

Savings, Financial Development
and Economic Growth
in the Arab Republic of Egypt Revisited

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Abstract

Private savings play a pivotal role in financing development and sustaining growth. Recently, there have been many theoretical developments that underpin key determinants of savings behavior, many of which merit empirical investigation. Understanding the dynamics of the determinants of savings is crucial to inform economic policy and devise reform programs. This paper builds on earlier work examining the stability of the long-run relationship between the real interest rate, financial saving, and total saving during 1960 to 1990. The paper extends the scope of the empirical investigation of the determinants of private savings behavior in the Arab Republic of Egypt, and considers the effect of financial development. The analysis uses quarterly data

covering 1991–2010, adopting a vector error correction model. The key findings attest that private savings in Egypt follow the Life Cycle Model in the long term. Controlling for population growth, the analysis finds that the real interest rate and financial development are key determinates for real private savings in the long run. The negative long-run relation between the real interest rate and private savings holds under the proposed model structure as well as for that in the earlier work. However, in the short run, inflation and exchange rate movements are key determinants for private savings decisions. Robust economic policies, inclusive of macroeconomic and monetary measures, are prerequisites for maximizing private savings and financing growth in Egypt.

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“Savings, Financial Development and Economic Growth in the Arab Republic of Egypt Revisited”¹

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1. Introduction

Savings is alternatively defined as income minus consumption, the change in wealth, or the supply of capital. Given the comprehensive and consistent definitions of each of these terms, each definition of savings would represent the same concept and give rise to similar empirical measures (Gale and Sabelhaus 1999).

Understanding savings behavior is critical when designing economic policies that promote investment and growth. Most of the empirical literature that analyzes cross-country savings behavior concentrates on aggregate savings for a multitude of reasons. The first reason is due in part to the lack of consistent information on household behavior, as well as possible differences in the household savings in developing versus industrial countries (Loayza et. al. 2000).

The decline in savings will reflect on the state of economic growth and development. One interpretation asserts that the low savings rate will induce low savings behavior and will accordingly lead to low capital accumulation. On the macro level, it illustrates vulnerability of an economy's dependence on foreign capital. At the micro level, it raises households' fears to secure future consumption through pension systems for retirement or other purposes.

Another interpretation is that the sustainment of short-term aggregate demand is indicative of a low savings rate; however, worries that the savings rate will rebound tend to arise. The decline in personal savings, and the accompanying rise in consumption has helped fuel the economic expansion in the United States as well as propping up the global economy (Gale and Sabelhaus 1999).

Nordhaus (1996) proposed a third view asserting that current tools for measuring savings and investment are stone-age definitions in the information era. His view emphasized that measures of aggregate savings weakly correspond to the classical concept of savings. Accordingly, empirical analysis of different economic issues may require examining different measures of savings. In spite of that, his view supports the conceptual theory that low savings or higher consumption accelerates economic growth; however, both the minimal and poor quality of savings data makes it quite difficult to reach such conclusion when based solely on official savings aggregates.

While analysis of savings is significant to guide development policies in developing economies, it is challenged by quality of data and strength of the analytical framework and interpretation of empirical outcomes. With that being said, this paper will study savings behavior in the Arab Republic of Egypt. The next section provides a literature review of recent empirical literature on savings behavior in addition to earlier research on modeling savings behavior in Egypt. It is followed by a section describing the data and the empirical methodology. The last two sections include the analysis of the empirical findings and the conclusion.

2. Literature Review on Modeling Savings Behavior

The Life Cycle Hypothesis (LCH) enriched the theoretical literature on savings. The key assumption of this hypothesis is that individuals spread their lifetime consumption evenly over their lives by accumulating savings during earning years and maintaining consumption levels throughout retirement. Therefore, tests of the life cycle hypothesis are mainly concerned with the effect of demographic variables such as age groups, birth rates, and dependency ratios on savings

behavior mainly in the long term. The second group of variables used to describe savings during working life and dissavings during retirement are financial variables such as interest rates, inflation rates, available financial instruments, and initial wealth levels. These variables are significant as they dynamically affect the intertemporal consumption decisions of households.

The life-cycle model of household savings behavior, grounded in expected utility theory, is generally associated with Modigliani⁵ and Friedman (1957). Modigliani and Friedman made their literary contributions by translating the abstract notion of an optimal consumption profile into a model that could be estimated econometrically (King, 1985). This demonstrated the empirical relevance of the separation of the consumption and income profiles, which is the principal implication of the life-cycle model. Modigliani stresses the role of wealth in the consumption function, Friedman's concept of "permanent income," and how both are based on the idea that current consumption is not determined primarily by current income.

Nevertheless, empirical tests of these two major hypotheses focused on cross-country studies that resulted in many drawbacks (Muradoglu and Taskin, 1996). The key challenge is the comparability of samples that include countries at different levels of development; this questions the reliability of these studies as far as interpreting differences across country groups.⁶ Moreover, Schmidt-Hebbel, Webb, and Corsetti (1992) emphasized another great challenge that cast doubt upon using national aggregate savings data, assuming that the private savings account was a predominant part of total savings. They emphasized that aggregation of savings is inconsistent across countries, which resulted in a number of cross-country inconsistencies due to the difference in the methodology employed in their derivation. The following section provides a brief review of recent empirical literature on modeling savings behavior.

i) Recent Developments in Literature on Savings Behavior in Emerging and Developing Countries

Kwakwa (2013) examines the key determinants of national savings using the Johansen cointegration technique as well as the error correction model for Ghana over 1975-2008. The empirical results show that in the long run, income and terms of trade have a positive and significant impact on savings while dependency ratio, political instability and the real interest rate have a negative impact on savings. In the short run, however, only terms of trade positively affects savings.

Awan et al. (2010) analyzes the long run and short run association among the real rate of interest on deposits, financial liberalization, economic growth, terms of trade, real remittances by Pakistani emigrants, and domestic savings behavior in Pakistan, using annual time series data for 1973-2007. The "Auto Regressive Distributed Lag Bounds Testing" approach is utilized to determine cointegration. The results reveal that real interest rate, financial liberalization, and economic growth positively affect domestic savings in Pakistan in the long run. The coefficient of the liberalization dummy is also positive and statistically significant, suggesting a need for increased liberalization and deregulation of interest rates for mobilization of savings. Conversely, the terms of trade and real remittances by emigrants show a negative relationship with domestic savings, thus supporting the Complementarity Hypothesis which was developed separately by Mckinnon and Shaw in 1973.

⁵ Modigliani & Brumberg, 1954; Modigliani & Ando, 1957.

⁶ See Ortmeier, 1985; Koskela and Viren, 1982; Schmidt-Hebbel and Servén, 2000; Beneston and Kauffman, 1990.

Dhanasekaran (2010) examines the causal relationship between gross domestic product and savings using annual data in India between 1950-51 and 2002-03. In his investigation, he adopts cointegration and causality models that allude to the presence of a stable long-run relationship between both variables. Having verified that GDP and savings are cointegrated, the Granger test was implemented in pursuit of indicating the absence of any causal relationship between both variables.

Kim's (2010) study explores internal and external determinants that could affect personal savings in the United States using time series data between 1950 and 2007. The findings reveal that personal savings is highly dependent on personal income, tax, bank credit and employment, while the dependency ratio, current real estate loan, real interest rate, and status of economic performance are indeterminate.

Agrawal and Sahoo (2009) estimate the long-run total and private savings functions for Bangladesh using annual data during 1975 - 2004. They find that the total savings rate is mainly determined by GDP growth rate, dependency ratio, interest rates, and bank density. Additionally, the private savings rate is also affected by the public savings rate. The Granger Causality test pointed to a bi-directional causality between savings and growth. They also carry out the Forecast Error Variance Decomposition (FEVD) analysis using the Vector Auto Regression framework. The FEVD is consistent with the causality results obtained using the Granger Causality tests as well as the estimated savings functions.

Slami and Sheikhy (2008) examine the behavior of household savings in Algeria from 1970-2005; they tested several models using the Least Squares method. The following models were tested: the classical model, Keynesian model, relative income model, permanent income model, life cycle model, and Taylor model. They find that the permanent income model most accurately explains the saving behavior of an individual in Algeria. According to this model, previous savings and current available income determine savings behavior.

Nwachukwu and Egwaikhide (2007) examine the determinants of private saving in Nigeria. Their study re-estimates Nigeria's saving function using ECM and annual data from 1970-2005. In addition, the study compared the estimation results of ECM with those of three conventional models: Partial-Adjustment, Growth Rate and Static Models. The conclusion was that the ECM performed far better than the other models. Moreover, the results revealed that the savings rate is positively correlated with the level of disposable income but negatively correlated with the rate of growth of disposable income. The real interest rate on bank deposits has a significant negative impact while public savings appears not to crowd out private savings. Therefore, the Ricardian Equivalence does not hold in the case of Nigeria, in contrast to industrialized and semi-industrialized economies. Furthermore, external terms of trade, inflation rate, and external debt service ratio appear to have a positive impact on private saving.

ElBassam (2005) estimates a model that analyzes household savings in Saudi Arabia from 1970-2002. A partial adjustment model of Koyck type was utilized to analyze the behavior of household savings in Saudi Arabia. The estimated model of this study indicates that the income, wealth, and financial development variables are statistically significant, while the other variables (inflation, Dollar interest rate, and financial intermediation) are found statistically insignificant. Furthermore, it suggested that the Gulf crisis had an effect on household savings behavior in Saudi Arabia.

