modern economic theories, which are briefly discussed in the following section.

In the model proposed by Harrod and Domar in 1939 and 1946, they highlighted on the role of saving as a factor which affects investment and assigned a limited role to the government in the economy. In this model, it is assumed that interest rate remains fixed through time. Such limitations and unrealistic assumptions led to the development of other models by neoclassicists such as Solow and Swan. Solow's model is based on the production function with fixed return relative to the scale and entails that labor and capital are interchangeable and that the final return of inputs has a falling trend. In this model, growth is achieved through capital accumulation and a fixed trend of growth happens only through technological growth, which is an exogenous variable. Although the changes in the population growth and savings can affect the growth trend, it does not affect the long-term growth trend. Also, increased savings rate elevates growth from a long-term trend to a higher one.

The post-neoclassicists' exogenous economic growth predicts that due to its positive influence on investment and capital accumulation, increased saving contributes to increased economic growth. According to the Ramsey optimal growth model, increased savings lead to increased national income, which in turn accelerates investment. In this model, saving is not endogenous and is determined through optimizing households and institutions acting in the competitive market and face time-bound budget limitations. However, increased capital, which is the result of increased savings, might contribute to economic growth in the short run but in the long run, this influence is nominal.

4- Methodology:

4-1 Variables and Statistical References:

In this study, the time-series statistics of the annual GDP and savings taken from the official Iranian sources including the Central Bank official website and the Iranian Statistics Center.

The time period includes 1971-2008. Due to the nature of the Iranian economy, GDP is classified into total GDP and GDP without oil. All prices are based on the fixed ones in 1997 and at billion Rials.

4-2 The Main Model:

Equation 1 determines the influence of savings on economic growth:
\[ \text{LGDPO}_t = \alpha_0 + \sum_{i=1}^{p} \beta_i \text{LGDPO}_{t-i} + \sum_{i=0}^{r} \gamma_i \text{LS}_{t-i} + \varepsilon_t \]  
(1)

Where, LGDPO is the natural log of GDP difference and LS is the natural log of gross domestic savings.

And equation two determines the causality from savings to economic growth:

\[ \Delta \text{LGDPO}_t = \alpha_0 + \sum_{i=1}^{p} \beta_i \Delta \text{LS}_{t-i} + \sum_{i=0}^{r} \lambda_i \text{ECM}_{t-i} + \mu_t \]  
(2)

If \( \beta_i = 0 \), causality from savings to short-term economic growth is confirmed and if \( \beta_i = 0 \) and \( \lambda_i = 0 \), causality from savings to long-term economic growth is confirmed.

In order to investigate the influence of savings on economic growth without oil, equation 3 is used:

\[ \text{LGDPO}_t = \alpha_0 + \sum_{i=1}^{p} \beta_i \text{LGDPO}_{t-i} + \sum_{i=0}^{r} \gamma_i \text{LS}_{t-i} + \varepsilon_t \]  
(3)

Where, LGDPO is the natural logarithm of non-oil GDP

\[ \Delta \text{LGDPO}_t = \alpha_0 + \sum_{i=1}^{p} \beta_i \Delta \text{LS}_{t-i} + \sum_{i=0}^{r} \lambda_i \text{ECM}_{t-i} + \mu_t \]  
(4)

In this section, the influence of GDP on gross domestic savings is investigated:

\[ \text{LS}_t = \alpha_0 + \sum_{i=1}^{p} \theta_i \text{LS}_{t-i} + \sum_{i=0}^{r} \nu_i \text{LGDPO}_{t-i} + \xi_t \]  
(5)

And in equation 6, the causality from oil-dependent economic growth to savings is investigated:

\[ \Delta \text{LS}_t = \alpha_0 + \sum_{i=1}^{p} \phi_i \Delta \text{LGDPO}_{t-i} + \sum_{i=0}^{r} \varphi_i \text{ECM}_{t-i} + \psi_t \]  
(6)

If \( \phi_i = 0 \), the short-term causality from oil-dependent economic growth to savings is confirmed and if \( \phi_i = 0 \) and \( \varphi_i = 0 \), the long-term one is confirmed.

