Journal of International Business and Economics
December 2014, Vol. 2, No. 4, pp. 107-124
ISSN: 2374-2208(Print), 2374-2194(Online)

Published by American Research Institute for Policy Development
DOI: 10.15640/jibe.v2n4a7
URL: http://dx.doi.org/10.15640/jibe.v2n4a7

Relationship between Savings and Economic Growth: The Case For Iran

Reza Najarzadeh[1], Michael Reed[2] & Mona Tasan[3]

Abstract

Achieving a high and stable economic growth rate is an important issue for every country since economic growth is crucial for economic development. Since savings is key to economic growth, this paper assesses the relationship between savings and total and non-oil economic growth for Iran. We also analyze the long-run causality among the above variables in Iran's economy. Annual data for the period 1972-2010 is used with an Autoregressive Distributed Lag Model for the empirical results. The resultsof the study show that there is a positive and significant impact of savings on total and non-oil economic growth. Both types of economic growth are also found to have positive and significant effect on savings. In addition, the results show that there is a long-run causal relationship between savings and economic growth, and between saving and non-oil economic growth, and that these relations are two-way.

Keywords: Economic Growth, Oil Sector, Non-oil Sector, Savings, Autoregressive Distributed Lag Model, Iran

JEL classification: O40,C51, C50

1- Introduction

Economic growth is a key facet of most societies these days. Citizens want to enjoy a higher standard of living and policy makers are anxious to provide that higher standard through economic growth. Such growth is an important measure for the success of governments. This is why economic research and textbooks have covered this topic extensively and politicians talk about it regularly.

[1] Assistant Professor, Department of Economics, TarbiatModdares University, Tehran, Iran. Email: Reza_Narjarzadeh@yahoo.com

[2]Professor,Department of Agricultural Economics, 308 Barnhart Building, University of Kentucky, Lexington, Kentucky 40546 USA,Email: mrreed@uky.edu

[3]PhD, Student, Department of Economics, Azad University of Shiraz, Shiraz, Iran.

A major factor impacting economic growth in a given society is the level of savings. Classical economists believed that the existence of savings is a necessary and sufficient condition for investment creation. They believed that if savings go up, investment increases because the interest rate and economic growth will be imminent. Even though there is an obvious relationship between savings and economic growth, the direction of causality is not assured. Does savings cause growth or vice versa? In this paper our main goal is to study the long-run two-waycausal relationship between savings and economic growth. This inquiry about causalitydifferentiates this study from others.

This study uses annual data on savings and GDP for Iran's economy during 1971-2009 to investigate the relationship between these two important variables. Gross domestic product is separated between total GDP and non-oil GDP because Iran is very interested in stimulating the non-oil sectors of the economy. An Auto Regressive Distributed Lag Model is used for the analysis to provide better evidence concerning the causal relationships. Theliterature is reviewed in the next section; the third section covers conceptual issues; the fourth and fifth sections cover methodology and results, respectively; and the last section offers some conclusions and suggestions.

2- Literature Review

Tinaromm (2005) studied the relationship between savings and economic growth in North Africa using a Vector Error Correction Model for 1946-1992. He concluded that private saving has both direct and indirect effects on economic growth. In his view, the direct effect of savings is through private investment. He also showed that economic growth has a positive effect on the private savings rate.

Mohan (2006) investigated the causality relationship between savings and economic growth in 13 countries with different income levels during 1960- 2001. The countries were divided into four different income levels: low income, less than the average, more than the average and high income. He used a Granger Causality Test and showed that the causality relation and direction differs among countries depending on income levels. In general, the Keynesian theory of savings as a function of growth was confirmed in countries with low and less than average incomes while the Solow hypothesis that savings is a determinant of economic growth was confirmed in countries with high and more than average incomes.

Hemmi et al. (2007) studied the relationship between precautionary savings and economic growth. They used an Autoregressive Conditional Heteroskedastic (ARCH) model with annual data from 1955 to 1990. They concluded that increased savings can have a favorable impact on sustainable growth. They also found that stronger shocks on precautionary savings result in the higher levels of savings as a whole.

