The Relationship Between Savings and Investment in MENA Countries

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INTRODUCTION

The debate over the correlation between saving and investment has been initiated by the work of Feldstein and Horioka (1980). Feldstein and Horioka (1980) investigated the link between saving and investment using data from OECD countries and their findings was in favor of the capital immobility hypothesis across countries. This link between saving and investment became under further empirical investigation where more of such investigations have focused on the developed countries with little performed on developing countries. These studies include, among others, Feldstein (1983), Murphy (1984), Miller (1988), Tesar (1991), Baxter and Crucini (1993), Barkoulas et al (1996), Jansen (1996), Jansen and Schulze (1996), Bajo-Rubio (1998), Sarno and Taylor (1998), Sinha and Sinha (1998), Van Rensselaer and Copeland (2000), Agrawal (2001), Anoruo (2001), Abbott and Vita (2003), and Schmidt (2003).

This paper will investigate the causality link between saving and investment in four MENA countries: Egypt, Jordan, Morocco, and Tunisia. The questions that this paper will try to answer are the following: Are saving and investment correlated? What will be the impact of such correlation on the economic development in these countries? Are the domestic savings in these countries used to enhance their domestic investment? How will the capital mobility issue affect the government policies to increase saving rates and/or ease its restrictions on the flow of capital? That is, how such a relation will impact policies that will be made by policymakers to influence the saving and investment rates in these countries to enhance their economic growth and development. Therefore, by examining the relation between saving and investment, this paper will a) provide an empirical investigation of the causal relation between saving and investment in MENA countries, and b) offer the policymakers in these countries a guideline to help them in formulating their policies in terms of encouraging domestic saving and/or investment. The rest of the paper is structured as follows. Section 2 explains the data and the methodology, and section 3 presents the empirical results. Finally, section 4 provides the conclusion of this study.

DATA AND EMPIRICAL METHODOLOGY

To provide answers to the above questions that will be investigated in this research, the paper will use annual data on gross domestic saving, gross domestic investment, and gross domestic product for Egypt (1965-2002), Jordan (1976-2002), Morocco (1966-2002), and Tunisia (1961-2002). All the variables are in real terms. All the data are extracted from the World Bank, World Development Indicators tapes.

The methodology that will be used in this study is cointegration and error correction model (Johansen 1991, and Johansen and Juselius 1990). After investigating the time series properties of the saving and investment rates in each country, the appropriate model will be used based on the results in order to investigate the short run and the long run relation between saving and investment rates.

Here, let SR_t and IR_t be the saving and investment rates, respectively. Following Granger's (1969, 1988) standard test of causality, SR_t is said to Granger-causes IR_t, if the lagged values of SR_t contain information that helps improve the prediction of IR_t. To use the appropriate model for investigating the causal relationship between SR_t and IR_t, however, one needs to determine the stochastic properties of the individual time series. We need to test whether the variables SR_t and IR_t are stationary, i.e., integrated of order of zero, $SR_t \sim I(0)$ and $IR_t \sim I(0)$. This can be provided by using the Dickey-Fuller (DF) and the Augmented Dickey-Fuller (ADF) tests. The ADF test requires estimating the regression given by equation (1) as:

$$\Delta SR_t = \alpha_{1o} + \beta_1 SR_{t-1} + \sum_{i=1} \gamma_{1i} \Delta SR_{t-i} + \varepsilon_{1t}$$

$$(1)$$

$$\Delta IR_t = \delta_{1o} + \theta_t IR_{t-1} + \sum_{j=1} \eta_{1j} \Delta IR_{t-j} + \mu_{1t.}$$

where Δ is the first-difference operator, α, β, γ, δ, θ, and η are the coefficients, and ε_{1t} and μ_{1t} are error terms.

The null hypothesis in equation (1) is that SR_t and IR_t are nonstationary series, i.e., have unit roots, ($\beta_1 = \theta_t = 0$). The alternative hypothesis is that the variables SR_t and IR_t are stationary, i.e., integrated of order of zero, $SR_t \sim I(0)$ and $IR_t \sim I(0)$, if the calculated t-ratio for β_1 and θ_t is significantly negative when using the MacKinnon (1991) critical values.

A cointegration procedure requires that time series to be nonstationary in levels, and have the same order of integration. That is, we need to test whether the variables SR_t and IR_t are cointegrated meaning that a long-run relationship between saving rate and investment rate exist. The cointegration test used in this study is based on both methods of Engle and Granger (1987), and the Johansen (1988) and Johansen and Juselius (1990). The Johansen cointegration test uses two likelihood-ratio tests. They are the trace and the maximum eigenvalue (λ-max) statistics in order to determine the number of cointegrating vectors. If the two variables are $I(1)$ and cointegrated then this suggests that a causal relationship may exist between them in at least one direction. The causal relationship between the variables SR_t and IR_t can be accomplished using Granger-causality test by estimating the vector error correction model (VECM) (Engle and Granger, 1987) that is given in equation (2) as follows:

$$\Delta SR_t = \alpha_{2o} + \sum_{i=1} \beta_2 \Delta SR_{t-i} + \sum_{j=1} \gamma_{2j} \Delta IR_{t-j} + \lambda_1 u_{t-1} + \varepsilon_{2t}$$

$$(2)$$

$$\Delta IR_t = \delta_{2o} + \sum_{i=1} \theta_2 \Delta IR_{t-i} + \sum_{j=1} \eta_{2j} \Delta SR_{t-j} + \lambda_2 v_{t-1} + \mu_{2t.}$$

where u (= $SR - a - \beta IR$) and v (= $IR - a' - \beta' SR$) are error correction terms that measure deviations from the long-run equilibrium relation between SR_t and