Taher's (2001) study explores the determinants of private savings in Saudi Arabia. His findings assert that government spending on investment has a positive effect on private saving; alternatively, budget surplus, excess of consumer loans, and outgoing remittances observed a negative effect.

Burnside (2000) analyzes the behavior of private savings in Mexico by using quarterly data from 1980 to 1995. The correlation of private savings with various macroeconomic time series data suggests that private savings is negatively correlated with the fiscal balance of the government. In addition, private savings is more highly correlated with the level of private disposable income (which has significant cyclical components) than it is with GNP. This suggests that savings, rather than consumption, absorbs transitory movements in income. The paper uses vector autoregressions in which tax shocks are found to be the primary determinants of the ratio of private savings to GDP.

Rymes (1993) examines the fundamental determinants of savings and bubbles in stocks, bonds, and real estate prices by exploring key findings drawn from the works of Laurence Kotlikoff and Robert Shiller. Kotlikoff attributes savings to the existence of the extended family as well as intergenerational transfers; he attests that savings is determined by the individual based on their "fundamentals" (tastes, technology, endowments) as well as their intertemporal maximizing choices. In addition, he claims that the role of the government is overemphasized in the determination of rates and accumulation. Alternatively, Shiller examines the prices of stocks, bonds, and residential real estate, hypothesizing that stock markets are efficient and that no such excessive volatility exists in prices. Moreover, he argues that asset prices reflect more than fundamentals, attesting that they reflect bubbles as well. Rymes concludes that although both studies are detrimental to savings literature, he deems that the necessity to draw a line of separation between fundamentals and conventions is wrong.

The main takeaway from surveying recent literature is that the findings are consistent with the classical theory; that is, growth in income per capita has a predictive power to savings behavior that is in line with the Keynesian proposition. However, it should be noted that determinants of private savings behavior differ across countries, which merit individual country analysis to robustly model savings behavior and identify its key determinants; this is a key motivation to the deliberation of this paper.

ii) Recent Contributions for Understanding Savings Behavior in Egypt

Hevia and Loayza (2012) illustrate the mechanisms that link national savings and economic growth in Egypt. The study uses a simple theoretical model calibrated to fit the Egyptian economy and simulated to explore different potential scenarios. Their main conclusion was that if the Egyptian economy did not experience progress in productivity, then a high rate of economic growth would not be feasible at current rates of national saving and would require a saving effort that is highly unrealistic. To obtain a constant 4% growth rate of GDP per capita with no TFP improvement would require a national saving rate of around 50% in the first decade and 80% in 25 years. However, if productivity starts to rise to at least moderate levels, sustaining and improving high rates of economic growth becomes viable. Realistically, to achieve the goal of high economic growth, the national savings effort must be alleviated by forcefully and purposefully improving productivity.

Giavazzi et al.'s (2010) study explores the behavior of household savings using household-level micro data from the Egyptian Income, Expenditure and Consumption Surveys. Different from aggregate time series, the survey data clearly observed an immense reduction in household savings, from 14% in 2004/05 to 10% in 2008/09. The authors find evidence that indicates the reduction can be attributed to improvements in access to finance and credit. Moreover, they find a negative correlation between savings and measures of financial development. The study also suggests that the pension reform considered in Egypt—in which contributions to pension funds are compulsory—is less likely to result in the saving shortfall observed in other countries which left individuals the option of savings for retirement.

Love (2010) examines corporate savings in Egypt, which represents 50% of total savings. Her study focuses on two measures of corporate savings – financial savings and physical savings.⁷ It employs two data sets - Investment Climate Assessment and data for publicly listed firms on EGX to analyze the determinants of corporate savings behavior. The study finds that larger firms invest more (physical savings), which is imperative to maintaining competitiveness and growth. Moreover, the study also concludes that small firms invest less because of their lack of access to credit. Therefore, improving access to credit for small and medium enterprises is likely to have a positive impact on investment. Furthermore, despite the financial deepening, the use of credit products observed a reduction during the last decade. The main policy recommendation from the study reaffirms the importance of improving access to financial services in Egypt. In addition, policies aimed at reducing macroeconomic volatility are likely to result in increased investment.

Touny (2008) shows that Egypt's domestic savings ratio has an average of only 14.6 percent of GDP through the period 1980 - 2005, which is relatively low compared to other countries at a similar level of per capita income. He examines the long-run determinants of domestic saving rates in Egypt through the period 1975 – 2006 using unit root and co-integration tests, which allow for heterogeneity in parameters and dynamics. The results of the study show that domestic savings in Egypt is determined by the following factors: first, the growth of per capita income positively influences domestic savings in the short- and the long run. Second, the budget deficit ratio has a negative effect on the domestic savings ratio; in other words, higher government savings partially crowd out private savings, and thus, does not provide support to the existence of the Ricardian Equivalence. Third, financial depth, proxied by the increase in the ratio of broad money supply (M2) to GDP, illustrates a positive and statistically significant effect on domestic savings in the long run. Fourth, the real interest rate (RR) has a positive effect in the short-run; however, the effect of RR in the long run appears to be positive but statistically insignificant. Fifth, the inflation rate has a positive impact on the level of domestic savings in Egypt in both the short run and the long run. This provides support for precautionary motives for savings in the face of increased economic uncertainty in Egypt. Finally, the current account deficit has a negative and statistically significant effect in both the short and long run, implying that external savings may tend to act as a substitute to domestic private saving.

AL-Mashat (2006) assesses the effects of financial sector reforms on non-government savings in Egypt through the period 1970-1999. The quantitative outcomes of financial sector reforms are evaluated by comparing relevant indicators before and after the introduction of reform measures, and by analyzing the link between those indicators and the non-government savings rate. The

⁷ Physical savings represent addition to physical assets as investment in property, plant and equipment. Financial savings represent addition to financial assets, as increase in the firm's holdings of cash and marketable securities.

measures of the financial sector reforms include (i) the cost of capital approximated by the real interest rate, (ii) the volume of intermediation measured by the ratio of M2 to GDP, and (iii) the effectiveness of financial intermediation proxied by the ratio of reserve money to total deposits and reserve money to quasi-money, with a decrease in the ratios indicating a growing efficiency of the banking system in mobilizing deposits. The model is estimated for the entire period between 1976-1999, the pre-reform period between 1976-1990, and the reform period between 1991-1999. For the entire period, among the financial intermediation variables, the study finds that reserve money in percent of total deposits is the only significant variable. This was reflective by the dominance of “forced savings” and rationing, as well as the importance of the public sector. For the pre-reform period, among the financial intermediation variables, the reserve money in percent of total deposits and credit to the private sector are significant. During the reform period, all the financial intermediation variables proved to be significant (with the exception of M2/GDP). This suggests that after the reforms the savings ratio became more responsive to changes in the effectiveness of the financial intermediation. The author concludes that as market-based financial systems are established, higher real returns on savings, greater efficiency of the financial system, and a larger share of resources intermediated through financial institutions all contributed to higher savings.

Hussein (2002) examines the impact of financial liberalization proxied by the expected real interest rate on financial savings in Egypt over the time period 1967-1996. The study used the autoregressive distributed lag (ARDL) procedure developed by Pesaran, Shin, and Smith (1995, 1999) and Pesaran and Shin (1999). The study concludes that interest rates have a positive impact on financial savings; nonetheless, the magnitude of the interest elasticity of financial savings in Egypt is statistically too small. In other words, an increase in the interest rate by 1% causes a meager increase in financial savings by 0.08% and 0.04% in the long and short term, respectively. Furthermore, real per capita income and expected inflation rate have a positive effect on financial savings in the long run. Lastly, Hussein concludes that an increase in the real rate of interest is neither the most logical nor feasible path for the pursuit of the development and enhancement of the financial sector in Egypt.

Elsayed (1993) studies the determinants of savings in Egypt, and the factors that contribute to the rising savings rates from 1969-1990. Her study focuses on the determinants of domestic savings (gross and private) using stepwise regression. It examines the following determinants: real per capita income, inflation rate, per capita cash balances (money, quasi money, and saving deposits), nominal and real interest rates on one-year deposits, unemployment rate, and international trade rate. Elsayed finds that savings is determined by income, and it is negatively correlated with the unemployment rate and interest rate. On the other hand the effect of inflation is undetermined. She concludes that implementing the government economic reform policies that liberalized the interest rate since the 1980s in addition to the economic regression Egypt was witnessing would lead to a further decline in saving rates.

3. Econometric Methodology and Modeling Strategy

This paper builds on earlier research by Hussein and Mohieldin (1997) that examines the stability of the long run relationship between the real interest rate and the following savings indicators: (i) financial saving, (ii) total saving, (iii) private investment, as well as (iv) real economic growth in

Egypt over the period 1960-1990. They utilize the cointegration tests to identify relationships between the variables of interest. The authors employ a series of tests in two preliminary stages: first, they use Augmented Dickey-Fuller tests to identify unit-roots and stationarity, a prerequisite to testing for cointegration; following this, the Engle and Granger (1987) as well as the Johansen (1988) multivariate cointegration techniques are utilized to identify linear relationships.