Sajid and Sarfaraz (2008) analyzed the effect of savings on economic growth by using seasonal data for 1973 to 2003 in Pakistan. The authors assessed the causality relation between savings and economic growth by usingco-integration techniquesand a Vector Error Correction Model (VECM). Their results show that there is a one-way causal relationship from savings to economic growth. The long run results of this study show the importance of savings in investment creationforPakistan. The short run results also indicate that there is a relation between domestic savings and GDP. The causality relation only runs from national savings to GDP in the short run. The short and long run results of this study confirmed the Keynesian view that saving is a function of income levels.

Odhiambo (2008) investigated the relationship between savings and economic growth in Kenya. Hestudied the causality relation between savings, economic growth and the fiscal deficit using panel data from 1991 to 2005. His emphasis was on two-way causality testswhich differentiates his work from other studies. The results show that there is Granger causality between savings and economic growth, and that savings are an important driver for development of the financial sector. Odhiambo (2009) also studied the relationship between savings and economic growth in South Africa. He used a multi-variable causality test with data from 1950 to 2005 which showed that there is one-way causality from the savings rate to foreign capital inflows. His results also show that economic growth Granger causes foreign capital inflows. Therefore, he concludes that policies should be directed toward increasing savings and economic growth in the short run.

Dipendra (2009) studied the relation between savings and economic growth in India. The goal of this study was to check the long-run relationship between GDP and savings. An Engel-Granger Co-Integrated method was used and the results showed that gross savings of the private sector have a bigger impact on GDP than gross domestic savings.

Moreover, gross domestic savings and gross private savingswere shown to be co-integrated with GDP. Yet the causality analysis between these variables showed that there is no causality in any direction among them.

Abu (2010)studied the relationship between savings and economic growth in Nigeria using Granger Causality techniques and Co-Integration for the period 1970 to 2007. His results indicate that the variables are co-integrated in such a manner that one can concludethere is a long-run equilibrium relationship between them and that causality is from economic growth to savings.

Masih and Peters(2010) studied the mutual relation between savings and economic growth in Mexico using a Vector Auto-Regressive (VAR) method and annual data from 1960 to 1996. They concluded that savings have a positive effect on economic growth.

Singh (2010) studied the causal relationship between domestic savings and economic growth in India. He analyzed the shortand long run relation between these variables using an Autoregressive Distributed Lag model for the period 1950 to 2002. The results indicate that there is a two-way relationship between savings and economic growth. His results also showed that an increase in savings and capital accumulation will lead to higher income and economic growth.

3- Conceptual Issues

3-1-Definition of Economic Growth and Savings

Economic growth has many definitions. Schumpeter (1939) suggests that economic growth is created througha higher saving rate. According to Kindleberger, economic growth means more than production. He believes that economic growth is not only producing more but also improving productivity and raising the ratio of output to input.

Saving is maintaining part of current income for use in the future. It is the accumulation of financial and non-financial assets. In national income accounting we face two separate concepts in this regard: Net Savings and Gross Savings.

Net Savings is generated when disposable personal income is more than personal expenditure; firms have profit that is not divided amongshareholders; or when current government expenditure is less than current governmentreceipts. Gross Savings includesNet Savings and depreciation allowances for replacement of real assets in the future.

3-2- Theories of Economic Growth and Savings

Classical economists believed that saving is a necessary and sufficient condition for securing investment and that the interest rate is the price that equates them. They believed that if savings go up, investment increases, and then economic growthfollows. Keynes, on the other hand, did not believe that investors and savers are the same group, but they save or invest for the same reason (that is to maximize utility/income). According to his theory saving is a direct function of national income whereas investment is an indirect function of interest rates.

Economic growth has been of particular interest to many economists in recent decades and a new set of ideas, called the new economic growth theory, have been generated. We review these theories that relate savings and economic growth below.

Early economic growth theories go back to the studies of Harrod and Domar in 1939 and 1946 where economic growth was assumed to be determined mostlyby the equilibrium path for an economy. Their model focused on the limited role of government in the economy and the role of savings as the main determinant of investment. They assumed that interest rates moved to an equilibrium level over time and then remained unchanged.

