THE EFFECT OF INTEREST RATE, INFLATION RATE AND GDP ON NATIONAL SAVINGS RATE[1]

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Abstract

The study aims at investigating the effect of Real Gross Domestic Product (GDP), interest rate, and inflation rate on national saving rate in kingdom of Bahrain over the last twenty years. The study adopts Augmented Dickey-Fuller unit root test and cointegration test to examine the long run relationship between the variables under study. The findings indicate that the Real GDP growth rate has positive effect on national saving in the short run and significant at 5% level in the long run. Nominal interest rate has positive and significant effect on national saving rate at 1%level on the short run; however, its effect in the long run appears to be positive but insignificant, while the inflation rate (as a measure of macroeconomic uncertainty) has positive and significant effect on national saving rate in both the short run and the long run.

Keyword: National Savings, GDP, Inflation, Interest, Bahrain.

1. Introduction

National savings defined as the sum of public and private savings of a nation. It is generally equal to a nation's income minus consumption and government purchases. Growth theories have shown that savings is a necessary ingredient to finance investment which would enhance a nation's productivity.

National savings in kingdom of Bahrain represents 28% of GDP on average over the last twenty decades, which is considered one of the highest saving/GDP ratios in emerging economies. Because of the availability of adequate savings for productive long run investment, Bahrain had consistently achieved a high rate of growth with relative price stability.

The objective of the current study is to estimate the national saving function for Bahrain economy over the last twenty years; therefore the study tries to answer the following questions:

-Is the effect of inflation on national savings rate significant?
-Is the effect of interest rate on national savings rate significant?
-Is the effect of real GDP growth rate on national savings rate significant?

The study framework depends on the life-cycle model by Modigliani (1966) that represents the standard theory for the explanation of changes in savings over time and across countries. The attractiveness of the life cycle model for our analysis lies on both in its elegant formulation of the effect of growth and the interest rate on saving, and the flexibility provided for incorporating other relevant theoretical considerations to form an integrated analytical framework without changing the basic structure of the model.

The study adopts unit root and cointegration tests, which allow for heterogeneity in parameters and dynamics, to examine the long run determinants of national savings rate in Bahrain during the period of study. These techniques are more powerful than the conventional tests and overcome the inconsistency problem of the fixed effect estimator typically employed in some previous studies of saving behavior.

The choice of Bahrain economy is motivated by the shortage of studies and research on the current issue for Bahrain. In addition, the database for Bahrain is considered relatively good by developing country standards.

The plan of the study is as follows. Section two briefly reviews related literatures. Section three discusses the sources of data and model specification. Section four presents methodology and empirical results. Policy implications and conclusion are presented in section five.

2. Literature Review

Economic theory argues that saving is an increasing function of income. However, in a macroeconomic context, savings, like other economic variables, depend on a numbers of factors. Saving is expected to depend on the overall health of the economy represented by the growth of real GDP because growth and savings are closely related in the virtuous circle of "saving-investment-growth-saving", and this process also depends on how savings are efficiently channeled into productive investment. Moreover, expected inflation and interest rate are also important determinants of saving.

GDP and income growth

The fundamental assumption of the life-cycle hypothesis is that an individual seeks to maximize the present value of lifetime utility subject to the budget constraint. The theory predicts that consumption in a particular period, and thus the decision to save, depends on expectations about lifetime income. According to this theory, the lifetime of an individual is divided into working period and retirement period. Individuals are assumed to be net savers during the working period and dissevers during the retirement period. In the light of that, growth of per capita income will result in an increase of aggregate savings rate, because it increases the lifetime earnings and savings of younger age groups relative to older age groups. Thus countries with higher GDP growth rate and so higher per capita growth rate are expected to have higher savings ratios than countries with lower growth rates. However, there is another view indicates that the size of this effect is likely to decline as per capita income rises and may even become negative for rich countries where investment opportunities and growth are relatively lower.

Interest rate

The life-cycle theory introduced that the net effect of the real interest rate on savings is ambiguous. The net effect of the real interest rate on savings can be decomposed into two effects. The substitution effect implies that a higher interest rate increases the current price of consumption relative to the future price, and thus affecting savings positively. The other effect, which is called the income effect, indicates that if the household is a net lender, an increase in the interest rate will increase lifetime income, and so increase consumption and reduce saving. Therefore, it is expected that the interest rate will have a positive impact on savings ratio only when the substitution effect dominates the income effect. In developing countries where financial markets are still not well developed, substitution effect is expected to be much greater than income effect, and thus the real interest rate is likely to have a net positive impact on domestic savings. However, the complexity and distortions in both the real and the financial sides of the economy tend to reduce the benefits of an increase in interest rates, and thus the positive impact on domestic savings may not be achieved.