To fully understand the construction of the model utilized by Hussein and Mohieldin, consider the interest bearing financial assets at the formal financial sector as a percent of GDP (FS/Y) as an independent variable. Additionally, consider real interest rate ($i_d - \pi$), lagged savings rate, per capita income (y), as well as the premium between the domestic and foreign interest rates adjusted for expected devaluation (Z). The long-run equation is as follows:

$$L(FS/Y) = -0.03(i_d - \pi) - 5.58Z + 0.43 L(y) \quad (1)$$

Subsequent to their empirical analysis, the authors identified a plethora of key findings relevant to savings literature:

- a) **Money illusion:** deposit holders suffer from *money illusion*. As a result, the rise in nominal interest rate may explain the increase in financial savings within the formal sector.
- b) **Risk and return:** when selecting a particular asset in accordance to the relationship between its return and risk, it seems as though a large number of depositors in the formal sector were satisfied with the relationship, and selected the asset. Since the sequestration of deposits that accompanied the Egyptianization and nationalization laws of 1957 and 1961, the formal financial sector was stable, and as a result did not suffer any major crises.
- c) **Implicit deposit insurance:** the monetary authority was quick to rescue ailing units and managed to contain the possible damages of failing banks, under a notion of collective responsibility among all of the operating banks. According to this implicit insurance mechanism and the government's explicit support of the banking system, bank deposits were associated with low risk, which thus satisfied risk-averse savers.
- d) **Tax free returns:** interest on deposits with banks was tax-exempt which attracted more depositors.
- e) **Limited choices of financial instruments:** because of the absence of an active capital market, bank deposits were the only available saving instruments for a large number of savers. Those who took the risk and saved with the Informal Investment Companies during the 1980s as an alternative (realized with the collapse of 1988) concluded that they had collectively made the wrong decision.
- f) **Moderate inflation:** this provides an explanation as to why depositors behave the way that they do. Despite the downward bias in official rates, inflation in Egypt averaged 9.57% throughout the period between 1960-1990. Comparatively, this is considered as a period of moderate inflation. With that being said, the authors argue that had the inflation rates been higher in Egypt, *ceteris paribus* and real interest rates would have been negative, and therefore, the behavior of savers with regards to the selection of bank deposits would have been fundamentally different.
- g) **Widows and orphan behavior:** many formal sector depositors neglect to foster entrepreneurial skills and/or lack the ability to invest or manage their savings, even in the face of alternatives. Regular predetermined returns are offered by banks, and perhaps may suit depositors better than any form of saving, which may be implicated by irregularity and high variability.

In summary, the authors concluded on the basis of their empirical analysis, that the real interest rate has an insignificant impact on economic growth. On the other hand, real interest rate has a negative impact on financial savings and investment. Changes in exports and private investment exhibited a positive impact on economic growth. Relevant policy recommendations provided by the study assert that the economic problems of the Egyptian government derived from the financial repression of 1960s cannot be alleviated by an increase in real interest rate as it further deepens the problem of excess liquidity of the banking system, which is indicative to the liquidity crisis in the late 1990s.

For the purpose of this research, we focus on the period 1991–2010. First, we inspect the stochastic properties of the variables. This procedure involves visual inspection of the given variables to check whether the series is trending smoothly. Moreover, the smooth trending pattern makes it feasible to quantitatively test for the presence of unit roots following the implementation of the Augmented Dickey Fuller procedures (ADF).⁸ (See Dickey and Fuller 1979, Campbell and Perron 1991 and Enders 1995.) This step is vital to the cointegration procedure as it determines the strategy and the methodology for modeling. Using variables with unit roots in linear regression violates the basic assumptions needed for asymptotic analysis and consistency of estimation as it leads to spurious results (Davidson and Mackinnon, 1999).

The unrestricted (or general) form of the ADF (1981) unit root test equation is:

$$\Delta y_t = b_0 + b_1 y_{t-1} + \sum_{i=1}^k \alpha_i \Delta y_{t-i} + \sum_{i=1}^3 \gamma_i CS_{it} + \psi trend + \xi_t \quad (2)$$

trend is time trend, ξ is white noise errors.

The Augmented Dickey-Fuller test maintains the null hypothesis of non-stationarity of the given time series. If the test provides evidence illustrating the presence of unit roots in levels of the series, the test is repeated for differenced series to identify the order at which the series is stationary. This is defined as “order of integration of the series.” Variables of interest interact to enter into equilibrium in the long run if they are integrated of the same order. This is the key objective of this paper as it attempts to test the nature of the equilibrium relationship between the real monetary aggregates, the real sector, as well as the external sector.

Accordingly, a system of equations will be modeled to investigate the existence of a stable relationship between the variables of interest by employing a Vector Auto Regression (VAR) procedure as well as testing for optimal lag length using the general to specific criteria⁹ (see Enders, 1995).

This is complemented by visually inspecting the graph of residuals and its respective distribution as well as the resultant residual diagnostic tests to ensure that residuals are white-type and do not influence the parsimony of the model. The Chow test and break point test for model stability are also implemented in order to ensure consistency of estimation and inference. The Johansen (1988)

⁸ See Dickey and Fuller, 1979; Campbell and Perron, 1991; and Enders, 1995.

⁹ The optimal lag length is defined as lags are reduced without losing information.

and Enders (1995) test for co-integration are then employed upon ensuring that the series are all integrated of the same order. Tests of weak exogeneity will also provide evidence on the nature of the long run equilibrium relationship between variables.

The full information maximum likelihood (FIML) of a Vector Error Correction Model is as following:

$$\Delta y_t = \Pi y_{t-1} + \sum_{i=1}^{k-1} \Gamma_i \Delta y_{t-i} + \mu + \varepsilon_t \quad (3)$$

Where, y_t is a (n x 1) vector of the n variables in interest, μ is a (n x 1) vector of constants, Γ represents a (n x (k-1)) matrix of short-run coefficients, ε_t denotes a (n x 1) vector of white noise residuals, and Π is a (n x n) coefficient matrix. If the matrix Π has reduced rank ($0 < r < n$), it can be split into a (n x r) matrix of adjustment coefficients α , and a (n x r) matrix of co-integrating vectors β . The former indicates the importance of the co-integration relationships in the individual equations of the system as well as the speed of adjustment to disequilibrium; the latter represents the long-term equilibrium relationship, so that $\Pi = \alpha\beta'$. k is a maximum number of lags in VAR; t denotes time and Δ is a difference operator.

Testing for co-integration, using the Johansen's reduced rank regression approach, centers on estimating the matrix Π in an unrestricted form, and as a result, testing whether the restriction implied by the reduced rank of Π can be rejected. In particular, the number of the independent co-integrating vectors depends on the rank of Π which in turn is determined by the number of its characteristic roots that are different from zero. The test for nonzero characteristic roots is conducted using Max and Trace tests statistics. It is important to note that as illustrated by Johansen (2002), these tests tend to reject the null hypothesis of no cointegration in small samples, therefore it is useful to also use the degree of freedom adjusted test statistics in the cointegration analysis.

A vector error correction model (VECM) is then determined following Johansen (1988) and Johansen and Juselius (1990). The last step is identifying a conditional vector error correction model including endogenous variables that rejected the null hypothesis of being excluded from the co-integrating relation.

This model will be tested for stability and residuals should be ensured to be non-serially correlated. The analysis will move on to determining the short-run relation through running the VECM. The General to Specific Modeling Approach is applied. Note that general idea behind this approach is: (a) first, to estimate general/unrestricted VECM with the maximum lags of the right hand side variables:

$$\Delta x_t = \alpha_0 + \alpha_y ECM_{t-1} + \sum_{i=1}^{k-1} \alpha_{1i} \Delta x_{t-i} + \sum_{i=0}^{k-1} \alpha_{2i} \Delta z_{t-i} + v_{yt} \quad (4)$$

Where, x_t is a dependent variable, z_t stands for a vector of explanatory variables, ECM_{t-1} is one lagged the residuals from the long-run model, v_{yt} – is the residuals which are expected to be white noise. If α_y falls the interval of (-1 0) and is statistically significant; it can then be concluded that the variables exhibit a stable cointegrated relationship and short-run fluctuations are corrected in the long-run equilibrium.

The coefficient of the lagged error correction term (α) is expected to be negative and statistically significant for the model to work and converge to the equilibrium path in the long run. This model should be also be tested for stability to ensure the parsimony of the outcomes. (b) The appropriate lag length will be determined based on the general to specific reduction methodology, and the model will also test for stability and the well-defined nature of the relation between the four variables in the short and long run. The exclusion of statistically insignificant variables and performing the comprehensive set of autocorrelation, serial correlation, normality, heteroscedasticity, and misspecification tests is critical to reach a more parsimonious specification for the model. For this deliberation, Oxmetrics 6.1 will be used as the key econometric package for related quantitative modeling.

4. Hypothesis to Be Tested, Variable Selection and Data Issues

This section follows Modigliani & Brumbreg (1954) LCH motivation as adopted by Loayza, Schmidt-Hebbel, and Servén (2000) specification for empirically testing for determinants of savings. We test the null hypothesis (H_0) that aggregate private savings in Egypt vary positively with real per capita income, interest rate, yet it varies negatively with inflation, and the level of financial development (M2 to GDP).

