# Economic Growth and Savings in GCC:A Cointegration and Causal Relationship Analysis

**Ibrahim Alomar**
Associated Prof. at Economics and Finance Dept.
Qassim University
Visiting Asso. Prof. at Economics Department,
Kansas State University.

## Abstract

*While Long run growth theories imply that economic growth is associated with accumulating of the physical capital by more domestic savings, easy transfer of the savings across borders or having financial excess resulted from selling natural resources change nature or results of these theories. This study aims to investigate the relationship between domestic savings and economic growth of GCC. Using time series annual data, the cointegration method was used to conduct nature of the relationship. The main finding is pointing to such a relationship between Domestic savings and economic growth in all of the GCC with different level of significant. The findings suggested that the economic growth rate Granger causes growth rate of savings in 4 countries. The opposite results prevailed in one country, which is Oman. In Bahrain only, a bi directional causality was found. Based on the empirical results, the main conclusion of this study is that income source of a country does play an important role in determining the direction of causality. In those countries where most income comes from natural resources, direction of the causality is from economic growth to domestic savings.*

## 1. Introduction

Saving in the economic literature is well known, as a sacrifice of current consumption to provide for the accumulation of capital, where in turn, is necessary for any additional output. In this regard, savings of the citizen and their governments is a key central for economic growth.  Also, countries those have high saving rates for long periods of time tend to have a large and sustained economic growth. An example of that is the experience of the developing countries in East Asia during last decades.  This kind of relationship is quantitatively strong and robust to different types of data (Attanasio et. al. 2000, and Banerjee and Duflo 2005).On the other hand, many recent studies have concluded that economic growth contributes to savings (Sinha and Sinha, 1998, Salz, 1999). In this case, it is important for the countries of Cooperation Council for the Arab States of the Gulf (called after by GCC) to estimate this kind of relationship between domestic savings and economic growth. Such results can help to improve developing suitablepolicies in these countries. Yet, this is in need for determination of the causality direction between economic growth and domestic savings.  The study target is to determine if there is a connection between domestic saving and economic growth and the possibilities and limits of a savingbased growth agenda, in the context of the GCC economy. That means this study will examine the long-run relationship between economic growth and domestic savings using suitable econometrics method in GCC.To formally examine the relationship between savings and economic growth, this study investigates whether the causality is from savings to economic growth or vice versa.

The GCC have some unique features that lead to unique results. The GCC are relatively low populated countries, rich of natural resources, and high of financial surplus. These features might lead to a different causality relationship. The choice of this country is motivated by the fact that research on this issue for GCC has been limited. In addition, the database for GCC is considered relatively good by developing country standards. The use of annual data covering the period1980 to 2010 is sufficiently long to allow for a meaningful time series investigation. The rest of this article is organized as follows: Section II provides an overview of the literature review.  Data description is going to be discussed in the third section. Econometric methodology is set out in Section four. In Section five, it presentsthe empirical results. Finally, conclusion and results tables are in the last section.

## 2. Literature Review

The existing literature on this subject in general has been noticed long time.  In the past, literature on economic growth has found that countries with higher saving or investment rates have tended to have higher growth rates (Levine and Renelt, 1992). These results and findings consist with the traditional Solow (1956) growth model.  In Solow model, higher saving leads to higher level ofincome per capita in steady state and thus to higher growth rates.  Edwards (1995) concluded that per capita growth is one of the most important determinants of both private and public savings. Inthe new growth models of Romer (1987) and others, higher saving leads to a permanently higher rate of growth.In the empirical works, most use contemporaneous correlation and dynamic models. These works attempted to correlate savings and economic growth.In this regard, many attempts focused on the dynamic relationship of national savings and economic development using causalitymethods. DeGregorio (1992), and Jappelli and Pagano (1994) conducted a panel data regression and concluded that a higher savings rateratio led to higher economic growth.

A recent study of group countries by Krieckhaus (2002) showed that a higher level of national savings could explain higher economic growth as a causal relationship. Caroll and Weil (1994) tried finding the relationship between savings and economic growth. In their work, they showed that the economic growth and investment relationship depends on the utility of consumption and saving habit.  Anoruo and Ahmad (2001) investigated the causality of savings and economic growth in seven African countries using VEC. The authors found that in four out of seven countries, economic growth Granger caused the growth rate of domestic savings. However, they obtained a bi-directional causality in two countries. Only in one country, did the opposite result where the growth rate of domestic savings Granger caused economic growth. Mavrotas and Kelly (2001) used the Toda and Yamamoto method to test for Granger causality.