Due to these unreasonable and limiting assumptions, efforts were made by neo-classical economists,such as Solow and Swan in 1950, to study the relationship between economic growth and savings using a less limiting platform. The Solow model is based on a constant returns to scale production function with two inputs, labor and capital, substitution possibilities between inputs, and decreasing marginal productivity. In this model, growth takes place through capital accumulation and the stable growth rate is determined by the rate of technology progress, which is an exogenous variable.

Although changes in the population growth and savings rates can alter the growth path, they have no effect on the long-run growth rate. Increases in the savings rate cause an upward shift in the long-run growth path instead of an increased growth rate (Branson, 2008).

Endogenous economic growth theory predicts that an increase in the savings rate leads to an increase in economic growth through its positive effect on investment and capital accumulation (Barro and Sala-i-Martin, 1995). Ramsey's Optimal Growth Model posits that saving increases cause increases in national income and accelerate the investment process (Romer, 2006). Saving is not exogenous in this model; it is determined endogenously by the optimization behavior of households and firms (Singh, 2010). Increases in the capital stock can only cause economic growth in the short-run but its effect is negligible in the long-run (Romer, 2006).

4- Methodology

4-1- Variable Introduction and Data Sources

In this study we use annual time series data from 1972 to 2010 for GDP and savings from Iran'sCentral Bank and Statistical Center. Gross domestic product is analyzed in total and for the non-oil sector in order to focus on Iran's non-oil economy. All variables are in rials (the Iranian currency) and in constant 1998 prices.

4-2- Model Specifications

We use the following equation to show the impact of savings on economic growth:

$$LGDP_t = \alpha_0 + \sum_{i=1}^{p} \beta_i LGDP_{t-i} + \sum_{i=0}^{p} \gamma_t LS_{t-i} + \varepsilon_t \qquad (1)$$

where LGDP is natural logarithm differential of GDP and LS is natural logarithm of gross domestic savings (or savings).The saving coefficients indicate the impact of savings on investment and consequently on economic growth. Large coefficients mean that the capital market is functioning efficientlyso that savings lead to production and economic growth.

We use the following equation to investigate the causality relation from savings to economic growth:

$$\Delta LGDP_t = \alpha_0 + \sum_{i=1}^{p} \beta_{1i} \Delta LS_{t-i} + \sum_{i=1}^{r} \lambda_{1i} ECM_{r,t-1} + \mu_1 \quad (2)$$

If $\beta_{1i} = 0 \ and \ \lambda_{1i} = 0$ and the other coefficients are non-zero, then the direction of causality from savings to economic growth in the long run is confirmed. Equation (3) is used to check the effect of savings on non-oil economic growth:

$$LGDPO_t = \alpha_0 + \sum_{i=1}^{p} \beta_i LGDPO_{t-i} + \sum_{i=0}^{p} \gamma_t LS_{t-i} + \varepsilon_t \quad (3)$$

where LGDPO is natural logarithm of GDP without oil.

Equation (3) has particular significance because Iran's long-run economic strategy is to reduce its dependence on oil. The estimation results of this equation can help determine whether savings and investment can rid Iran of its dependence on oil. Equation (4) is used to investigate the causality relation from savings to non-oil economic growth without oil:

$$\Delta LGDPO_t = \alpha_0 + \sum_{i=1}^{p} \beta_{1i} \Delta LS_{t-i} + \sum_{i=1}^{r} \lambda_{1i} ECM_{r,t-1} + \mu_1 \quad (4)$$

The interpretation of the coefficients in equation (4) is identical to equation (2).

In order to complete the study of causality between savings and economic growth, we use the following equationsto study the effect of economic growth on savings.