In equation 7, the causality between non-oil economic growth and savings is investigated:

\[ \text{LS}_t = \alpha_0 + \sum_{i=1}^{p} \theta_i \text{LS}_{t-i} + \sum_{i=0}^{r} \nu_i \text{LGDPO}_{t-i} + \xi_t \]  
(7)

And finally, the short-term and long-term causal relations from non-oil economic growth to savings are investigated through equation 8:

\[ \Delta \text{LS}_t = \alpha_0 + \sum_{i=1}^{p} \phi_i \Delta \text{LGDPO}_{t-i} + \sum_{i=0}^{r} \varphi_i \text{ECM}_{t-i} + \psi_t \]  
(8)

Coefficients are interpreted like those of equation 6.

4.3 Econometric Methods:

Adopting traditional approaches in econometrics for experimental studies is based on the assumption that variables are stable. However, the studies show that for many time series, this is an improper assumption and most variables are not stable. This might lead to false regressions and destroy the trust to estimated coefficients.

Therefore, according to the co-integration theory in modern econometrics, for estimating functions of time series, it is vital to adopt methods which take stability and co-integration into account. This method was developed due to the limitations of Engel-Granger and Johansen methods.

In the Engel-Granger approach, the estimations in small samples are biased due to the failure to regard short-term dynamic reactions among variables. Moreover, the limit distribution of least squares is not normal, which makes the testing of hypotheses through normal statistics invalid. Also, this method is based on the presumption of one co-integration vector and in cases with more than one vector, the results are ineffective. In order to address these shortcomings, Johansen (1989) and Johansen and Juselius (1992) proposed the maximum likelihood ratio for testing the convergence and extracting co-accumulating vectors. This method might not be useful since all variables might not have the same degrees of consistency. In this study, since variables had various degrees of integration the ARDL approach was adopted.

In the ARDL method, the Schwartz-Bayesian, Akaik, and Hannan-Quinn criteria are adopted to choose optimal intervals for each variable. It estimates the long-term and short-term relations among the dependent and explanatory variables, simultaneously. In this approach, it is not required that the variables have the same degrees of co-integration. It is applicable even in cases where variables are a combination of I(1) and I(0).
4-3-1 The Autoregressive Distribution Lag Model (ARDL):

Generally speaking, a dynamic model is one in which variable intervals are incorporated like equation 1.

\[ Y_t = aX_t + bX_{t-1} + cY_{t-1} + u_t \]  

(1)

In order to reduce the bias generated in small samples, it is better to adopt approaches which assign many intervals for variables:

\[ \phi(L, P)Y_t = \sum_{i=1}^{k} b_i(L, q_i)X_{it} + c'w_t + u_t \]

In the above equations, \( Y_t \) and \( X_{it} \) are the dependent and independent variables, respectively. The "L" statement is the interval operand and \( w_t \) is a vector of Sx1, which represents the predetermined variables including intercept, dummy variables, time trend, and other exogenous variables, \( P \) is the number of intervals for the dependent variable and \( q \) is the ones for independent variables. These equations were developed in 1997 by Pesaran and Pesaran.

The above model is called ARDL, in which:

\[ \phi(L, P) = 1 - \phi_1L - \phi_2L^2 - \ldots - \phi_pL^p \]

\[ b_i(L, q_i) = b_{i0} + b_{i1}L + \ldots + b_{iq_i}L^q_i \]  

(3-1)

The number of optimal intervals for each explanatory variable can be determined by one of the AIC, SBC, HQC, or R-bar squared criteria. Typically, in samples smaller than 100, the SBC is adopted so that not much freedom degree is lost. This criterion economizes on interval allocation, which leads to greater degrees of freedom. In order to calculate the long-term coefficients, the dynamic model is used. The long-term coefficients of the X variables are calculated through the following equation:

\[ \theta_i = \frac{\hat{b}_i(L, q_i)}{1 - \phi(L, p)} = \frac{\hat{b}_{i0} + \hat{b}_{i1} + \ldots + \hat{b}_{iq_i}}{1 - \hat{\phi}_1 - \hat{\phi}_2 - \ldots - \hat{\phi}_p} \]