Using data from India and Sri Lanka, the relationship among gross domestic product, gross domestic savings, and private savings was examined in this study. The authors found no causality between GDP growth and private savings in India. However, bi-directional causalitywas found in Sri Lanka.Baharumshah et al. (2003) investigated growth rate of savings behavior in five Asian countries. Based on time series data from 1960-1997, using VEC, the authors found that growth rate of savings didnot Granger cause economic growth rate in the countries, except for Singapore.Ramesh (2009) investigated the direction of causality in 17 countries using VAR and VEC models. His study found that for nine countries the causality is from the economic growth rate to growth rate of savings. For only two countries, the direction of causality was reversed. There were four countries where no causality was found. Other two countries bidirectional causality was detected.  Their study ended with a conclusion that higher growth rates of real GDP contribute to a higher growth of savings.

This study aims to study the relationship between GCC economy'sgrowth rate and their domestic savings growth rate.  It also targets studying the direction of the causality during the period of time from 1980 to 2010.

## 3. Data

To conduct its results, this study uses annual data from 1980 to 2010 for a panel of 6 Countries. The collected data are macro data for growth of the GDP, and total domestic savings. Some of the data came from International Financial Statistics database, while the rest came fromWorld Development Indicators online 2013. Domestic Savings series are not directly presented in the row data. They are calculated from the GDP and the final consumption expenditure (total consumption). The variables used in this study are LogGDS (log of Gross Domestic Savings) and LogGDP (log of Gross Domestic Product). GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. The aim of this study is to identify the causality between the two variables in each country. Thus, all the data used are in terms of a constant local currency unit (constant LCU).The countries include Saudi Arabia, Kuwait, Bahrain, Qatar, United Arab Emirates, and Oman. There were no missing data for all countries and the whole period of time.

## 4. Empirical Methodology

The target of this study is to test existing of the relationship between economic growth and savings in GCC.  If this kind of relationship exists, the next is to test the direction of causality between these countries.

To do so, an ADF test is being conducted to indicate that the GDP and saving series have unit roots in the level data for all countries based on these equations:

$$\Delta X = \beta X_{t-1} + \sum_{i-2}^{p} \eta_i \, \Delta X_{t-1+i} + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots .1$$

$$\Delta X = \alpha_\circ + \beta X_{t-1} + \sum_{i-2}^{p} \eta_i \, \Delta X_{t-1+i} + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots .2$$

$$\Delta X = \alpha_\circ + \beta X_{t-1} + \delta t + \sum_{i-2}^{p} \eta_i \, \Delta X_{t-1+i} + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots .3$$

Where X is log of the variables series, p is the maximum lag, and ε is the stationary random error. The first equation is a test of pure random walk since there is no time trend and intercept. The hypothesis test is to test if β = 0 or not. Equation 3 is being tested in the begging. In case of rejecting the null, one should go back to test equation 2 and 1, which are more restricted. In the presence of unit roots, the variables need to be differenced one year or more in order for the series to be stationary. It is well known that without differencing the data, a causality test is meaningless and would lead to misspecification. The asymptotic distributions of the Granger causality test statistics are nonstandard with no stationary time series. By differencing log saving, the series become the growth rates of national saving. This leads the hypothesis to focus on the relationship and causation direction between the GDS and GDP of GCC countries.

The second step is to estimate an existing of cointegration using the Johansen (1988) method for each of the two variables that is I(1) in the GCC. To estimate the cointegration rank and vector, the following $\lambda_{trace}$ and $\lambda_{max}$ statistics test are being used where

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^{n} \ln(1 - \lambda i) \ldots\ldots\ldots\ldots\ldots\ldots\; 4$$

$$\lambda_{max}(r, r+1) = -T \ln(1 - \lambda_{r+1}) \ldots\ldots\ldots\ldots\ldots\; 5$$

for the $\lambda_{trace}$ statistics, the null hypothesis is that the number of cointegrating vectors is less than or equal to r against r =1,2,3,4…, while in case of $\lambda_{max}$ statistics, the null hypothesis is that the number of cointegrating vectors is less than or equal to r against r = r + 1.

In the last stage of this study, a VEC model suggested by Engle and Granger (1987) is being used to investigate the causality between variables of the study. The model can be written as the following:

$$d \begin{bmatrix} \log GDP_t \\ \log GDS_t \end{bmatrix} = \begin{bmatrix} \beta_1 \\ \beta_2 \end{bmatrix} + \sum_{i=1}^{s} d \begin{bmatrix} \emptyset_{11i} & \emptyset_{12i} \\ \emptyset_{21i} & \emptyset_{22i} \end{bmatrix} \begin{bmatrix} \log GDP_{t-i} \\ \log GDS_{t-i} \end{bmatrix} + \begin{bmatrix} \lambda_1 \\ \lambda_2 \end{bmatrix} [Z_{t-1}] + \begin{bmatrix} e_{1t} \\ e_{2t} \end{bmatrix} \ldots .6$$

Where accordingly, $d$ is the first difference, s is the optimum lag length, Z is the error correction term lagged by one period, and e is white noise error. These three steps are being followed to get the empirical results of this study.