IR_t (Engle and Granger, 1987). In testing the causal relation between SR_t and IR_t using the *VECM* in equation (2), the independent variables "Granger-causes" the dependent variable if the error correction term in equation (2) is statistically significant. For example, using the saving equation in equation (2), then growth rate of investment "Granger-causes" growth rate of saving if either the sum of γ_{2j}'s or λ_1 is statistically significant, (i.e. not equal to zero). Similarly, using the investment equation in equation (2), then growth rate of saving rate "Granger-causes" growth rate of investment rate if either the sum of η_{2j}'s or λ_2 is statistically significant, (i.e. not equal to zero). In addition, another source of causation of IR_t by SR_t (or, SR_t by IR_t), can be through the lagged terms of ΔSR_t (or, ΔIR_t) if all the η_{2j} (or, γ_{2j}) are not equal to zero.

EMPIRICAL RESULTS

Unit Root Test

Table 1 reports results of the Augmented Dickey-Fuller (ADF) unit root test. The results show that both time series (SR_t and IR_t) are integrated of order of one, i.e., $SR_t \sim I(1)$ and $IR_t \sim I(1)$ are nonstationary in levels but stationary in first difference. The lag length for the ADF unit root test was chosen to minimize the Akaike Information Criterion (AIC).

{Table 1 here}

Granger Causality Test
Since the saving and investment rates were nonstationery in their levels but not cointegrated for Egypt, Jordan, Morroco, and Tunisia, the vector autoregressive (VAR-in first difference) model is used to determine the direction of causality between saving and investment rates [1]. Table 2 shows the results of Granger causality test. The results show that there is a unidirectional Granger causality between saving and investment rates that runs from saving to investment rates in the case of both Egypt and Jordan. For Morocco, the results indicate that a unidirectional Granger causality that runs from investment rate to saving rate. In

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[1] Based on Johansen's and Engle-Granger methods, the cointegration test results (not reported here) reveal that saving and investment rates are not cointegrated which supports the idea that capital mobility exists.

addition, the results reveal that no Granger causality between investment and saving rates in either direction is detected for Tunisia.

{Table 2 here}

CONCLUSIONS

This paper investigates the causal relation between saving and investment in four MENA countries: Egypt, Jordan, Morocco, and Tunisia. Using unit root analysis, the results show that saving and investment rates are integrated of order of one. However, using cointegration analysis, the study findings show that the two variables are not cointegrated indicating that saving and investment have no long run relation thus capital mobility exist. Using the Ganger causality test based on VAR model, the results reveal that a unidirectional causality between saving and investment exists for both Egypt and Jordan and that direction of causality runs from saving to investment. In addition, the results show that a unidirectional causation from investment to saving is statistically supported in the Granger sense for Morocco. However, in the case of Tunisia, the results provide no statistical support in the Granger sense between saving and investment. It is also worth mentioning when interpreting the results that the bivariate Granger causality models may have the problem of omitted variable bias. It is also worth mentioning that results should be interpreted with caution since the power of the unit root and cointegration tests may suffer in small samples.

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TABLE 1: ADF UNIT ROOT TEST

(The null hypothesis: SR and IR have a unit root)

Country/Period	Variables	Level	Difference
Egypt (1965-2002)	SR	-2.517 (1)	-4.936*** (1)
	IR	-1.382 (1)	-3.502** (1)
Jordan (1976-2002)	SR	-1.328 (1)	-4.097*** (1)
	IR	-2.429 (1)	-3.686** (1)
Morocco (1966-2002)	SR	-2.333 (1)	-5.148*** (1)
	IR	-2.636 (1)	-4.147*** (1)
Tunisia (1961-2002)	SR	-1.620 (5)	-5.102*** (1)
	IR	-2.380 (1)	-3.677*** (1)

Notes: SR = ratio of gross domestic saving to GDP and IR = ratio of gross domestic investment to GDP.
Optimal lags according to Akaiki Information Criteria (AIC) are given in parenthesis.
***, **, and * indicate significance levels of the 1%, 5%, and 10%, respectively.

TABLE 2: Granger-Causality Tests Based on VAR: F-Statistic

Null Hypothesis	F-Statistic	Causality Inference
Egypt:		
D(IR) does not Granger Cause D(SR)	2.09	D(IR) ≠> D(SR)
D(SR) does not Granger Cause D(IR)	9.31***	D(SR) ⇒ D(IR)
Jordan:		
D(IR) does not Granger Cause D(SR)	1.35	D(IR) ≠> D(SR)
D(SR) does not Granger Cause D(IR)	3.35*	D(SR) ⇒ D(IR)
Morocco:		
D(IR) does not Granger Cause D(SR)	3.50*	D(IR) ⇒ D(SR)
D(SR) does not Granger Cause D(IR)	0.03	D(SR) ≠> D(IR)
Tunisia:		
D(IR) does not Granger Cause D(SR)	0.001	D(IR) ≠> D(SR)
D(SR) does not Granger Cause D(IR)	1.17	D(SR) ≠> D(IR)

Notes: SR and IR as defined above. D(SR) & D(IR) are the first derivative of SR & IR, respectively.
***, **, and * indicate rejection of the null hypothesis at significance levels of the 1%, 5%, and 10%, respectively.