(3-2)

The t statistic for the long-term calculated coefficient can be calculated through equation 2-3. Inder (1993) shows this type of t statistic is normally distributed and that the t-test based on the common critical values has good power. Therefore, using \( \theta_i \), valid tests can be performed on long-term relationships. In ARDL, the long-term relation can be calculated in the following way:

In the first stage, the existence of long-term relationships among variables is tested. To make sure that the long-term relation is not false, two methods can be adopted:

First, after the estimation of ARDL, the below hypothesis is tested:

\[ H_0 : \sum_{i=1}^{p} \phi_i - 1 \geq 0 \]

\[ H_a : \sum_{i=1}^{p} \phi_i - 1 < 0 \]

The null hypothesis demonstrates the lack of co-integration or long-term relationship since the short-term relation moves toward a long-term one provided that the sum of coefficients is smaller than 1. In order to perform the test proposed by Banerjee et al (1993), I must be subtracted from the sum of coefficients with the dependent variable intervals and be divided by the sum of the SDs of the variables, yielding the t statistic:

\[ t = \frac{\sum_{i=1}^{p} \hat{\phi}_i - 1}{\sum_{i=1}^{p} S_{\hat{\phi}_i}} \]

If the absolute value of the t statistic is greater than that of the critical values proposed by Banerjee et al, the null hypothesis is rejected and the long-term relationship is proved. In present study, this approach is adopted.

In the second approach, proposed by Pesaran and Shin (1996), the variables are tested for long-term relationships through the F statistic to test the significance level of intervals in the error correction form.

4-3-2 Error Correction Model:

Granger (1988) states that if two variables are co-integrated, Granger causality holds between them, at least in one direction. Although the co-integration test can determine the presence or absence of causality between
variables, it is not able to determine the direction of causality. Engel and Granger (1987) state that if \( X_t \) and \( Y_t \) are co-integrated, there is always a vector error correction model for them.

Therefore, it is possible to adopt a vector error correction model to investigate Granger causality between variables. The error correction model states that the changes in the dependent variable are a function of long-term balance deviations and changes in other explanatory variables. This model which relates the long-term and short-term behaviors of the two variables is represented as:

\[
\Delta Y_t = \alpha + \sum_{i=1}^{m} B_i \Delta Y_{t-i} + \sum_{i=1}^{n} \gamma_i \Delta X_{t-i} + \lambda X_{t-i} + V_t - K \lambda < 0
\]

The error correction part, \( \lambda X_{t-i} \), opens an additional path to investigate Granger causality, which is ignored in Granger-Sims causality tests. If the variables are co-integrated and have first-grade reliability, using an autoregressive model on the first difference of the variables, rather than using a vector error correction model to investigate Granger causality between the variables, increases the variance of the regression equation through eliminating the error correction part, \( X_{t-i} - BY_{t-i} \). This will cause the parent statistic to be skewed.

This creates improper judgments on the direction of causality. In addition to determining the direction of Granger causality, the vector error correction model enables us to distinguish between Long-term and Short-term Granger causality.

Insignificance of \( \lambda \) might indicate that there is not long-term causality between explanatory and the dependent variables or that the dependent variable is a weak exogenous one. Insignificance of interval sums for each explanatory variable might indicate that there is no short-term Granger causality between any explanatory variable and the dependent variable. Insignificance of the sum of intervals for each explanatory variable together with \( \lambda \) might indicate that in the long run, there is no Granger causality between any explanatory variable and the dependent variable.