## 5. Empirical Results

The first concern is to test stationary of the whole GCC countries. The ADF test has been used. It indicates that both logGDP and logGDSseries have unit roots in the level data. They are presented in table 1. In this table at the 1% significance level, the statistics accept as a whole strongly suggest that the both panels at levels contain a unit root. In the presence of unit roots, the variables need to be differenced in order for the series to be stationary. Table 2 indicates that both panel series are stationary at their first differences. Since both test results suggest that logGDP and logGDSshould be taken as I(1) panel series, these series become the growth rates of gross domestic of production and Savings. In this case, one should proceed totest for the direction of causation of the variables. Of course, this is after proving existing of the cointegrationrelationship among its variables.Table 3 gives Johansen Fisher panel test results for possible cointegration between logGDP and logDS.For all panels, the Johansen Fisher Panel cointegration significantly rejects the null of no cointegration at the 1% level.

Theseoutcomes suggest a long run equilibrium model of the variables overall. Table 4 gives individual cross section results for possible cointegration between logGDP and logGDS based on individual countries. Based on this result, all countries show significant existing cointegration between logGDP and logGDS at level of 5%, exceptQatar, which does at 10%. Confirmation ofcointegration implies that the variables in the system move together in the long run. Hence, it can be shown that there is a stable long-run relationship between GDP and savings for the whole GCC.In the six economies which GDP and savings were cointegrated, Granger causality test is being conducted to know direction of the causality. The Variables of this study that were cointegrated were estimated using the VEC model. Table 5 summarizes results of the granger causality test. Only one country (Bahrain) showed a bi directional causality. Overall empirical results revealed that the economic growth rate Granger caused the growth rate of savings in four countries. These countries include Kuwait, Saudi Arabia, Qatar, and United Emirates. On the other hand, in Oman the growth rate of savings Granger caused economic growth rate.

The traditional view that higher savings leads to higher investment and higher economic growth is not supported by GCC case. Instead, the result of this study showed that the causality is from economic growth rate to growth rate of savings. This result is supported with Salz (1999), and Baharumshah et al. (2003). The result is not surprising because of the high income in GCC in general. Producing oil and Natural gas and exporting them leads the development and growth to rely on them instead of domestic savings as endogenous variable. This interpretation is not valid for Oman while it does not depend on oil production as other GCC.

## 6. Conclusion

Long run growth theories imply that economic growth is connected to more investment. Yet, accumulating physical capital by more savings is necessary to have more investment. The Solow model and the club convergence theory provide a basis forexpecting higher income per capita levels with more capital per capita. A number of cross-country studies showed the catching up effect to various clubs based on a nation's initial per captaincome. However, easy transfer of the savings across borders makes national savings less important than used to be. This study aims to investigate the relationship between thedomestic savings and economic growth for GCC. Using time series annual data,the cointegration method was used to conduct nature of the relationship between domestic savings of the GCC and their economic growth. The main finding of this work was pointing to such a relationship between Domestic savings and economic growth in all of the GCC with different level of significant. Such an existence of long relationship leads to investigate the causality direction between variables of the study. The objective was to determine whether the direction ofcausality starts from savings to economic growth or the opposite. The findings suggested that the economic growth rate Granger causesgrowth rate of savings in 4 countries. The opposite results prevailed in one country, which is Oman. In Bahrain only, a bi directional causality was found.

Based on the results, the study favors the hypothesis that the causality in GCC isfrom economic growth rate to growth rate of savings. Based on the empirical results, the mainconclusion of this study is that income source of a country does play an important role in determining the direction of causality. In those countries where most income comes from natural resources, direction of the causality is from economic growth to domestic savings.

## 7. Tables
### Table 1: Unit Root ADF Test by level for LogGDP and logGDS in GCC

| Country           ADF T | Log GDP | LogGDS |
|---|---|---|
|  | P-Value | P-Value |
| All GCC Countries | 0.9999 | 1.0000 |
| Bahrain | 0.9980 | 0.9930 |
| Kuwait | 0.9633 | 0.9580 |
| Oman | 0.9796 | 0.9367 |
| Qatar | 1.0000 | 0.9957 |
| Saudi Arabia | 0.9973 | 0.9214 |
| United Arab Emirates | 0.9994 | 0.9672 |

Null Hypothesis: Unit root by Level (individual unit root process).