The effect of economic growth on gross domestic savings is introduced in equation (5):

$$LS_t = \alpha_0 + \sum_{i=1}^{p} \theta_i LS_{t-i} + \sum_{i=0}^{p} \vartheta_t LGDP_{t-i} + \xi_t \quad (5)$$

The coefficients on economic growth in the above equation showthe extent that savings depend on economic growth. We know that the level of savings is a function of income per capita and per capita income growth. The idea is that people desire to smooth their consumption during their lifetime such that when their income is low (when they are young and old), they use savings and they accumulate savings when they work and have high income. So if income increases for any reason, people save more because they want to have higher consumption in their retirement. So if a country's income growth is faster than another's, then we can claim that the saving ratio of the faster growing country is higher than the other country.

We investigate the causality relationship from economic growth to savings in the following equation:

$$\Delta LS_t = \alpha_0 + \sum_{i=1}^{p} \emptyset_{1i} \Delta LGDP_{t-i} + \sum_{i=1}^{r} \varphi_{1i} ECM_{r,t-i} + \psi_1 \quad (6)$$

If $\emptyset_{1i} = 0 \; and \; \varphi_{1i} = 0$ and the other coefficients are non-zero, then economic growth causes savings in the long run.

In equation (7), the relationship between non-oil economic growth and savings is considered:

$$LS_t = \alpha_0 + \sum_{i=1}^{p} \theta_i LS_{t-i} + \sum_{i=0}^{p} \vartheta_t LGDPO_{t-i} + \xi_t \quad (7)$$

Equation (8) is used to measure the long-run causal relationship from non-oil economic growth to savings:

$$\Delta LS_t = \alpha_0 + \sum_{i=1}^{p} \emptyset_{1i} \Delta LGDPO_{t-i} + \sum_{i=1}^{r} \varphi_{1i} ECM_{r,t-i} + \psi_1 \quad (8)$$

The coefficients are interpreted inthe same way as in equation (6).

4-3- Econometrics Issues

Traditional empirical methods in econometrics are based on the assumption that variables are stationary. The studies reviewed here show that this assumption is not validfor economic growth studies using time series data because most of the important variables are non-stationary. Non-stationary variables can cause spurious regression results and increase the confidence intervals for estimated coefficients. Thus, it is imperative that data be tested for stationary. One reason for using the ARDL approach is that previous methods, like Engle-Granger or Johansen-Juseliusco-integration, have limitations.

The Engle-Granger estimation resultswith small samples are biased due to neglecting the short-run dynamic reactions between variables (Banarjee et al. 1993). Alternatively, the distributions of least squares estimators in such cases are not normal. So, hypothesis testing is not dependable. The Engle-Granger method is based on the assumption that a co-integrated vector exists. However, using this method will lead to inefficiency if there is more than one co-integrated vector (Pesaran and Smith, 1998). To overcome these drawbacks, Johansen (1989) and Johansen and Juselius (1992) suggest maximum likelihood estimation method for convergence tests and co-integrated vector derivation. The Johansen-Juselius method may not be useful when model variables have different degrees of stationarity. In this study, we use the ARDL method because variables are not integrated to the same degree.

In the ARDL model, the optimal lag is selected for every variable using criteria such as Schwartz-Bayesian, Akaike and Hannan-Quinn. This approach estimates short-run and long-run relationships between the dependent variable and the explanatory variables simultaneously and does not require the same degree of integration. Moreover, the ARDL methodology is also applicable when variables are combinations of I(0) and I(1).

4-3-1- Auto Regressive Distributed Lag Model

Equation (9) shows a general dynamic model:

$$Y_t = aX_t + bX_{t-1} + cY_{t-1} + u_t \quad (9)$$

To reduce the bias of coefficient estimatesin small samples it is better to implement models with many lags (Pesaran and Shin (1995)), such as in equation (10):

$$\emptyset(L,P)Y_t = \sum_{i=1}^{k} b_i(L,q_i)X_{it} + c'w_t + u_t \quad (10)$$

where $Y_t and X_{it}$ are,respectively, dependent and independent variables. "L" represented a lag operator, "P" represented the number of lags used for the dependent variable, "q" represents the number of lags used for independent variables, and w_t is an S ×1 vector of predetermined variables (such as intercept, dummy variables, trend and other exogenous variables) (Pesaran and Pesaran(1997)). The model described above is called an ARDL where:

$$\emptyset(L,P) = 1 - \emptyset_1 L - \emptyset_2 L^2 - \cdots - \emptyset_p L^p \quad (11)$$

$$b_i(L,q_i) = b_{i0} + b_{i1}L + \cdots + b_{iq}L^q \; i = 1,2,\cdots,k \quad (12)$$