Inflation

A third issue relates to the role of inflation in determining saving. In the standard life-cycle model the only impact of inflation on savings is through its role in determining real returns to savings (the real interest rate). This postulate is based on the implicit assumptions of inflation neutrality (the absence of money illusion) in saving behavior and the absence of the real balance effect of inflation. There are, however, good reasons for doubting the validity of these assumptions. First, inflation brings about uncertainty in future income streams and can thus lead to higher saving on precautionary grounds. This may be particularly true for households in developing countries whose income prospects are much more uncertain than their counterparts in developed countries. Second, inflation could influence savings through its impact on real wealth. If consumers attempt to maintain a target level of wealth or liquid assets relative to income, savings will rise with inflation. For these considerations, we include the inflation rate as an additional explanatory variable of national saving

The empirical studies that examine these determinants in developed and developing countries adopted several approaches. Some studies have concentrated mainly on fixed-effect models using OLS estimates to explain the variations in savings performance among countries. While other studies depended on some robust techniques such as cointegration and integration tests, which allow for heterogeneity in parameters and dynamics across countries in order to examine the long-run determinants of saving rates.

McKinnon (1973), Shaw (1973) and Giovanni (1985) empirically investigate the hypothesis that savings respond positively to changes in the real interest rate in Less Developed Countries (LDCs). They hinge their argument on the fact that the financial markets of these countries are not well developed, where self-financing and bank loans make up the bulk of investment funds, accumulation of financial saving is determined more by the desire to invest than the desire to live on interest income. As a result, the greater part of saving will be in the form of cash and near-money assets. Thus, the substitution effect will usually be much greater than the income effect of an interest rate change. In other word, they point out that the presence of very low responses of aggregate saving to the real interest rate.

Khan et. Al (1992) examined the determinants of the national saving rate in Pakistan. The study shows that income, real interest rate, changes in terms of trade and openness of the economy positively influenced national savings while foreign capital inflow discouraged national savings. Another study by Khan et al (1994), by using variety of factors that included income, real interest rate, dependency ratio, foreign capital inflows, foreign aid, changes in TOT and openness of economy. The study found a strong and positive effect of per capita GNP on national saving. In addition, it was found that real interest rate, change TOT and openness of the economy positively influenced national saving. On the other way, debt to GNP ratio and dependency ratio were found to have adverse impact on national saving.

Edwards (1996) examined the process of determination of saving rates by incorporating some policy-related, demographic, structural and political variables that possibly determine the saving ratio. Per capita income growth seemed to be the most important determinant of private and public savings. Moreover, the results indicated that public savings were lower in countries with higher political instability, and public savings crowded out private savings, but less than proportionately.

Mwega (1997) conducted a comparative analysis of average private saving rates in 15 African countries for the period (1970-1993) and he found a negative and highly significant coefficient on fiscal balance. Concretely, a 1% increase in government budget surplus was found to reduce the national saving rate by up to 0.9, implying full Ricardian Equivalence. The implication is that fiscal balance and private saving are perfect substitutes.

Masson et al (1998) examined the determinants of private savings for a large sample of industrial and developing countries using both time series and cross-section data. The results suggested that there was a partial offset to private savings from changes in public saving for industrial countries, whereas in developing countries demographics and GDP growth were the most important determinants of private saving rates. In another study, Cardenas and Escobar (1998) analyzed the determinants of saving in Colombia, the findings reinforced the importance linkage among national savings, government expenditure and age dependency. The results concluded that national saving partially responded to temporary changes in output, and higher government expenditures were associated with lower national saving. The results also indicated that an increase in age dependency has a significantly negative effect on private saving rates.

Hussain and Brookins (2001) examined the determinants of national savings, based on both cross-sectional and panel data across a large sample of countries. Their results support that agricultural share in total output; public saving, budget balance, and the current account balance were robust in explaining saving behavior. Sarantis and Stewart (2001) adopted unit root and cointegration tests to examine the long run determinants of aggregate private saving rates in a dynamic panel of OECD countries during the post Second World War period. They found strong evidence for the existence of a long run equilibrium saving function. Although the results suggested a number of significant determinants of saving rates, the parameter estimates varied significantly across countries.