### Table 2: Unit Root ADF Test by D(1) for LogGDP and LogSAV in GCC

| Country          ADF T | Log GDP P-Value | LogGDS P-Value |
|---|---|---|
| All GCC Countries | 0.0000 | 0.0000 |
| Bahrain | 0.0015 | 0.0152 |
| Kuwait | 0.0001 | 0.0029 |
| Oman | 0.0000 | 0.0000 |
| Qatar | 0.0050 | 0.0159 |
| Saudi Arabia | 0.0017 | 0.0186 |
| United Arab Emirates | 0.0053 | 0.0022 |

Null Hypothesis: Unit root by D(1) (individual unit root process).

### Table 3: Johansen Fisher Panel Cointegration (Trace and Maximum Eigen Value Test)

| Type | Hypothesized No. of CE(s) | Trace test | Prob. | Max-Eigen test | Prob. |
|---|---|---|---|---|---|
| Economic Growth and National Savings | None | 76.28 | 0.0000 | 47.99 | 0.0000 |
| | At Most One | 62.12 | 0.0000 | 62.12 | 0.0000 |

### Table 4: Individual (GCC ) Cross Section Results

| Hypothesized No. of CE(s) | Country | Max-Eigen Test | Prob. | Trace Test | Prob. |
|---|---|---|---|---|---|
| None | BH | 10.0529 | 0.0162 | 18.6372 | 0.0162 |
| | KW | 25.3452 | 0.0000 | 38.5917 | 0.0000 |
| | OM | 18.0048 | 0.0017 | 24.5280 | 0.0017 |
| | QT | 9.4847 | 0.0429 | 13.6545 | 0.0429 |
| | SA | 10.1584 | 0.0186 | 18.2643 | 0.0186 |
| | UA | 25.9407 | 0.0001 | 31.5308 | 0.0001 |
| At most one | BH | 8.5843 | 0.0034 | 8.5843 | 0.0034 |
| | KW | 13.2465 | 0.0003 | 13.2465 | 0.0003 |
| | OM | 6.5232 | 0.0106 | 6.5232 | 0.0106 |
| | QT | 4.1698 | 0.0911 | 4.1698 | 0.0911 |
| | SA | 8.1059 | 0.0044 | 8.1059 | 0.0044 |
| | UA | 5.5901 | 0.0181 | 5.5901 | 0.0181 |

### Table 5: Result of Granger Causality Tests

| Country | Savings granger causes Economic Growth | Economic Growth causes granger Savings | Bi directional causality |
|---|---|---|---|
| Bahrain | | | * |
| Kuwait | | * | |
| Oman | * | | |
| Qatar | | * | |
| Saudi Arabia | | * | |
| United Emirates | | * | |

## Figures6: graphs of the study series
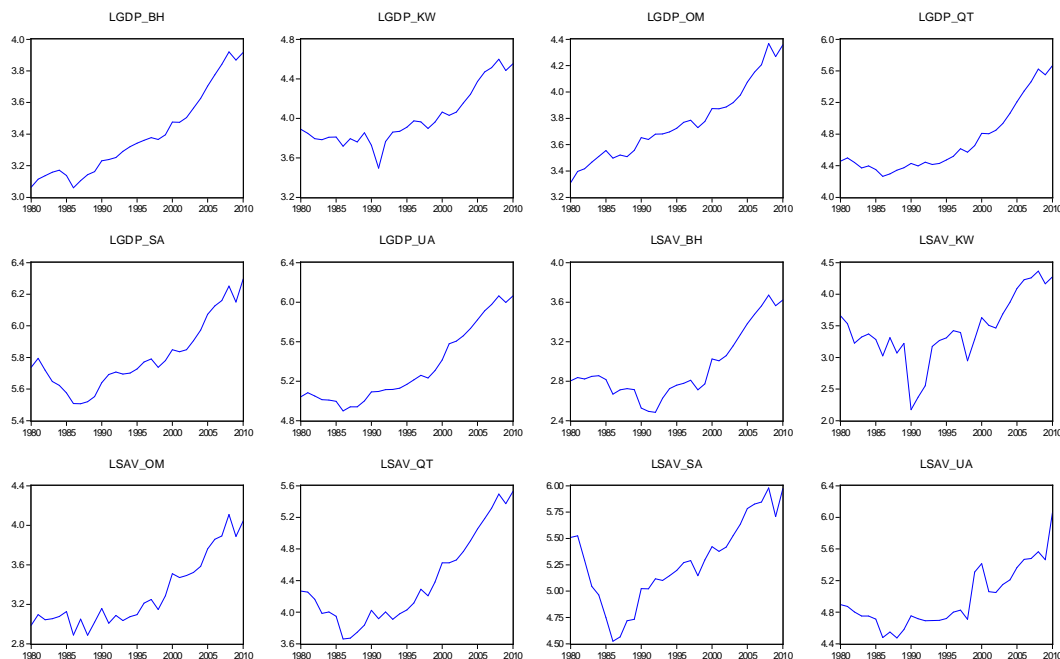


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