The optimal number of lags for any variable can be determined bytheAkaike (AIC), Hannan-Quinn(HQC), Schwartz- Bayesian (SBC) or adjusted R squared methods. The SBC is normally used in samples withless than 100 observations to reduce the loss of degrees of freedom. By reducing the number of lags this criteria can provide more degrees of freedom (Pesaran et al., 2001). We use the dynamic model to calculate long-run coefficients. We can use the following equation to obtain the long run coefficients of the variable X:

$$\theta_i = \frac{\hat{b}_i(L,q_i)}{1 - \emptyset\hat{}(L,P)} = \frac{\hat{b}_{i0} + \hat{b}_{i1} + \cdots + \hat{b}_{iq}}{1 - \emptyset\hat{}_1 - \emptyset\hat{}_2 - \cdots - \emptyset\hat{}_p} \quad , \quad i = 1,2,\cdots,k$$

The t-statistics for the long-run coefficient estimates can also be calculated by equation (13).Inder (1993) has shown that t-statistics derived for θimeet the usual criteria for hypothesis testing. So we can perform valid tests about the existence of a long-run relationship with θ_i. In the ARDL method, one uses a 2-step approachto estimate the long-run relationships.

In the first step, the existence of a long-run relationship between underlying variables is tested (Banerjee et al., 1993). There are two ways to determine whether the long-run relationship is spurious. After estimating the ARDL dynamic modelthe following hypothesis can be tested:

$$H_0: \sum_{i=1}^{p} \varphi_i - 1 \geq 0$$

$$H_a: \sum_{i=1}^{p} \varphi_i - 1 < 0$$

The null hypothesis posits that there is no long-run relationship or co-integration among the variables because in orderfor the dynamic short-run relationshipto move toward long-run equilibrium the sum of the estimated coefficients must be less than 1.To carry out this test, which was first performed byBanerjee et al (1993), one is subtracted from the sum of lagged coefficientsfor the dependent variable and the result is divided by the sum of standard errors of the lagged coefficients. The resulting statistic will have a t-distribution:

$$t = \frac{\sum_{i=1}^{p} \widehat{\emptyset}_i - 1}{\sum_{i=1}^{p} S_{\widehat{\emptyset}_i}}$$

If the absolute value of the calculated t is more than the critical value of t given by Banerjee et al. (1993), at the 95% confidence level, then the null hypothesis is rejected and the existence of a long-run relationship is accepted. This is the approach used in the currentstudy.

A second way, offered by Pesaran and Shin (1996), examines the existence of a long-run relation among the underlying variables through calculating the F-statistic used for testing the significance of lagged levels of variables in an Error Correction Model.

4-3-2- Error Correction Model

Granger (1985) suggests that if there is a co-integration relation between two variables, then Granger causality will exist in at least one direction. However, although a co-integration test can determine the existence of Granger causality between variables it cannot determine the direction of this relation. Engle and Granger (1987) indicate that if two variables $X_t$andY_t are co-integrated then a relationship will exist that can be measured with a Vector Error Correction Model (VECM). Therefore, we can use a VECM to investigate Granger causality among variables. A VECM allows a dependent variable to be explained by independent variables, while allowing the dependent variable to fluctuate around its long-run equilibrium (shown by the disturbance term). Such a model, which connects the short-run and the long-run behavior of two variables, is shown in the following equation:

$$\Delta Y_t = \alpha + \sum_{i=1}^{m} B_i \Delta Y_{t-i} + \sum_{i=1}^{n} \gamma_i \Delta X_{t-i} + \lambda\varepsilon_{t-i} + V_t - K\lambda < 0 \quad (13)$$

The disturbance term $(\lambda\varepsilon_{t-i})$ in the error correction model (equation (13)) introduces an additional way to examine causality which has been overlooked in Granger-Sims causality tests. If the underlying variables are I(1) and co-integrated, then using a vector auto regressive model in first differences, instead of a VECM (when examining the Granger causality relationship), increases the regression equation variance by eliminating the error correction term $(X_{t-1} - BY_{t-1})$, and so the Wald-statistic will be biased. This problem could cause incorrect conclusions about the direction of causality.