Özcan, et al. (2003) investigated the determinants of saving for Turkey during the period (1968-1994) using a number of policy and non-policy variables. The findings of the estimated model support the hypothesis that the saving rates have strong inertia. It was found that the effects of a change in a given saving determinant were fully realized in the long run rather than in the short run. The findings further indicated that although higher government savings crowded out private savings, they did it in less than one-to-one manner, and thus the Ricardian Equivalence did not hold strictly. In addition, income level showed a positive effect on the private saving rate, however, the growth rate of income was not statistically significant. Moreover, financial depth and development measure of Turkey suggested that countries with deeper financial systems tend to have higher private saving rates. The results also indicated that life expectancy rate tends to have a negative impact on savings. Furthermore, the precautionary motive for saving was supported by the findings that inflation captured the degree of macroeconomic uncertainty and had a positive impact on private saving in Turkey. With regard to external factors, it was found that terms of trade shocks increased private saving in Turkey. Although the current account deficit represents an important explanatory variable for the private savings, its effect was insignificant in Turkey.

Hallaq (2003) analyzed and examined the determinants of saving in Jordan during the period (1976-2000) using the OLS and the instrumental variable methods. The main results indicate that GDP growth rate and GDP per capita income have significant positive effect on savings, while, the real interest rate, inflation rate, and terms of trade were found to have insignificant impact on the level of saving during the study period.

Athukorala and Sen (2004) examined the determinants of saving in India, during the period (1954-1998). The methodology used in this study involving the estimation of a saving rate function derived from the life-cycle model. The results of the estimated model provided an evidence of a statistically positive effect of the real interest rate, the growth and the level of per capita income, the spread of banking facilities, and the rate of inflation on saving. On the other hand, terms of trade and inward remittances by expatriate Indians witnessed a negative impact on the saving rate. Fiscal policy reported that public saving seemed to be an imperfect substitute for private saving. The result relating to the inflation rate suggested that mild inflation seemed to have a positive impact on private saving.

In another study by Metin Özcan and Özcan (2005) to examine the relationship between a variety of macroeconomic variables and private savings. They used a sample of 15 countries in the Middle East and North Africa (MENA) over the period (1981–1994). The estimated results provided further evidence of the significantly positive effect of the growth rate of income, and per capita income on private savings. In addition, public savings crowded out private savings only partially which means that the Ricardian Equivalence does not hold strictly. Regarding the financial factors, the paper provided evidence that countries with deeper financial systems tend to have higher private savings. Moreover, macroeconomic stability captured by the inflation rate was found to have a positive impact on savings.

George Hondroyiannis (2006) investigated the determinants of aggregate private saving in European countries employing panel data. The long run saving function is estimated based on an extended lifecycle hypothesis taking into account the economic and demographic developments during this period. A long run saving function sensitive to dependency ratio, old dependency ratio, liquidity, public finances, real disposable income growth, real interest rate and inflation is found to exist. The empirical evidence suggests the existence of a long run saving function in Europe. The policy implications of such a relationship are presented.

In Nigeria Chete (1999) employed the Error Correction Methodology (ECM) to evaluate the determinants of saving, using data from (1973-1993). He finds that financial development and external debt had a negative significant relationship on saving, while terms of trade changes and level of income had a positive significant impact on saving. On the other hand, real interest rate, inflation, public saving and dependency ratio were all insignificant in the regression.

Also, Nwachukwu, and Egwaikhide(2007) examined the determinants of saving in Nigeria. They compare the estimation results of the ECM with those of three conventional models: partial-adjustment, growth rate and static models. The conclusion is the real interest rate on bank deposits has a significant negative impact while public saving seems not to crowd out private saving. Furthermore, external terms of trade, inflation rate and external debt service ratio have a positive impact on saving. While Nwachukwu and Odigie (2009), discussed the trend of Nigerian saving behavior and reviews policy options to increase domestic saving. They also examined the determinants of saving in Nigeria during the period covering (1970–2007).The framework for analysis involves the estimation of a saving rate function derived from the life cycle hypothesis while taking into consideration the structural characteristics of a developing economy. The study employs ECM procedure which minimized the possibility of estimating spurious relations, while at the same time retaining long run information. The results of the analysis showed that the saving rate rose with both the growth rate of

disposable income and the real interest rate on bank deposits. Public saving seemed not to crowd out private saving; suggesting that government policies aimed at improving the fiscal balance has the potential of bringing about a substantial increase in the national saving rate. Finally, the degree of financial depth had a negative but insignificant impact on saving behavior in Nigerian.

Misztal (2010) analyzed the cause and effect relationship between real GDP growth and savings rates in advanced economies and in emerging and developing countries. He uses the method based on studies in macroeconomics and international finance as well as econometric methods "co-integration models and Granger's causality test". The results confirm the existence of one-way casual relationship, where GDP were not the cause of the Gross Domestic Savings in Granger sense but at the same time the Gross Domestic Savings were the cause of changes in GDP in Granger sense in advanced economies in the case of developed countries as well as in developing and transition countries. At the same time it is revealed the absence of causal relationship between GDP and gross domestic savings both in developed economies and developing and transition countries.