5- Equation Estimation:

5-1 Stability Test of Variables:

In this section, the stability test is conducted since it prevents from false results created by regression estimation. As we know, if the variable is \( I(2) \), the value of \( F \) could not be trusted. The results of the test are represented in table 1:

<table>
<thead>
<tr>
<th>prob</th>
<th>Adj.t-Stat</th>
<th>prob</th>
<th>t-Statistic</th>
<th>Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0098</td>
<td>-3.6295</td>
<td>0.0068</td>
<td>-3.7717</td>
<td>LGDP</td>
</tr>
<tr>
<td>0.00194</td>
<td>-3.3529</td>
<td>0.00118</td>
<td>-3.5565</td>
<td>LGDP</td>
</tr>
<tr>
<td>0.0617</td>
<td>-0.5861</td>
<td>0.8592</td>
<td>-0.5971</td>
<td>LS</td>
</tr>
</tbody>
</table>

Source: Findings of Study

<table>
<thead>
<tr>
<th>prob</th>
<th>Adj.t-Stat</th>
<th>prob</th>
<th>t-Statistic</th>
<th>Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.060</td>
<td>-3.4481</td>
<td>0.081</td>
<td>-3.3172</td>
<td>LGDP</td>
</tr>
<tr>
<td>0.0699</td>
<td>-3.3783</td>
<td>0.1196</td>
<td>-3.1105</td>
<td>LGDP</td>
</tr>
<tr>
<td>0.8565</td>
<td>-1.3587</td>
<td>0.4183</td>
<td>-2.3098</td>
<td>LS</td>
</tr>
</tbody>
</table>

As indicated by Tables 1 and 2, economic growth and non-oil economic growth are stable variables and saving is an unstable one. In the following section, the stability test is conducted with the first difference of the variable (Table 3):

<table>
<thead>
<tr>
<th>prob</th>
<th>Adj.t-Stat</th>
<th>prob</th>
<th>t-Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0004</td>
<td>-4.7971</td>
<td>0.0003</td>
<td>-4.8815</td>
</tr>
<tr>
<td>0.0001</td>
<td>-5.8543</td>
<td>0.0006</td>
<td>-5.3060</td>
</tr>
</tbody>
</table>

Source: Findings of Study

According to the summarized results of the stability test for savings, it could be concluded that saving is an \( I(1) \) variable.

Given the fact that the variables under the study are \( I(1) \) and \( I(0) \), the ARDL approach is adopted.
5-2 Estimating and Determining the Direction of Causality from Savings to Economic Growth and Non-oil Economic Growth:

First, the causality from savings to economic growth is investigated. As we know, in order to be able to use the ARDL, we need to prove the long-term relationship between the variables, which is done through the Microfit 4 software. Choosing the ARDL (1,1) as the optimal interval, the Banerjee et al statistic is estimated as:

\[
t = \frac{0/8831-1}{0/0328} = -3/5640
\]

The value of the statistic at the confidence level of %95 with intercept is -3.28, which proves the existence of a long-term relationship between the variables.

Now, the long-term relationship is investigated:

\[
LGDP = 1/88C + 0/94LS
\]

Therefore, saving has a positive significant long-term influence on economic growth. In other words, savings increase economic growth in the long run.

Now, the short-term relationship between savings and economic growth is investigated:

\[
dLGDP = 0/21dC + 0/32dLS - 0/1lecm(-1)
\]

Therefore, saving has a positive significant short-term influence on economic growth. In short, savings boost economic growth both in the short and long runs.

The ECM coefficient was significant and negative, which shows the model moves from short term to long term. In other words, the error correction trend from long-term to short-term happens with a speed of 0.11.

Now, the classic hypotheses are tested, which shows that disturbance statements are not serial correlated, the equation is properly explained, the residual statements are normally distributed and the variance residual statements are similar. Therefore, the equation satisfies the classic hypotheses and is well-estimated.

The long-term relationship between the variables indicates that there is causality between the variables. However, the direction of causality is not clear. Since the main aim of this section is to determine the direction of causality in the long and short runs, a model which can do so is required. This model is the ECM using the parent statistic.