The following equation represents the regression equation with expected signs shown between brackets based on theory:

$$\begin{aligned}
 \text{Real Gross Private Savings}_t = & \\
 f(\text{Growth in real per capita income}_{t-k}, \text{M2 to GDP}_{t-k}, \text{Inflation}_{t-k}, \text{Real interest rate}_{t-k}) & \\
 (+/-) \qquad \qquad \qquad (-) \qquad \qquad \qquad (-) \qquad \qquad \qquad (+) & \qquad \qquad \qquad (5)
 \end{aligned}$$

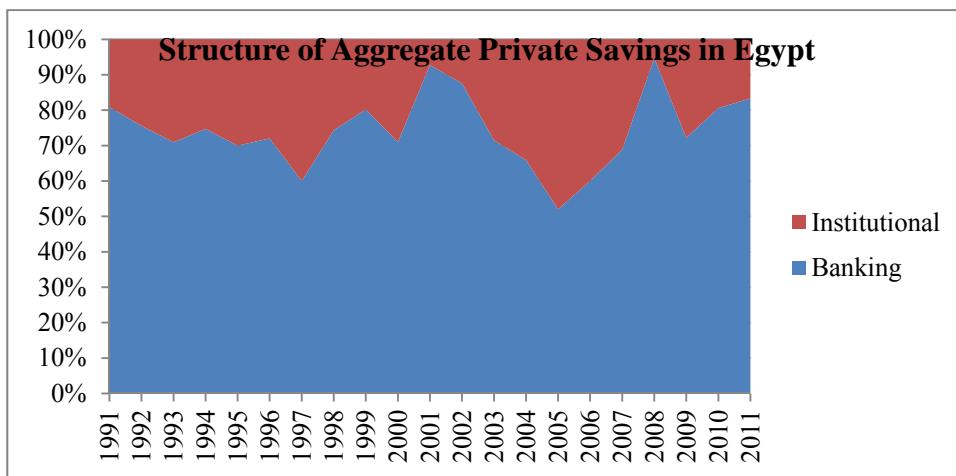
This paper will investigate short and long run relationships between the variables of interest using the above mentioned econometric procedure.

Real Gross Private Savings Per-Capita

Gross private saving is generally computed as the difference between gross national saving and the relevant definition of gross public saving (Loayza, Schmidt-Hebbel and Servén 1999). The applicability of this definition is challenged in developing economies that suffer from a weak national accounting framework. Accordingly, saving behavior in developing countries has been predominantly examined using multi-country cross-sectional data, which has produced dubious results given vast disparities among countries with respect to the nature and quality of data. This makes cross-country comparisons and policy recommendations difficult as it is fraught with danger. (Athukorala and Sen 2001). This was the main limitation for studying private savings behavior in Egypt in the past. For example, Al-Mashat (2006) used non-government time deposits to GDP as a proxy for private savings to assess the probable relation between financial sector

development and growth. Hussein (2002) used savings to GDP as a proxy for financial development where financial savings is the sum of demand, time, and savings deposits held at deposit money banks. He utilized such to assess the response of the savings rate to the liberalization of interest rates in Egypt in early 1991. The other three studies on savings in Egypt focused on gross domestic savings that include both public and private savings.¹⁰

This research fills a significant gap on empirical modeling of private savings in Egypt. It employs a new time series on private savings in Egypt that was compiled by the Central Bank of Egypt (CBE) and the Central Authority for Public Mobilization and Statistics (CAPMAS) in Egypt. This series is inclusive of savings in deposits, money banking, post offices, specialized banks, investment and savings certificates issued by banks in addition to institutional private savings in pension funds and insurance companies. These were significant components that account for almost 15% of aggregate private savings during 1990-2010.



Source: CBE and CAPMAS, 2014

While the new series is available in annual frequency, the Chow-Lin's Temporal Disaggregation Methodology (Chow and Lin 1971) is employed to disaggregate the annual data into a higher frequency quarterly series. This methodology generates the best linear unbiased interpolation, distribution, and extrapolation of time series by using a related series called the indicator variable. The Chow-Lin method uses quarterly indicators to generate the quarterly volatility and transforms annual frequency data to quarterly data. To generate a quarterly series of aggregate private savings, the quarterly series of non-government demand and time deposits (obtained from the IMF – IFS 2015) was used as an indicator variable.¹¹

The generated quarterly series was deflated using CPI and divided by the population count to obtain the real gross private saving per capita in logarithm.

Motivated by the Life Cycle Model, it follows a brief account on relevant variable selection and the hypothesis to be tested with respect to the saving behavior in Egypt.

¹⁰ See ElSayed (1993), Touny (2008) and the literature review section.

¹¹ Full details of the matlab code and output is provided in the annex.

Real Income Growth Per Capita

Theory provided various interpretations to the nature of the relation between private savings and income growth. The life-cycle theory of saving and consumption predicts that changes in an economy's rate of economic growth will affect its aggregate saving rate. In the simplest version of the model, in which young people save for retirement, and old people consume their previously-accumulated assets, an increase in the rate of economic growth will unambiguously increase the aggregate saving rate. This is because of the observed increase in lifetime resources (and saving) of younger age groups relative to older age groups. Furthermore, Chow and Lin 1971, among others, supported this hypothesis. However, more complicated and realistic versions of the model yield ambiguous conclusions pertaining to the relationship between saving and growth. For example, young people may have low current income but high lifetime wealth, and may therefore borrow to finance current consumption.

Whether higher growth increases or reduces the aggregate saving rate depends on the respective age-profile of saving, which is an empirical matter and is negatively correlated with age (See Poterba (1994), Paxson (1996), Deaton and Paxson (1997) and Nwachukwu and Egwaikhide (2007)).

Following Modigliani and Brumberg (1954) and Modigliani (1998) the growth in the aggregate growth of real per capita income - not the level - is considered in the proposed setup as a determinant to private savings. The difference log of real per capita income is included in the model.

Real gross private savings and real income are both controlled for population growth - considering both variables in per capita terms. Due to the unavailability of high frequency data on population, the annual population count is used to index both quarterly series.

Accordingly, the nature and magnitude of the relation between growth and savings will be tested using Egypt's data and provide an explanation to the ongoing debate.

Financial Development

The earlier work of McKinnon (1973) and Shaw (1973) as well as the large body of contributions that followed assumed that financial development was indicative to the increased saving rate. Financial development policies called for elimination of credit ceilings, interest rate liberalization, ease of capital flows, enhanced prudential guidelines and supervision, and the development of capital markets.

Loayza and Shankar (2000) empirically show that – from a portfolio composition perspective - financial development allowed the private sector to increase long-term assets and durable goods within their portfolios of financial assets.

Loayza et al. (2000) propose that financial development has a direct short-run impact on saving rates and an indirect positive long-run impact. The direct effect goes through price and quantity channels. The price channel works through higher interest rates and, although popularly advocated in operational documents and the financial press, it is rarely effective in raising private saving—suggesting that the negative income effect of higher interest rates tends to neutralize their positive intertemporal substitution effect. Expanding access to credit to previously credit-constrained private agents allows households and small firms to use collateral more widely, and thus reduce

down payments on loans for housing and consumer durables. In theory, this move should reduce private saving because individuals are able to finance higher consumption at a given current income level.

However, whether increased financial development itself significantly increases overall propensity to save depends on the extent of substitution between financial saving and other components of the financial assets portfolio. Consequently, the expected signs of this relationship in the private saving function are ambiguous (Athukorala and Sen, 2004).

Real Interest Rate

The net effect of the interest rate on saving/consumption is unclear in the Life Cycle Model. A higher interest rate increases the present price of consumption relative to the future price (the substitution effect), and thus provides an incentive to increase saving (Athukorala and Sen, 2004). If the household is a net lender, an increase in interest rates also raises lifetime income, and thus tends to increase consumption and consequently, decrease saving (the income effect). Therefore, saving responds positively to increases in the interest rate only if the substitution effect is stronger than the income effect. It could be argued that for the typical developing economy, the net impact of a change in real interest rate on saving is likely to be positive.

McKinnon (1973) and Shaw (1973) also argued that the relationship between real interest rate and saving is positive for a developing economy. The argument is hinged on the basis of the state of underdevelopment of financial markets in these countries. Financial intermediation in these economies is dominated by self-financing and bank loans. This influences decisions on financial saving, which is determined more in this case by the desire to invest rather than to live on interest income. As a result, the greater part of household saving will be in the form of cash and near-money assets as well as the substitution effect will usually be much greater than the income effect of an interest rate change.

In January 1991, banks' lending and deposit rates were liberalized in Egypt. Ceilings on bank lending to the private sector and bank-specific ceilings on lending to public sector companies were abolished in October 1992 and July 1993. This gave way to increasing the public's confidence in the government's reform program that was in accordance with the IMF. Lifting restrictions on market entry and increasing competition proved to stimulate the efficiency of bank intermediation. Moreover, public sector companies were permitted to deal with all banks without prior permission from public sector banks. In the context of a developing economy, the hypothesis of a positive relation between real interest and real private savings in Egypt will be tested in this paper.

Inflation and Macroeconomic Uncertainty

The impact of inflation on saving - within the setup of the Life Cycle Model - prevails upon determining real returns to saving (the real interest rate). This proposition is based implicitly on the assumptions of inflation neutrality and absence of money illusion in saving behavior as well as the absence of the real balance effect of inflation. However, the validity of this assumption is questioned in countries with underdeveloped financial markets for the following two reasons.

The first is that inflation brings about ample uncertainty in future income streams and can thus lead to higher saving on the basis of 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 saving through its impact on real wealth. If consumers attempt to maintain a target level of wealth or liquid assets relative to income, saving will rise with inflation. For these considerations, we include the inflation rate as an additional explanatory variable.¹² It is calculated as the quarter over quarter percentage in change in CPI.