Davis (2013) explored the determinants of savings in Ghana using the Phillips and Ouliaris (1990) residual-based tests for cointegration to determine the long run relationship between savings and its determinants. Financial liberalization, per capita income and inflation were found to have a positive and significant relationship with savings.

Khalil and Haider (2013) explained the determinants of savings in Pakistan via the process of economic growth by using Autoregressive Distributed Lag Model (ARDL) bound testing approach for cointegration techniques to check the robustness for long run relationship and ECM for short run dynamics during the period (1974-2010). They find that the per capita income inversely related with national saving rate, both in long run and as well in short run significantly. The exchange rate and inflation rate had a negative impact on national saving but lagged exchange rate had significantly impact. Because of floating exchange rates and the decrease in capital controls, the volume of international capital flows in a country had increased significantly. Trade openness was positive associated with national savings in Pakistan because trade openness caused to increase the income and welfare of the society via the market economy. Money supply was positively linked with national saving. The growth of the income level had negatively related with national savings. Keynesian and permanent income hypothesis of income and savings was not valid for Pakistan because per capita income and income growth inverse function of savings at national level.

Finally, Abou Elseoud(2014) investigated the long run and short run relationship between real GDP growth rate and saving in Bahrain during the period(1990-2012), based on econometrics analytical approach. He finds that there is a bilateral causality between these variables, which means that real GDP growth could stimulate Savings, and savings could accelerate economic growth in the long run.

3. Model and Data collection

Based on the above discussion, national savings model for the ensuring empirical analysis can be specified as:

$$NS_t = \alpha_0 + \alpha_1\,GDP_t + \alpha_2\,INF_t + \alpha_3\,INT_t + \mu_t \qquad (1)$$

Where:

NS_t　: national savings rate
GDP_t : real GDP growth rate
INF_t : Expected inflation rate measured by consumer price index (CPI)
INT_t : nominal interest rate on saving deposits
μ_t　 : Error term

Data of all certain variables has been taken from Central Bank of Bahrain (CBB), National accounts statistics (various issues), and Economic statistical bulletin (various issues). Some of the missing observations for the period (1993-1999) have been taken from the World Bank International Financial Statistics database (various issue). All the data used are in terms of a Bahrain Dinar.

4. Methodology and empirical results

Most macroeconomic time series exhibit substantial co-movement, and thus estimating the previous model using OLS frequently suffers from the problem of nonstationary regressors and spurious regressions, which do not reflect long run relationship but common time trends (Engle and Granger, 1987). Therefore, in order to investigate the long run effects of the model, we should first test whether the proposed variables in the model (1) are stationary or not. This step is carried out using Augmented Dickey Fuller (ADF) test. The next step is to test for the presence of cointegration among the explanatory variables.

The procedure to test for stationarity in the levels of variables starts with the most unrestricted model as shown in equation below:

$$X_t = X_{t-1} = \Delta X_t = \alpha + \beta\,T + \rho\,X_{t-1} + \Upsilon\,X_{t-1} + \epsilon_t$$

Where:

X_t　: represents the variable of interest,
　t　:time trend.

The null hypothesis that X_t is non-stationary ($\beta = 0$, and $\rho = 1$) is rejected if the coefficient on X_{t-1} is significantly negative. One lag of the dependent variable is added to make sure that the error term is free of significant serial correlation.

The ADF test is conducted to check for a unit root for the four variables in both levels and first differences. The results of these tests are shown in table (1), which reveals that the hypothesis of a unit root cannot be rejected in most variables in levels. However, the hypothesis of a unit root is rejected in first differences which indicates that all variables are integrated of degree one, I(1).

Furthermore, cointegration involves examining the stationarity of the residuals (ut) from the long run relationship. If the residuals are integrated of degree zero, then we can assure that the linear combination of the variables in the model (1) is cointegrated. The result of the ADF stationarity tests of the residuals indicates that these residuals are stationary of degree zero I(0) at 1% level of significance. In other words, the linear combination of the variables of the model (1) is stationary and they are cointegrated.