Tables 4 and 5 summarize the results of causality tests in the long and short runs:

### Table 4: short-term causality test from savings to economic growth

<table>
<thead>
<tr>
<th>Causality</th>
<th>prob</th>
<th>Wald statistic</th>
<th>Null hypothesis</th>
<th>Independent variable</th>
<th>Dependent variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>LS → RGDP</td>
<td>0/000</td>
<td>74/55</td>
<td>A₂ = 0</td>
<td>LS</td>
<td>LGDP</td>
</tr>
</tbody>
</table>

Source: Findings of Study

### Table 5: long-term causality test from savings to economic growth

<table>
<thead>
<tr>
<th>Causality</th>
<th>prob</th>
<th>Wald statistic</th>
<th>Null hypothesis</th>
<th>Independent variable</th>
<th>Dependent variable</th>
</tr>
</thead>
</table>
| LS → RGDP | 0/000 | 78/42 | A₂ = 0  
A₃ = 0 | LS  
ECM(-1) | LGDP |

The results indicate that the direction of causality is from savings to economic growth. Therefore, in the long and short runs, saving has a positive and significant influence on economic growth and the relationship is a causal and direct one.

Now, the influence of savings on non-oil economic growth in the long run and short run and the causal relationship are investigated.

The software chose ARDL (1,0) as the optimal interval, giving the Banerjee et al statistic as:

\[
t = \frac{0/9064-1}{0/0254} = -3/6850
\]

The value of the statistic at the %95 confidence level with intercept is -3.28. Therefore, the long-term relationship between the variables is approved.

The long-term relationship between savings and non-oil economic growth is represented as:

\[
LGDP = -5/21C + 1/58LS
\]

(0/202) (0/000)
The results indicate that savings have a positive and significant long-term influence on non-oil economic growth.

Now, the short-term influence of savings on non-oil economic growth is investigated:

\[
dLGDPO = \frac{0}{48C} + 0/14dLS - 0/093ecm(-1)
\]

\[(0/982) \quad (0/000) \quad (0/001)\]

The results show that savings have a positive and significant influence on non-oil economic influence in the short run. The coefficient of the error correction statement was negative. Also, the classic hypotheses were tested and were all well-approved. The results of long-term and short-term causality tests are demonstrated in Tables 6 and 7.

Table 6: Results of Short-term Causality from Savings to Non-oil Economic Growth

<table>
<thead>
<tr>
<th>Causality</th>
<th>prob</th>
<th>Wald statistic</th>
<th>Null hypothesis</th>
<th>Independent variable</th>
<th>Dependent variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>LS → RGDP</td>
<td>0.000</td>
<td>3.25</td>
<td>(A_2 = 0)</td>
<td>LS</td>
<td>LGDPO</td>
</tr>
</tbody>
</table>

Table 7: Results of Long-term Causality from Savings to Non-oil Economic Growth

<table>
<thead>
<tr>
<th>Causality</th>
<th>prob</th>
<th>Wald statistic</th>
<th>Null hypothesis</th>
<th>Independent variable</th>
<th>Dependent variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>LS → RGDP</td>
<td>0.000</td>
<td>3.68</td>
<td>(A_2 = 0), (A_3 = 0)</td>
<td>LS ECM(-1)</td>
<td>LGDPO</td>
</tr>
</tbody>
</table>

Source: Findings of Study

According to the above tables, there is long-term and short-term causality from savings to non-oil economic growth and this relationship is direct.

So far, the one-way causality from savings to long-term and short-term economic growth with and without oil has been proved. Now, the influence of economic growth with and without oil on savings is investigated.

5-3 Estimation and Direction of Causality of Economic Growth with and without Oil to Savings:

In this section, the influence and the direction of causality of economic growth on savings are investigated. The statistic of Banerjee et al for ARDL (1,1) is:

\[
t = \frac{0.7185 - 1}{0.0680} = -4/1397
\]

The Banerjee et al Statistic at confidence level of %95 with intercept is -3.28. Therefore, the long-term relationship between the variables is proved.

The following equation demonstrates the long-term relationship between savings and economic growth.

\[
LS = 2/05C + 0/66LGDP
\]

\[(0/395) \quad (0/000)\]

Therefore, economic growth has a positive and significant effect on savings; as economic growth increases, savings also increase.