The second is motivated by the fact that an individual's level of precautionary saving is modeled as being determined by the utility maximization problem. This was realized by Friedman (1957), and later by and Bewley (1977) in their seminal work on the permanent income hypothesis (PIH). Ando and Modigliani (1963) emphasized the relevance of the life-cycle framework, therefore, building on intertemporal allocation of resources between the present and an uncertain future with the goal of maximizing utility. Rational individuals make sequential decisions in pursuit of achieving a coherent and otherwise 'stable' future goal using available information. Skinner (1988) and Zeldes (1989) observe that an increase in uncertainty should raise saving since risk-averse consumers set resources aside as a precaution against possible adverse changes in income; it is significant to note that individuals are inherently risk adverse, adhering to the assumption that the rational individual will increase savings in the face of uncertainty in hopes to avoid risk entirely. Carroll (1991) shows that uncertainty helps to explain why consumption is highly correlated with income in the case of young consumers who expect their incomes to increase in the future but do not know by how much.

Uncertainty also explains why the older population saves a positive amount as they face a lot of uncertainty regarding the length of their life and health costs; because of its subjective nature, those who make choices under uncertainty must rely on their intuition as well as present information to make such well-informed decisions. Furthermore, due to the concept of loss aversion, the homo economicus is largely affected by loss as opposed to a similar gain, which thus explains why the older population saves as opposed to consuming. Carroll and Samwick (1995a) obtained results, which suggest that precautionary saving may account for a large chunk of household wealth. Loayza, Schmidt-Hebbel, and Serven (2000) find a positive and significant relationship between inflation and the private saving rate.

The hypothesis of a negative relationship between real private savings and inflation will be tested to assess the aversion of the private savers to future uncertainty.

5. Empirical Results

Testing for Integration

Tables (3a), (3b) and (3b) provide summary statistics of the ADF test. Following the Dickey and Pantula (1987) sequential approach to confirm the order of integration for each variable, unit roots are tested under the assumption that the order of integration is at most two. The second difference for the data is employed for this purpose and as shown in table (3a), the data provide strong evidence to reject the null hypothesis of non-stationarity at the 1 percent level for all variables.

This is replicated for the first difference of the series. The null hypothesis of the existence of a unit root is rejected for all variables at 1% significance level. This indicates that the time series is stationary in their first and second differences.

¹² See Deaton, 1989.

Moreover, upon replication of this procedure with levels of data, the null hypothesis cannot be rejected for all variables with the exception of the change in the nominal exchange rate. This step concludes the existence of strong evidence that all the data series robustly follow an I(1) process in levels with the exception of the change in the exchange rate that follows an I(0).

Cointegration Analysis

At this stage the set of relevant variables proposed by LCH for savings behavior proposed by Modigliani & Brumbreg (1954) are considered. It is now plausible to investigate the presence of a long run equilibrium relation between real gross private savings per capita, real interest rate and m2togdp. A VAR-model in levels is considered between these three series.

Selecting the Lag Length

The reliability of the findings of the VAR system of equations depends on the lag length considered in running the system. This research adopts a robust procedure to test the optimal number of lags that maximize the efficiency of the model and ensure that the feedback information is adequately and efficiently maintained within the model. The optimal lag length is tested using several criteria including (AIC), Shwartz Criteria (SC) and the Log Likelihood test. The theory proposes that quarterly data as well as the propagation of the business cycle should be considered within a 6-year period (Cotis and Coppe, 2005).

The analysis begins with a VAR system using 6 lags and then a sequential reduction process is implemented thereafter to move from a general to a specific model specifically to avoid over-parameterization and ensure parsimony. Individual equations and vector misspecification tests for the reduced rank 3 lags model residuals and model stability robustly support our proposition to proceed with modeling long run and short run dynamics by adopting 3 lags and conditioning the analysis on white type noise residuals.

Cointegration Tests

The cointegration analysis is employed to a 3-lags system. The presence of a co-integrating relation is identified by Johansen's maximum likelihood estimator approach. The null hypothesis is rejected of no cointegration at 1% significance level and trace eigenvalue (λ_{trace}) - adjusted for the degrees of freedom – rejects the same null at 5% significance level. Table (7a) also reports that maximal eigenvalue test rejects the null at 5% for a second co integrating relation. These results means that one can confidently proceed with the analysis given the existence of a single cointegrating relation for the closed economy formulation.

Long-run Modeling

The long run equilibrium relation for real gross savings per capita in Egypt is provided in equation 6. The implied long run equilibrium relationship for real gross savings per capita (rgpspc) can be outlined (see tables 5 a &b):

$$rgpspc = 1.1317 - 0.045087 * RealInterest + 0.40821 * m2gdpratio \quad (6)$$

Real Interest Rate

The real interest rate negatively influences private savings in the long run in the case of Egypt; however, this interpretation should be considered with caution. As elaborated earlier, the empirical evidence on interest-rate elasticities of saving reflects the theoretical ambiguity: empirical

evidence estimates typically are small and not significantly different from zero. An interpretation to the overall negative relation between real private savings per capita and real interest rate can be attributed to the fact that the income effect outweighs the sum of its substitution and human wealth effects.

The statistical results shown in the long run equation provides evidence that income effect dominates the substitution effect in the case of Egypt. This result is consistent with relevant LDC's results by Loayza, Schmidt-Hebbel, and Servén (2000). The coefficient represents a semi-elasticity of real balances with respect to interest rates, and its value is - 0.045 if using percentages. At a 5% interest rate, the elasticity of money balances with respect to interest rates is (-0.22).

Financial Development

Financial development positively influences private savings in the long term in Egypt. The data provide strong evidence that the indirect positive effect of financial liberalization on private savings in Egypt should not be underemphasized. The positive implication of liberalizing domestic financial markets in Egypt—through recapitalizing domestic banks—fostering the efficiency of financial intermediation in addition to liberalizing interest rates has contributed to higher growth. Thus, through faster income growth, attaining higher levels of financial development depicted by a 1% increase in m2 to GDP increases private saving rates by 0.4% in the long run in Egypt if all other variables remain unchanged.

Short-run Modeling

The short run system is built using the cointegrating vector of real gross private savings per capita; as follows:

$$\begin{aligned}
 \text{Drgpspc} = & + 0.357 * \text{Drgpspc}_1 + 0.000117 * \text{DRealInterest}_1 + 0.018 * \text{Dm2gdpratio}_1 \\
 (\text{SE}) & (0.104) \quad (0.00449) \quad (0.048) \\
 & - 0.114 * \text{Drgpspc}_2 + 0.00313 * \text{DRealInterest}_2 + 0.0499 * \text{Dm2gdpratio}_2 \\
 & (0.103) \quad (0.00489) \quad (0.0443) \\
 & - 0.0612 * \text{CIa}_1 - 0.00577 * \text{CSeasonal} + 0.00664 * \text{CSeasonal}_1 \\
 & (0.0254) \quad (0.00301) \quad (0.00672) \\
 & + 0.00346 * \text{CSeasonal}_2 - 0.0299 * \text{dumm2002q3} - 0.00293 * \text{dumm1998q4} \\
 & (0.00697) \quad (0.00905) \quad (0.00838) \\
 & - 0.00303 * \text{dumm1999q1} + 0.0369 * \text{dumm2004q1} + 0.0409 * \text{dumm2002q4} \\
 & (0.00843) \quad (0.00851) \quad (0.00895) \\
 & - 0.0332 * \text{dumm2008q2} + 0.00609 * \text{dumm2002q1} \\
 & (0.00842) \quad (0.00849)
 \end{aligned}$$

$$\begin{aligned}
\text{Dm2gdpratio} = & + 0.508 * \text{Drgpspc}_1 - 0.00672 * \text{DRealInterest}_1 \\
(\text{SE}) & (0.242) \quad (0.0105) \\
& - 0.00897 * \text{Dm2gdpratio}_1 + 0.351 * \text{Drgpspc}_2 - 0.00629 * \text{DRealInterest}_2 \\
& (0.112) \quad (0.241) \quad (0.0114) \\
& - 0.156 * \text{Dm2gdpratio}_2 + 0.176 * \text{CIa}_1 - 0.134 * \text{CSeasonal} \\
& (0.104) \quad (0.0593) \quad (0.00704) \\
& + 0.000735 * \text{CSeasonal}_1 - 0.0297 * \text{CSeasonal}_2 - 0.0606 * \text{dumm2002q3} \\
& (0.0157) \quad (0.0163) \quad (0.0211) \\
& + 0.0104 * \text{dumm1998q4} + 0.0547 * \text{dumm1999q1} + 0.00534 * \text{dumm2004q1} \\
& (0.0196) \quad (0.0197) \quad (0.0199) \\
& + 0.0563 * \text{dumm2002q4} - 0.0138 * \text{dumm2008q2} + 0.0653 * \text{dumm2002q1} \\
& (0.0209) \quad (0.0197) \quad (0.0198)
\end{aligned}$$

The speed of adjustment in the short run money demand equation is negative, statistically significant and lies between zero and unity. It therefore satisfies the needed criteria to set up a robust model that converge to equilibrium in the long run. This also translates to the fact that real gross private savings per capita is above or below its long run equilibrium level. Finally, the negative sign and the magnitude that is less than unity ensure that real private savings converges to the long run equilibrium.