A vector error correction model enables us to distinguish between short-run and long-run Granger causality in addition to determining the direction of Granger causality relation. If λ is not significantly different from zero in equation (13), there is no long-run Granger causality relationship between the explanatory variables and the dependent variable, or that the dependent variable is weakly exogenous. If the sums of the lagged coefficients for all of the explanatory variables are insignificant, and λ is insignificant, there is no type of Granger causality relationship between any of the explanatory variables and the dependent variable (Masih and Masih, 1997).

5- Equation Estimation

5-1- Stationary Test of Variables

Stationary tests results are reported in Tables 1 and 2. GDP growth and non-oil GDP growth are stationary variables but savings is a non-stationary variable in levels. Savings becomes stationary after taking the first difference (Table 3), so it is an I(1) variable. Since our underlying variables are I(0) and I(1) we can use the ARDL model.

Table 1. Stationary Test in Levels with Intercept

ADF			P.P	
variable	t-Statistic	Prob.	Adj.t-Stat	Prob.
LGDP	-3.7717	0.0068	-3.6295	0.0098
LGDPO	-3.5565	0.0118	-3.3529	0.0194
LS	-0.5971	0.8592	-0.5861	0.8617

Table 2. Stationary Tests in Levels with Intercept & Trend

ADF			P.P	
variable	t-Statistic	Prob.	Adj.t-Stat	Prob.
LGDP	-3.3128	0.081	-3.4481	0.060
LGDPO	-3.1105	0.1196	-3.3783	0.0699
LS	-2.3098	0.4183	-1.3587	0.8565

Table 3. Stationary Test for Savings Variable using First Differences along with Intercept and Trend

ADF			P.P	
	t-Statistic	Prob.	Adj.t-Stat	Prob.
LS Coefficient using Intercept	-4.8815	0.0003	-4.7971	0.0004
LS Coefficient using Trend and Intercept	-5.3060	0.0006	-5.8543	0.0001

5-2- Estimation Results and Causality Direction of the Impact of Savings on Economic Growth

The existence of a long-run relationship among the variables under study should be verified to justify the use of ARDL method. We use Microfit 4 software and multiple lags on the variables for this test. The results with optimal lags and the Banerjee-Dolado-Master statisticare shown in Table 4. The existence of a long-run relationship between the variables is verified by comparing the calculated and critical values of the Banerjee-Dolado-Master statistic. The estimated long-run relationship (with standard errors in parentheses) is:

$$LGDP = 1.88C + 0.94LS \quad (14)$$
$$(0.330)(0.000)$$

$$LGDPO = -5.21C + 1.58LS \quad (15)$$
$$(0.202)(0.000)$$

Table 4. Effect of Economic Growth on Savings: Optimal lag value and Banerjee-Dolado-Master Statistic

Critical Banerjee – Dolado-Master statistic	Calculated Banerjee –Dolado-Master statistic	Optimal lag	Model
-3.28	$t = \frac{0.8831 - 1}{0.0328} = -3.5640$	ARDL(1,1)	Effect of savings on economic growth
-3.28	$t = \frac{0.9064 - 1}{0.0254} = -3.6850$	ARDL(1,0)	Effect of savings on non-oil economic growth

The estimated relationships, equations (14) and (15), show that savings have a positive and significant effect on economic growth and non-oil economic growth in the long-run. Saving increases lead to increases in economic growth and those impacts for the non-oil economy are larger than for the oil economy. However, the existence of long-run relationship between variables only indicates that there is a causal relation, but it doesn’t address its direction.

Since finding the direction of causality is a goal of the current study we use the Error Correction Model (ECM) and Wald Test to determine the direction of causality (Table 5). The results of the long-run causality test indicate that the causal direction is from savings to economic growth (including non-oil growth) and this relation is a direct (positive) casual relation.