Now, the influence of economic growth on savings in the short run is investigated:

\[
dLS = 0/57C + 2/13dLGDP - 0/28ecm(-1)
\]

\[(0/390) \quad (0/000) \quad (0/000)\]

The estimation of the short-term relationship indicates that economic growth has a positive and significant influence on savings. The coefficient of the error correction statement was negative. Also, the classic hypotheses were tested and indicated the good fit of the model. Therefore, the direction of long-term and short-term causality from economic growth to savings is investigated and demonstrated in Tables 7 and 8.
Table 8: Long-term Causality from Economic Growth to Savings

<table>
<thead>
<tr>
<th>Causality</th>
<th>prob</th>
<th>Wald statistic</th>
<th>Null hypothesis</th>
<th>Independent variable</th>
<th>Dependent variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>dLGDP → dLS</td>
<td>0.000</td>
<td>79.43</td>
<td>A_2 = 0</td>
<td>dLGDP ECM(-1)</td>
<td>dLS</td>
</tr>
</tbody>
</table>

According to the above tables, there is long-term and short-term causality from economic growth to savings.

Now, the influence of non-oil economic growth on savings and the direction of causality is investigated. The software chose ARDL (1,1) as the optimal interval.

\[ t = \frac{0}{7179 - 1} = -3/3463 \]

The statistic of Banerjee et al at confidence level of %95 with intercept is -3.28. Therefore, the long-term relationship between the variables is proved. The long-term equation of the influence of non-oil economic growth on savings is:

\[ LS = 2/45C + 0/707LGDPO \]

(0.349) (0.002)

which indicates the positive and significant influence of non-oil economic growth on savings in the short run. In other words, as the added value of oil products increase, savings also increase.

Now, the short-term influence of non-oil economic growth on savings is investigated:

\[ dLS = 0/69C + 1/70dLGDPO – 0/28ecm(-1) \]

The equation indicates that non-oil economic growth has a positive and significant influence on savings. The coefficient of the error correction statement was negative and significant. The classic hypotheses were also tested and approved the good fit of the model. Finally, the direction of causality in the long and short runs from non-oil economic growth to savings is investigated:

Table 9: Long-term Causality from Non-oil Economic Growth to Savings

<table>
<thead>
<tr>
<th>Causality</th>
<th>prob</th>
<th>Wald statistic</th>
<th>Null hypothesis</th>
<th>Independent variable</th>
<th>Dependent variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>dLGDP → dLS</td>
<td>0.000</td>
<td>21.64</td>
<td>A_2 = 0</td>
<td>dLGDP ECM(-1)</td>
<td>dLS</td>
</tr>
</tbody>
</table>

According to the above tables, the direction of causality from non-oil economic growth is approved: it is concluded that economic growth with and without oil have positive and significant influences on savings in the long and short runs. Also, the direction of causality from economic growth with and without oil to savings in the short and long runs is approved.

Conclusion and Suggestions:

Savings have always been regarded as a key factor influencing economic growth. In the traditional literature, increased saving is known to contribute to economic growth. However, most studies have failed to investigate the mutual influences of the two factors in the short and long runs. Moreover, the causality between the variables and the direction of causality have not been taken into account. In this study, the long-term and short-term causality between savings and economic growth with and without oil was investigated. Economic growth was calculated through the natural log of GDP with the fixed prices in 1997 and non-oil economic growth was calculated through the natural log of GDP subtracting oil income with the fixed prices in 1997.

The study was conducted using the time series data during 1971-2009 and the Autoregressive Distributed Lag approach (ARDL). Also the error correction causality test was conducted, which allowed the distinguishing of long-term and short-term periods.
The results indicated that savings have short-term and long-term influences on economic growth; as savings increase, economic growth is boosted. Moreover, savings positively influence non-oil economic growth in the short and long runs.

Economic growth with and without oil also positively affects savings in the short and long runs. It is concluded that savings and economic growth as well as savings and non-oil economic growth have long term and short term mutual influences; with any increase in any of the variables, the other grows, both in the short run and long run.

Then, the direction of causality was investigated and it was found that between savings and economic growth as well as savings and non-oil economic growth, there is two-way causality in the short and long runs.

Finally, it is suggested that policy-makers try to increase savings in order to achieve economic growth. This can be achieved by training people to increase their savings.

For future research, it is suggested that in addition to the mutual influences of variables, the causality and its directions be studied. Also, other factors should be studied in terms of their long-term and short-term influences on economic growth.

REFERENCES