Reduction of the General Model and Parsimonious Model

The estimation of the short term system with unrestricted constant and dummies indicated that a number of variables are statistically insignificant. Since our empirical analysis reached a general statistical model that captures the key characteristics of the underlying data set, we proceed to reducing the complexity of the general model by eliminating statistically insignificant variables and checking the validity of the reductions at every stage to ensure congruence and parsimony of the final selected model (See Hoover and Perez (1999) and Campos, Ericsson, and Hendry (2005)).

Throughout the reduction process, 32 regressors were eliminated based on their statistical insignificance. Throughout the process, a progress test was conducted to test for the validity of the elimination in each step. This test is built on the likelihood ratio of the restricted (after reduction) versus the unrestricted model (before reduction).

The parsimonious short term equations included some significant lagged variables in the general model in addition to the first lag of exchange rate and US treasury bills rate. This is in addition to contemporaneous growth in real per capita income, inflation, and real interest rates.

Moreover, a comprehensive test was conducted to ensure that no critical information was lost throughout the process. The parsimonious model was accordingly formulated based on minimizing the Schwartz (SC) and Hannan–Quinn (AIC) information, which was found to encompass the general unrestricted system as well as all the reduced systems. It also minimized the three information criteria.

This system reads:

$$\begin{aligned}
 \text{Drgpspc} = & + 0.338 \cdot \text{Drgpspc}_{-1} + 0.0297 \cdot \text{Dm2gdpratio}_{-2} - 0.0325 \cdot \text{CIa}_{-1} \\
 (\text{SE}) & \quad (0.0682) \quad (0.0109) \quad (0.0138) \\
 & - 0.00608 \cdot \text{CSeasonal} - 0.017 \cdot \text{DDrealPercapitaGDP} - 0.224 \cdot \text{DInflation} \\
 & \quad (0.00169) \quad (0.0101) \quad (0.0379) \\
 & + 0.00591 \cdot \text{DRealInterest} + 0.00713 \cdot \text{DDExchangeRate}_{-1} \\
 & \quad (0.00274) \quad (0.00353) \\
 & - 0.0028 \cdot \text{DUSTBills}_{-1} + 0.023 \cdot \text{dumm2003q1} - 0.0215 \cdot \text{dumm2002q3} \\
 & \quad (0.00147) \quad (0.0064) \quad (0.00642) \\
 & + 0.0407 \cdot \text{dumm2002q4} + 0.0346 \cdot \text{dumm2004q1} + 0.0183 \cdot \text{dumm2007q2} \\
 & \quad (0.00579) \quad (0.00535) \quad (0.00568) \\
 & - 0.0368 \cdot \text{dumm2008q2} \\
 & \quad (0.00572)
 \end{aligned}$$

$$\begin{aligned}
 \text{Dm2gdpratio} = & + 0.418 \cdot \text{Drgpspc}_{-1} + 0.114 \cdot \text{CIa}_{-1} - 0.135 \cdot \text{CSeasonal} \\
 (\text{SE}) & \quad (0.165) \quad (0.0345) \quad (0.00431) \\
 & - 0.00788 \cdot \text{CSeasonal}_{-2} - 0.0665 \cdot \text{dumm2002q3} + 0.0575 \cdot \text{dumm1999q1} \\
 & \quad (0.00397) \quad (0.0143) \quad (0.0134) \\
 & + 0.053 \cdot \text{dumm2002q4} + 0.0758 \cdot \text{dumm2002q1} + 0.0711 \cdot \text{dumm2003q1} \\
 & \quad (0.0144) \quad (0.0136) \quad (0.0151) \\
 & - 0.0722 \cdot \text{dumm2007q1} + 0.046 \cdot \text{dumm2007q2} - 0.47 \cdot \text{DUnemployment}_{-1} \\
 & \quad (0.0144) \quad (0.0138) \quad (0.255)
 \end{aligned}$$

The short-term private savings function for Egypt is more aligned with the simple permanent income hypothesis. Savings growth is negatively related to contemporaneous change in income growth. The change in income growth reflects on lower growth in private savings. The change in income growth by 10% leads to a drop in private savings growth by around 0.2%. This finding contradicts the proposition of Life-Cycle Model and findings of earlier studies by Modigliani, 1970; Madison, 1992; Bosworth, 1993 and Carroll and Weil, 1994).

However, these findings are aligned with the simple permanent income that proposes that current savings could drop in case of higher future income growth. This school of thought interpret the decline in aggregate saving rate by the fact that the lifetime wealth of the young is high enough relative to that of their elders (Athukorala and Sen, 2004). This in turn reflects on lower rates of inter-temporal substitution and triggers higher preference to current consumption. Accordingly, growth in per capita income could actually lead to a decrease in saving. This finding provides significant guidance to policy on the need to robustly provide involuntary savings mechanisms. This is critical to smooth the younger cohort's consumption across time and mitigate incidence of future poverty of the elderly.

In addition, our tests concluded that macroeconomic uncertainty negatively influences private savings. Although this contradicts with the theory of precautionary savings, it is a common finding in empirical studies on savings behavior. Loayza, Schmidt-Hebbel, and Servén (2000) found only one of the six seminal empirical studies on savings and growth in LDCs that included inflation among the explanatory variables finds a positive and significant effect on the private saving rate. This is supported by the fact that macroeconomic uncertainty in LDCs - suffering financial market

imperfection - leads to more reliance on non-financial inflation hedges as investment in real estate and gold that are perfect substitutes of financial savings.

Short-term influence of real interest rates and financial development on real private savings are in line with theory and our earlier interpretation of long-term equation. Both variables are positively related to real private savings in the short term. This is in full conformity with the LCH.

Market openness has a significant effect on private savings. Exchange rate movement in the previous period reflects on real private savings in the current period. This is consistent with the analysis on the impact of short-term inflation. In general, devaluation of domestic currency in LDCs with limited capital mobility raises the public aversion to future uncertainties and trigger higher precautionary savings to mitigate future macroeconomic shocks. Another interpretation for the case of LDCs is that devaluation inflates the volume of the equivalence of foreign currency deposits in domestic currency. This has in turn led to a positive net effect for exchange rate devaluation on real private savings. Furthermore, the rise of foreign exchange rate triggers dis-savings and preference to store of value in non-financial assets (See Hussein and Mohieldin 1997).

6. Conclusion

A mix of the simple permanent income hypothesis as well as the life cycle hypothesis determinants are used to interpret real private savings behavior in Egypt. This study provides new empirical evidence related to savings behavior, financial development, and economic growth in Egypt. By using high quality and high frequency quarterly data covering 1991-2010, this study employed a robust vector equilibrium correction modeling strategy. The key long-term determinants of private savings in Egypt are the real interest rate and level of financial development. The data also show higher persistence of real private savings in the short run.

The real interest rate varies negatively with real private savings in the long term for the period under consideration, 1991 – 2010. This translates to the fact higher consumption is becoming more attainable at lower cost. Hussein and Mohieldin (1997) reached the same conclusion on the relation between private savings and real interest rates during 1960 – 1990. However, they referred to the fact that the financial repression of 1960s cannot be alleviated by an increase in the real interest rate as it further deepens the problem of excess liquidity of the banking system, which is indicative to the liquidity crisis in the late 1990s.

In the short term, real private savings vary positively with real interest rates, whereas financial development positively reflects on higher private savings on both horizons. This is a literal translation of the McKinnon -Shaw hypothesis on financial development and growth, which strongly holds for the case of Egypt.

The effect of higher inflation on real savings contradicts theory and negates the presence of a precautionary motive for savings in Egypt. This can be attributed to seeking alternative non- formal inflation hedges particularly in real estate and gold. This is common in LDCs that suffer financial market imperfections. Unavailability of robust data on real estate holdings and gold prices in the domestic market limit the interpretation of this result and raise a feasible research question for future development of this model.

Exchange rate movements reflect on higher private savings. It provides signals of macroeconomic uncertainty to economic agents and triggers precautionary motive for savings. In the absence of data on domestic and foreign currency denominated private savings, devaluation would reflect on raising the domestic currency equivalence of foreign currency savings leading to a net positive effect of devaluation on private savings.

Relevant policy recommendations are imperative to the betterment of the Egyptian economic narrative. A multitude of sources indicate that trust is a significant determinant of saving; in other words, it has been observed that individuals who perceive that the economic situation within their country will improve are more likely to save. Moreover, regression analysis illustrates that trust in deposit safety and financial stability is highly correlated with trust in one's government; therefore, an individual who trusts the institutions within their country is likely to save. With that being said, it is imperative that Egypt builds creditability as well as maintains integrity in their financial institutions in pursuit of building trust to ultimately increase savings.

In addition to trust, Internet access is significant to savings behavior whereas physical access and distribution of banks does not have an effect on one's probability of participation in bank savings and/or on informal savings. In many underdeveloped countries, information barriers are generally associated with higher costs. With that being said, improvements in Internet access lower transaction and information costs for stock market participation; thus increasing the likelihood of savings as well as helping a consumer make better financial decisions. However, one must be financially literate to reap the benefits cultivated from access to the Internet. Increasing Internet access within Egypt could be pivotal to savings behavior; however, it should also be noted that it would only assist a specific cohort of individuals.

Furthermore, the inception of funded private pension systems schemes within Europe and Central Asia have been pivotal to savings behavior. Essentially, a pension system encourages savings within the workplace to ensure adequate income for workers during retirement. However, regulatory requirements and misguided strategies have reduced the yield of such investments as well as impeding on the overall objective of private pensions. Appropriately positioning a mandatory pension system within Egypt could dynamically alter savings behavior; however, it is recommended that more research should be conducted in regards to regulatory requirements prior to implementing such policy.