Table 5: Long-Run Joint Causality Test Results from Savings to Economic Growth

Dependent Variable	Independent Variable	Null hypothesis	Wald statistics	Probability	Causality
LGDP	LS ECM(-1)	$A_2 = 0$ $A_3 = 0$	78.42	0.000	LS→LGDP
LGDPO	LS ECM(-1)	$A_2 = 0$ $A_3 = 0$	33.68	0.000	LS→LGDPo

5-3- Relation Estimation and Causality Direction of the Impact of Economic Growth and Economic Growth Without Oilon Savings

This analysis is performed in the same way as in the previous section. The difference is that here we investigate the effect of economic growth on savings. Table 6 presents the optimal lag values and the calculated Banerjee-Dolado-Master statistics. Since the absolute value of the calculated Banerjee-Dolado-Master statistic is greater than the critical value, the null hypothesis of no long-run relationship is rejected. The estimated long-run relationship (with standard errors in parentheses) is:

$$LS = 2.05C + 1.06LGDP \quad (16)$$

(0.395) (0.000)

$$LS = 2.45C + 0.707LGDPO \quad (17)$$

(0.349) (0.002)

Table 6: Effect of Economic Growth on Savings; Optimal Lag Values and Banerjee –Dolado-Master Statistics

Critical Banerjee –Dolado-Master statistic	Calculated Banerjee –Dolado-Master Statistic	Optimal lag	Model
-3.28		ARDL(1,1)	Effect of Economic Growth on Savings
-3.28		ARDL(1,1)	Effect of Economic Growth Without Oil on Savings

We can see that economic growth and non-oil economic growth has a positive and significant effect on savings and that this effect is larger for the total economy than for the non-oil economy. The direction of long-run causality from economic growth to savings is confirmed in Table 7.

Table 7: Long-Run Joint Causality Test Results from Economic Growth to Savings

Dependent variable	Independent variables	Null hypothesis	Wald Statistic	Probability	Causality
LS	LGDP ECM(-1)	$A_2 = 0$ $A_3 = 0$	79.43	0.000	$LGDP \rightarrow LS$
LS	LGDPO ECM(-1)	$A_2 = 0$ $A_3 = 0$	21.64	0.000	$LGDPO \rightarrow LS$

6. Conclusion and Suggestions

It is common knowledge that savings is an important variable that affect economic growth. In the traditional literature, savings increases lead to economic growth and higher economic growth causes more savings. However, in most studies the role of savings on economic growth and economic growth on savings in the short-run and long-run is not investigated thoroughly. Although, the effect of these variables on each other is analyzed in some studies, the direction of causality is overlooked in many of them.

In this study, we investigate the relationship between savings and economic growth (including an analysis of the non-oil sectors) and performed long-run causality tests.

By using annual time series data during 1972-2010 and the ARDL and ECM models we were able to do provide estimates both for the short-run and the long-run relationships. The results of this paper show that there is a positive and significant effect of savings on both types of economic growth and vice versa in the long-run. The direction of causality shows a mutual relationship between these variables.

It is clear from the results that policy makers in Iran need to stimulate savings in order to increase economic growth. Since saving includes both private and public savings, and public savings largely depend on oil revenues, conditions should be improved to encourage the private sector to increase savings. The demands for public sector spending are very large under the current severe economic sanctions, so public savings are minimal. Private savings is the only feasible means for providing investment funds.

References

Abu, N. (2010). "Saving –Economic Growth Nexus in Nigeria, 1970-2007: Granger Causality and Co- Integration Analyses," Review of Economic & Business Studies, Vol. 3, p. 93-104.

Banerjee, A.,Dolado, J., Galbraith, J. W., Hendry, D.,(1993).Co-integration, Error-Correction, and the Econometric Analysis of Non-Stationary Data, Advanced Texts in Econometrics. Oxford, UK: Oxford University Press.

Barro, R. J., and X., Sala-i-Martin (1995).Economic Growth. New York: McGraw-Hill.