Table (1) ADF test for unit root

Variables	Lag	Level I(0)	1st differences I(1)
NS	0	-2.356	-4.82*
	1	-2.803	
GDP	0	-2.461	-3.974**
	1	-2.926	
INF	0	-1.121	-5.469*
	1	-1.052	
INT	0	-2.041	-3.396***
	1	-2.588	
u	0	-4.361*	

Source: Researcher's estimation using SPSS

* ADF critical values at level are: -4.071 at 1%, -3.464 at 5% and -3.158 at 10%. While ADF critical values at first differences are: -2.727 at 1%, -1.964 at 5% and -1.627 at 10%

Given the presence of both stationary and nonstationary variables; the study will adopt the general model, which aims at minimizing the possibility of estimating spurious relations while retaining long run information. The dynamic relationship includes lagged independent variables, plus the lagged value of the residual from the cointegration regression (u_{t-1}), in addition to the first difference of variables, which appear in the right hand side of the long run relationship. One way of overcoming autocorrelation is to add a lagged dependent variable to the model. Therefore, the dynamic relationship is formulated as following:

$$\Delta NS_t = a_0 + a_1 \Delta GDP_t + a_2 \Delta INF_t + a_3 \Delta INT_t + a_4 NS_{t-1} + a_5 GDP_{t-1} + a_6 INF_{t-1} + a_7 INT_{t-1} + a_8 \mu_{t-1} + et \quad (2)$$

Table (2) reports the final results of the estimated model (2), together with a set of commonly used diagnostic statistics. First, fitting of the model (2) seems to be statistically acceptable. The adjusted R^2 is about 68%, which implies that changes in the explanatory variables explain 68% of the variations in the national saving rate in Bahrain during the period (1993 – 2013). Moreover, the error correction term (u_{t-1}) appears with a negative sign and is statistically significant at 1% level, ensuring that the long run equilibrium can be attained. In addition, the Durbin-Watson statistic is about 2.84 which provide evidence of the absence of autocorrelation. The estimated parameters of the explanatory variables point out to:

- The entire coefficients in the national savings function have the correct and expected signs.
- The performance of the Bahrain economy represented by the growth of real GDP is the major determinant of national saving ,where the growth real GDP has a positive effect in both the short run and long run, and statistically significant at 5% level in the long run. A one percent increase in per capita income seems to bring about 0.51 percent increase in the national saving rate. This provides support for the argument that, for countries in the initial stages of development, the level of income is an important determinant of the capacity to save. If the growth rate in GDP were higher than the growth rate in population, this would increase the level of per capita GDP, which in turn would increase the level of national savings.
- Regarding the effect of the nominal interest rate (INT); it is found that it has a positive and statistically significant effect at 1% level on the short run. When nominal interest rate is low, as the case of Bahrain, where it was 1.1% on average in most years of the study, individuals tend to draw their savings from regular saving channels and prefer to retain their savings in other forms such as buying gold or physical assets. In that case, reduction in INT will result in a decrease in national savings. However, the effect of INT in the long run appears to be positive but statistically insignificant.
- We also found that the inflation rate (INF) -as a measure of macroeconomic uncertainty - has a positive and statistically significant effect on national saving rate in both the short run and the long run. This provides support of precautionary motives for saving in the face of increased economic uncertainty in Bahrain in some years of the study period. In addition, higher inflation rates may increase savings rate through its effect on the distribution of income in favor to entrepreneurs where their marginal propensity to save is higher than the low-income class. High inflation will also increase profits, which if it is reinvested will result in increasing of national savings.
- National Savings rate of the previous period have a negative and highly significant effect on today's savings rates. The coefficient is about (-0.71) indicating that savings rates clarify a certain degree of persistence.

Table (2) Estimated parameters of model (2)

Variable	Coefficient	t-statistic	P > t
Constant	-0.023	-0.2.34**	0.029
Short run results			
ΔGDPt	0.149	1.532	0.154
ΔINFt	2.719	2.387**	0.000
ΔINT	1.014	3.632*	0.000
Long run results			
NSt-1	-0.71	-3.538*	0.001
GDPt -1	0.512	2.472**	0.012
INFt-1	0.257	1.964***	0.086
INTt-1	0.298	1.459	0.193
μt-1	-0.802	-4.619*	0.000
No. of Obs.	20		
Adjusted R^2	0.684		
S.E. of regression	0.5447		
Durbin-Watson stat	2.84		
S.D dependent var.	1.1095		
F-statistic	6.576		
Prob. (F-statistic)	0.0003		

*,**,*** indicate statistical significant at 1%,5% 1nd 10% level, respectively

5. Conclusion

Analyzing the factors that could explain the level of national saving will determine what needs to be taken into consideration in order to increase both saving and investment. This is necessary if economic growth and development is to be stimulated in kingdom of Bahrain, according to Bahrain Economic Vision 2030. The main results of the study provide evidence that Real GDP growth rate and inflation rate have positive and significant effect on national savings in the long run, while nominal interest rate has a positive and statistically significant effect at 1%level on the short run only.

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