Overall, macroeconomic measures heavily influence resource mobilization and particularly savings behavior in Egypt during the period under consideration in this study (1991-2010). Robust economic policies including macroeconomic and monetary measures - are pre-requisites to maximize private savings and finance growth in Egypt.

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Annex I: Data Definitions

Table (1): Data Description:

Acronym	Description	Source	Adjusted	Date Accessed
rgpspc	Log of real gross private savings per capita	Egyptian Central Authority for Mobilization and Statistics	Yes (log of levels of quarterly interpolated data from annual series using Chow Lin disaggregation)	March 30 th 2015
DrealPercapitaGDP	Growth (First Difference) of Logs) of real per capita GDP	Quarterly Series Obtained from Egyptian Cabinet's Information and Decision Support Center	Yes (first difference of log of levels deflated by CPI: base year 2010)	March 30 th 2015
Inflation	Inflation Rate: quarter on quarter change in CPI	IMF International Financial Statistics	No	March 30 th 2015
RealInterest	Real Interest Rate: Three months deposit rate less inflation (quarter on quarter inflation)	IMF International Financial Statistics	No	March 30 th 2015
m2gdpratio	Financial Development Indicator: log of M2 to GDP ratio	IMF International Financial Statistics	No	March 30 th 2015
DExchangeRate	Expected Exchange Rate Depreciation: of differenced log of official nominal exchange rate	IMF International Financial Statistics	Yes (First Difference of levels)	March 30 th 2015
USTBills	Foreign Interest Rate: US Treasury Bills Rate	IMF International Financial Statistics	No	March 30 th 2015

Annex II: Diagnostic Tables

Table (2): Summary Statistics:

Sample: 1993(quarter: 1) - 2010(quarter: 4) (72 observations; quarterly data covering 18 years) # of Variables: 7

Variable	Leading sample	#obs	#miss	Minimum	Mean	Maximum	std.dev
rgpspc	1993(1) - 2010(4)	72	0	0.46401	0.61723	0.78112	0.11191
DrealPercapitaGDP	1993(1) - 2010(4)	72	0	-0.097638	0.0086462	0.15028	0.044196
Inflation	1993(1) - 2010(4)	72	0	0.00000	0.018889	0.080000	0.016746
RealInterest	1993(1) - 2010(4)	72	0	5.8600	8.6786	11.990	1.9372
m2gdpratio	1993(1) - 2010(4)	72	0	-0.37106	-0.20299	-0.030459	0.091823
DExchangeRate	1993(1) - 2010(4)	72	0	-0.34000	0.036806	1.2300	0.17118
USTBills	1993(1) - 2010(4)	72	0	0.050000	3.3743	6.2200	1.9594

Table (3a): Augmented Dickey-Fuller Tests for Unit Roots: Second Differences of Log Levels of Real Data - Sample 1993(2) - 2010(4)

Variable	t-adf	beta Y_lag	t-DY_lag	Maximum Lags	AIC
DDrgpspc	-8.330**	-2.4482	3.274	3	-8.925
DDDrealPercapitaGDP	-9.920**	-14.573	4.033	6	-6.243
DDInflation	-7.075**	-6.4815	2.577	6	-7.911
DDRealInterest	-5.640**	-2.3274	1.654	5	-2.610
DDm2gdpratio	-5.869**	-4.4654	1.546	6	-7.233

T=73, Constant+Trend+Seasonals; 5%=-3.47 1%=-4.09

P-values are in brackets, *** Significance level at 1%; ** Significance level at 5%; *Significance level at 10%

Table (3b): Augmented Dickey-Fuller Tests for Unit Roots: First Differences of Log Levels of Real Data - Sample 1993(1) - 2010(4)

Variable	t-adf	beta Y_lag	t-DY_lag	Maximum Lags	AIC
Drgpspc	-7.254***	0.11175		0	-8.990
DDrealPercapitaGDP	-10.05***	-1.0780	3.083	1	-5.740
DInflation	-7.873***	-1.6105	2.790	3	-8.237
DRealInterest	-5.200***	0.29126	1.555	1	-2.835
Dm2gdpratio	-7.952***	0.028625		0	-7.345

T=73, Constant+Trend+Seasonals; 5%=-3.47 1%=-4.09

P-values are in brackets, *** Significance level at 1%; ** Significance level at 5%; *Significance level at 10%

Table (3c): Augmented Dickey-Fuller Tests for Unit Roots: Levels of Real Data - Sample 1993(1) - 2010(4)

Variable	t-adf	beta Y_lag	t-DY_lag	Maximum Lags	AIC
rgpspc	-1.824	0.93194	2.724	5	-9.018
DrealPercapitaGDP	-10.49**	-1.6168	4.614	2	-6.720
Inflation	-5.934**	0.26828	2.500	1	-8.329
RealInterest	-2.658	0.86223	4.333	1	-2.911
m2gdpratio	-0.8490	0.96645		0	-7.356

T=73, Constant+Trend+Seasonals; 5%=-3.47 1%=-4.09

P-values are in brackets; *** Significance level at 1%; ** Significance level at 5%; *Significance level at 10%

Table 4a: Baseline Model

Cointegration Analysis with Johansen Test: sample 1991 - 2010						
rank	eigenvalue	Log likelihood for rank	Trace test [Prob]	Max test [Prob]	Trace test (T-nm)	Max test (T-nm)
0		470.8575	44.98 [0.003]***	29.52 [0.003]***	39.51 [0.015]**	25.93 [0.012]**
1	0.32895	485.6172	15.46 [0.205]	12.54 [0.161]	13.58 [0.327]	11.01 [0.260]
2	0.15582	491.8848	2.92 [0.603]	2.92 [0.602]	2.57 [0.669]	2.57 [0.668]
3	0.038718	493.3458				

P-values are in brackets, *** Significance level at 1%; ** Significance level at 5%; * Significance level at 10%

Table 4b: Eigen vector of the variables entering into the respective cointegrating vector			
beta (scaled on diagonal; cointegrating vectors in columns)			
rgpspc	1.0000	19.041	0.87189
RealInterest	0.045789	1.0000	0.028402
m2gdpratio	-0.39439	-5.4924	1.0000
Constant	-1.1301	-21.190	0.98448
alpha			
rgpspc	-0.066459	0.00066369	-0.029979
RealInterest	-0.47952	-0.14404	-0.28516
m2gdpratio	0.19591	0.0035570	0.060292
Constant	-0.066459	0.00066369	-0.029979

P-values are in brackets, *** Significance level at 1%; ** Significance level at 5%; * Significance level at 10%

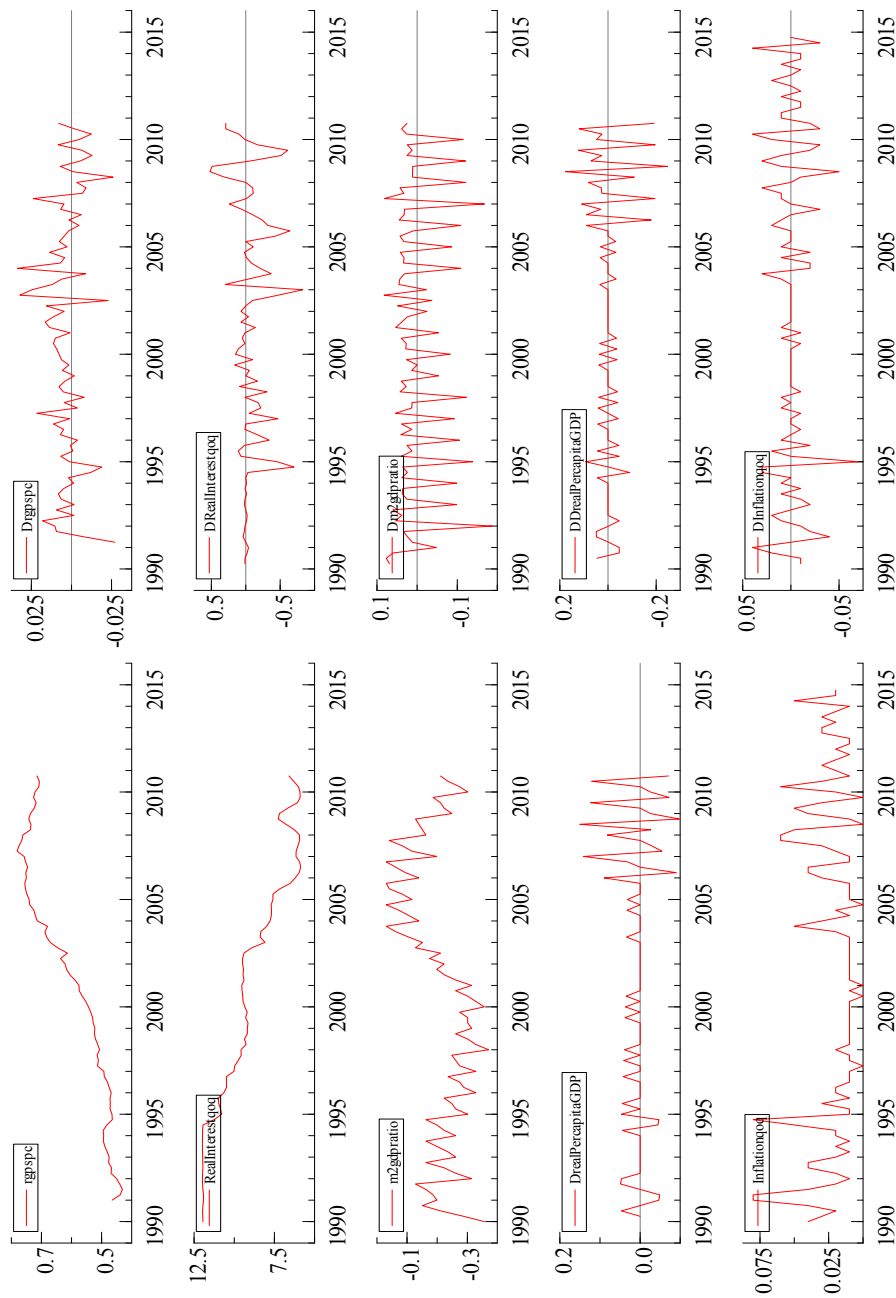
Table 5a: Hypotheses Tests for the Alpha Vector: Weak Exogeneity			
rgpspc	Zero	Chi ² (1)	6.4004 [0.0114]**
RealInterest	Zero	Chi ² (1)	0.28427 [0.5939]
m2gdpratio	Zero	Chi ² (1)	9.2625 [0.0023]**
Joint Significance for alphas of (RealInterest rgpspc)	Zero	Chi ² (2)	6.4985 [0.0388]**