Dickey, D. A., and W.A., Fuller. (1981)."Likelihood Ratio Statistics for Autoregressive Time Series With a Unit root,"Econometrica, Vol. 49, p. 1057-1072.

Dipendra, S. (2009). "Saving and Economic Growth in India", Munich Personal RePEc Archive,Vol. 199, p. 1-18.

Engle, R.F. and C.W.J., Granger (1987)." Co-Integration and Error Correction : Representation

Estimation and Testing,"Econometrica , Vol. 55, p. 251-276.

Hemmi, N. et al. (2007). "The Long-Term Care Problem, Precautionary Saving, and Economic Growth,"Journal of Macroeconomics, Vol 29, p. 60–74.

Inder, B. (1993) "Estimating Long-run Relationships in Economics", Journal of Econometrics, 57, 53-68.

Johansen, S., and K. Juselius (1992). "Testing Structural Hypothesis in a Multivariate Co-Integration Analysis of the PPP and UIP for UK,"Journal of Econometrics, Vol. 53, p. 211 –244.

Kindleberger, C. (1965) Economic development. McGraw-Hill, New York, NY.

Masih, A.M.M., and R. Masih (1997). "On the Temporal Causal Relationship Between Energy Consumption, Real Income and Prices: Some New Evidence from Asian Energy Dependent NICs Based on a Multivariate Co-Integration/Vector Error Correction Approach," Journal of Policy Modeling, Vol 19, p. 417-440.

Mohan, R (2006). "Causal Relationship Between Savings and Economic Growth in Countries with Different Income Levels," Economics Bulletin, Vol. 5, p. 1−12.

Odhiambo, N, M. (2008). " Financial Depth, Savings and Economic Growth in Kenya: A Dynamic Causal Linkage," Journal of Policy Modeling, Vol 31, p. 708–718.

Odhiambo, N, M. (2009). "Savings and Economic Growth in South Africa: A Multivariate Causality Test," Journal of Policy Modeling, Vol 31, p. 708–718.

Pesaran, M.H. and Y. Shin (1995). "An Autoregressive Distributed Lag Modeling Approach to Co-Integration Analysis,"Cambridge University, p. 134-150.

Pesaran, M.H., and Y. Shin (1996). "Co-Integration and Speed of Convergence to Equilibrium," Journal of Econometrics, Vol 71, p. 43-117.

Pesaran , M.H. and B. Pesaran(1997).Working with Microfit 4.0: Interactive Econometric Analysis, Oxford: Oxford University Press.

Pesaran, M. H. and R. Smith (1998). "Structural Analysis of Co-Integration VARs,"Journal of Economic Surveys, Vol. 12, p. 471-505.

Pesaran , M. H., Y. Shin, and R. Smith (2001). "Bounds Testing Approaches to the Analysis of Level Relationships,"Journal of Applied Econometrics, Vol. 16, p. 289-326.

Masih, R. and S. Peters (2010). "A Re-Visitation of the Savings–Growth Nexus in Mexico," Economics Letters, Vol. 107, p. 318–330.

Phillips, P. C. B. and P.Perron (1988). "Testing for a Unit Root in Time Series Regression", Biometrika, Vol. 75, p. 335-346.

Romer, D. (2006).Advanced Macroeconomics (3rd ed.). New York: McGraw-Hill.

Sajid,G.M., and M.Sarfaraz (2008). "Savings and Economic Growth in Pakistan: An Issue of Causality," Pakistan Economic and Social Review, Vol. 46, p. 17-36.

Schumpeter, J. (1939), "Business Cycles: A Theoretical, Historical, and Statistical Analysis of the Capitalist Process" (2vol), New York: McGraw-Hill.

Singh, T. (2010). "Does Domestic Saving Cause Economic Growth? Time-Series Evidence from India,"Journal of Policy Modeling , Vol. 32 , p.231–253.

Tinaromm, A. (2005). "The Relationship Between Saving and Growth in South Africa: A Time Series Analysis," South Africa Journal of Economics, Vol. 73, p. 171-189.