P-values are in brackets, *** Significance level at 1%; ** Significance level at 5%; * Significance level at 10%

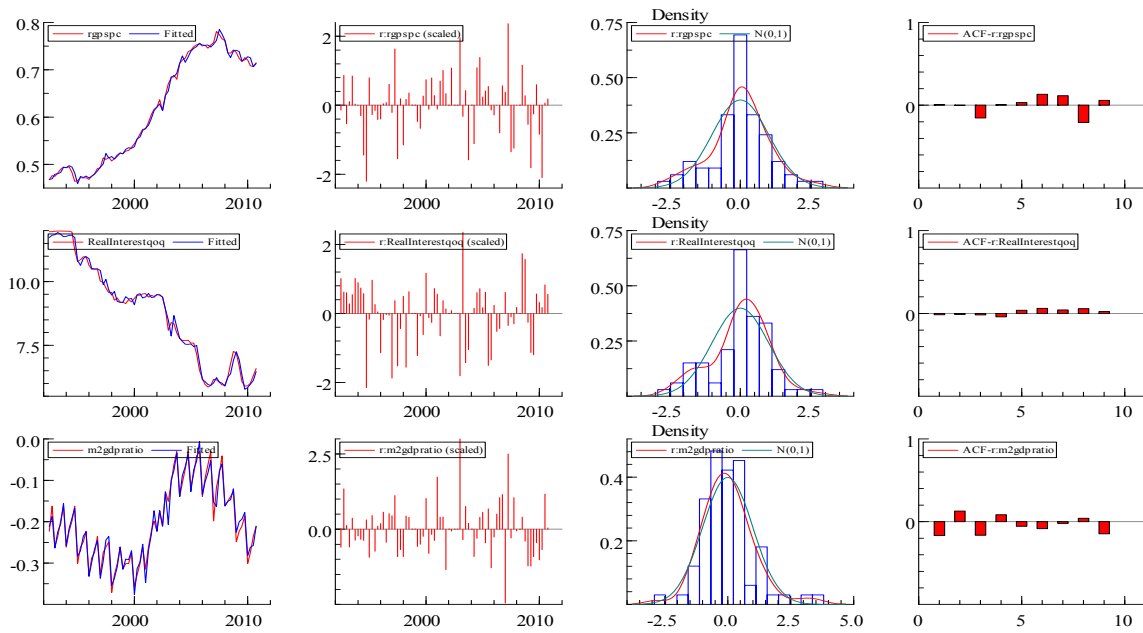
Table 5b: Reduced Rank Standardized Coefficients				
	Beta Vector	Std Err	Alpha Vector	Std Err
rgpspc	1.0000	0.00000	-0.059411	0.024957
RealInterest	0.045087	0.0044744	0.00000	0.00000
m2gdpratio	-0.40821	0.11153	0.17236	0.058731
Constant	-1.1317	0.033245	-0.059411	0.024957

Annex III: Graphical Representation and Diagnostics

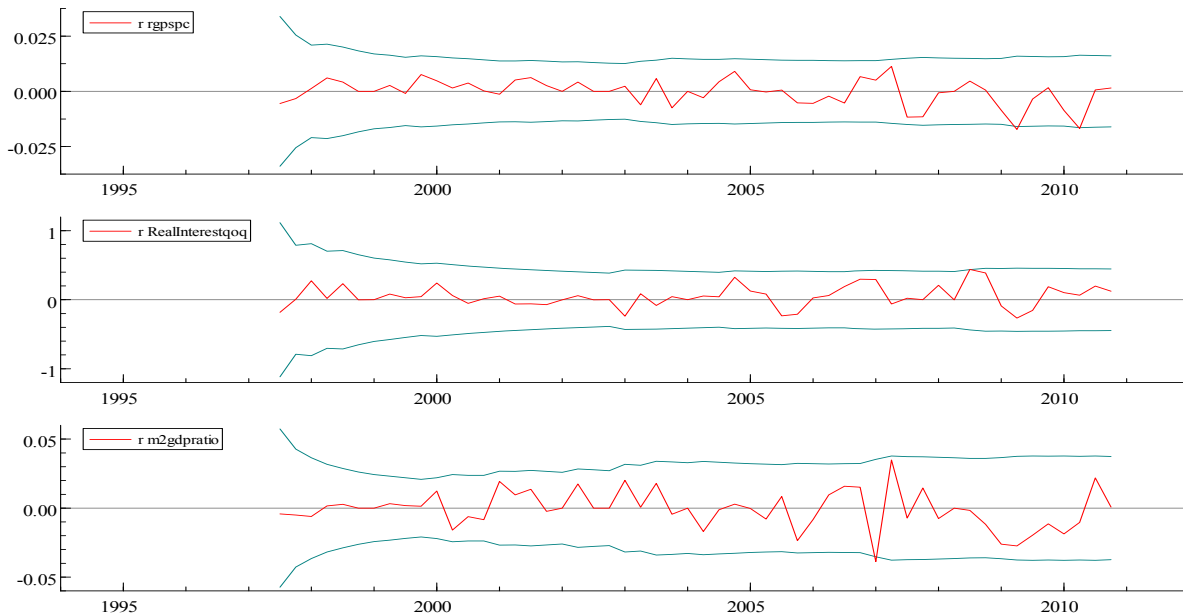
Graph (1): Plot of Levels and First Differences



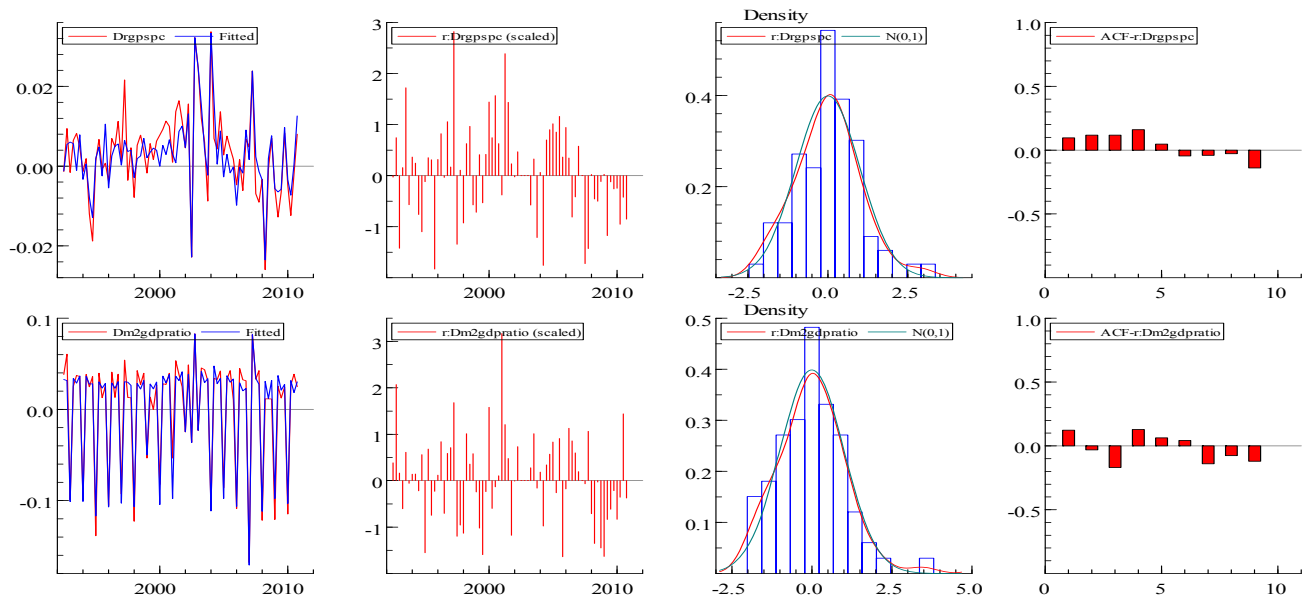
Graph (2): Diagnostic Graphs of Restricted VAR



Graph (3): Stability Test of Restricted VAR



Graph (4): Diagnostic Graphs of Parsimonious VECM:



Graph (5): Stability of Parsimonious VECM:

