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Investigating Capital Mobility and Saving-Investment Relationship: Case Study of MENA Countries

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Abstract

This paper determines the degree of capital mobility and saving- investment association by using the Feldstein- Horioka (1980) approach among Middle East and North African (MENA) countries during 1990-2011. According to the Feldstein- Horioka hypothesis, in a country with high degree of capital mobility there should be no relationship between domestic saving and domestic investment and inversely, in a country with low degree of capital mobility there is a high correlation between domestic saving and domestic investment. Using panel data and employing Random effect Model to estimate the model, the obtained results show that capital is highly mobile in these countries.

Keywords: Capital mobility, Feldestein and Horioka approach, MENA region, Panel Data

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Introduction

Rapid economic liberalization in emerging markets in the late 1980s and the early 1990s through technological progresses in transportation systems and communication,

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has led to rapid increasing in trade, expanding of international capital flows and more integration of countries in recent years. (Eichengreen, 2003)

Determining the degree of capital mobility is a striking issue in macroeconomics analysis because it is important for determining the optimal fiscal and monetary policy, managing the exchange rate, setting the tax induced by inflation and for many other purposes. (Jamilov, 2013)

Countries can gain from increasing capital mobility. For instance capital mobility can improve allocation of global resources. In addition, by stimulating investment, it can improve growth beyond the limits of domestic saving (Slimane, et al., 2013). With this view it is necessary to detect the extent of capital mobility and in this paper we probe this issue in MENA countries.

The rest of this paper is organized as follows: section 2 introduce the theoretical framework, section 3 describes a summary of empirical studies concerning with this issue, section 3 presents the model and data, section 4 discusses the methodology and finally section 5 includes summary and conclusion.

Theoretical framework

In the economics literature, there are several ways to examine the degree of international capital mobility. One test proposed by Feldstein and Horioka (1980) for measuring capital mobility is to investigate the relationship between saving and investment. As an indicator of capital mobility the saving-investment correlation of Feldstein and Horioka has some advantages over other indicators in the literature. For example, it does not have to deal with the problem of heterogeneity of assets, as occurs with the tests of parity conditions, and does not incorporate multiple hypotheses as the Euler equation tests or the consumption-smoothing approach. (Rocha, 2007)

So, in this paper we attempt to survey the degree of capital mobility in MENA countries.

Using cross-section regressions across 16 OECD countries for the period from 1960 to 1974, Feldstein and Horioka (1980) found that the estimation of the correlation between saving and investment ranges from 0.87 to 0.91. This result implies a low degree of capital mobility among industrial countries, in contradiction with the belief that the industrial countries had few barriers to capital movements.

They stated that saving responded to international opportunities for investment and investment in one country can be financed by domestic and foreign saving. (Eslamloueyan & Jafari, 2010). They argued that “With perfect world capital mobility, there should be no relation between domestic saving and domestic investment” (Feldstein and Horioka, 1980, p.317). It means that under capital immobility saving equals investment.

So, briefly, the feldstein- Horioka approach (hereafter is noted by F-H) implies that in a country with high degree of capital mobility there should be no relationship between domestic saving and domestic investment and inversely, in a country with low degree of capital mobility there is a high correlation between domestic saving and domestic investment.

Literature review

In recent years, a lot of studies have been conducted on the degree of international capital mobility based on the relation between domestic investment and domestic saving.

Krol (1996) believed that using time- averaged data in cross- sectional saving-investment regressions can bias the results against capital mobility. So, in order to solve this problem he estimated the model by using annual data for the period 1962 to 1990 for 21 OECD countries. The results indicated that capital is internationally mobile. Another support for this result in this paper is the existence of a significant impact of both saving and investment on the current account.

Adebola and Dahalan (2012) by applying ARDL bound test to estimate F-H (1980) model, examined the degree of capital mobility in Tunisia during 1970- 2009 and finally they showed that there is low capital mobility in Tunisia.

Meuronen (2012) investigated the relation between domestic saving and domestic investment in Finland during the period 1960Q1-1986Q2 and 1986Q3-2011Q2. In the earlier period studied, the variables were found to be co-integrated with a vector suggesting low capital mobility. However, in the later period the relationship disappeared.

Cheng Li (2010) showed that the savings and investment (both expressed as ratios to GDP) are positively correlated for a sample of 28 Chinese provinces during 1978-2006. He argued that according to the F-H hypothesis such a correlation can be interpreted as evidence of low capital mobility within china.

Jain and Sami (2011) attempted to investigate the existence of F-H (1980) hypothesis in Small Island States Employing three co-integration procedures. They indicated that overwhelming evidence that savings and investment are co-integrated in these small economies.

Bankage and Eggoh (2011) investigated the relationship between saving and investment rates for 37 African countries during 1970–2006. They used the recently developed Pooled Mean Group co-integration technique and found that in the long-run, capital was relatively mobile in African countries, while, in the short-run, coefficients were not significant.

slimane et al (2013) tested the hypothesis of perfect capital mobility in Tunisia and Moroco using F-H methodology. In this study they introduced additional variables to explain the degree of financial openness more effectively. They concluded that the degree of capital mobility was relatively high in these countries. Following Feldstein and Horioka, Dooley et al. (1987) estimated the F-H (1980) regression with cross-section data on developing countries. Their evidence indicates a close relation between saving and investment, suggesting a low degree of capital mobility. Rocha (2000) tried to provide more evidence on the degree of capital mobility in developing countries using annual data for the period 1996-1960 for 36 developing countries. The results of his study suggest that the degree of capital mobility in developing countries is higher than usually believed. In addition, capital mobility increased considerably after 1975.

Model specification and data

Model specification

Following Feldstein and Horioka (1980) and many other researches, we estimate the relationship between domestic saving and domestic investment in order to determine the degree of capital mobility. They estimate the following cross-section regression

$$(I/Y)_i = \alpha + \beta\,(S/Y)_i + \varepsilon_i \qquad (1)$$

Where (I/Y) and (S/Y) are respectively the saving and investment rates of country *i* , β is the savings- retention coefficient and ε is the error term. According to the F-H finding for a small-open economy where capital is perfectly mobile internationally, β should be close to zero. If β equals zero, then there is no relationship between saving and investment. On the other hand, if β is large, capital is considered immobile internationally. For example, if β equals one, then all additional saving goes to finance domestic investment (Feldstein and Horioka, 1980).

Following the original study of F-H (1980), savings is defined as gross domestic savings as a percentage of GDP, and investment is measured by gross fixed capital formation divided by GDP.

Data

Because using time-averaged data on saving and investment, like that F-H used in their research can bias the results toward rejecting the idea that capital is highly mobile, so, in this paper we use panel data to estimate the model. Generally, using of panel data has numerous benefits in contrast with time series data: controlling for individual heterogenity and give more informative data, more variability, less co-linearity among the variables, and more efficiency (Baltagi, 2005). Therefore, in this paper we have applied panel data of 14 MENA countries over the 1990 to 2011 years. Annual data have been taken from the World Development Indicators (WDI). Sample of countries includes: Algeria, Bahrain, Egypt, Iran, Jordan, Kuwait, Lebanon, Libya, Morocco, Qatar, Saudi Arabia, Syria, Tunisia, Yemen.

Methodology

LR Test

At the first step, in order to select between pooled data and panel data, we have used LR test. The null hypothesis of this test implies that the data have pooled structure. In contrast, the alternative hypothesis implies that we should estimate the model based on panel data.

Panel Unit Root Test

In the next step, in order to identify whether the data are stationary or not, panel unit root tests should be employed.

Several Panel unit root tests have been presented to investigate the stationary properties of panel data. This paper applied four tests proposed by Levin et al. (LLC, 2002), Im et al. (IPS, 2003), Breitung (2000) and Fisher-type test proposed by Maddala and Wu (1999) and Choi (2001) to test the null hypothesis of having unit root.

Following Dickey and Fuller (1979, 1981), Levin and Lin (1993), and Levin, Lin and Chu (2002), consider a panel extension of the null hypothesis that each individual time series in the panel contains a unit root against the alternative hypothesis that all individual series are stationary (Hsiao, 2003).

The adjusted t-statistic of LLC can be written as follows:

$$t_{\rho}^{*} = \frac{t_{\rho} - N\tilde{T}\hat{S}_{N}\hat{\sigma}_{\tilde{\varepsilon}}^{-2}\hat{\sigma}(\hat{\rho})\mu_{m\tilde{T}}^{*}}{\sigma_{m\tilde{T}}^{*}} \quad (2)$$

Where $\mu_{m\tilde{T}}^{*}$ and $\sigma_{m\tilde{T}}^{*}$ are the mean and standard deviation adjustments provided by table 2 of LLC. Levin, Lin and Chu show that t_{ρ}^{*} is asymptotically distributed as N (0, 1).

The test of Im, Pesaran and Shin (IPS, 2003) allows for a heterogeneous coefficient of y_{it-1} and propose an alternative testing procedure based on averaging individual unit root test statistics. IPS suggests an average of the ADF tests when u_{it} is serially correlated with different serial correlation properties across cross-sectional units.

The t-statistic of IPS can be expressed as follows:

$$t_{IPS} = \frac{\sqrt{N}\left(\bar{t} - \frac{1}{N}\sum_{i=1}^{N} E[t_{iT} \mid \rho_i = 0]\right)}{\sqrt{\frac{1}{N}\sum_{i=1}^{N} \operatorname{var}[t_{iT} \mid \rho_i = 0]}} \Rightarrow N(0,1) \quad (3)$$

Values of $E\,[t_{iT} \mid \rho_i = 0]$ and var $[t_{iT} \mid \rho_i = 0]$ obtained from the results of Monte Carlo simulations carried out by IPS.

As mentioned in Baltagi (2005), LLC and IPS tests may not keep nominal size well when either N is small or N is large relative to T. Breitung (2000) found that the LLC and IPS tests suffer from a dramatic loss of power if individual-specific trends are included. Breitung suggests a test statistic that does not employ a bias adjustment whose power is substantially higher than LLC or the IPS tests using Monte Carlo experiments. The test statistic of Breitung (2000) panel unit root test has the following form:

$$\lambda_B = \frac{\sum_{i=1}^{N} \sigma_1^{-2} y_i^{*\prime} X_i^{*\prime}}{\sqrt{\sum_{i=1}^{N} \sigma_1^{-2} X_i^{*\prime} A' A_i^{*}}} \qquad (4)$$

Maddala and Wu (1999) and Choi (2001) proposed a Fisher-type test of unit root, which combines the *p*-values from unit root tests for each cross-section *i* to test for unit root in panel data. The Fisher test is nonparametric and distributed as chi-square with two degrees of freedom:

$$p\lambda = -2 \sum log_e \pi_i \qquad (5)$$

Panel Co- integration Test

Several tests were presented to survey the existence of co-integration in panel data model. This paper applied panel co-integration test of Pedroni (1999, 2004) and Kao (1999).

Pedroni has presented seven statistics for testing the null hypothesis of no co-integration in panel data. Four statistics called panel co-integration statistics and based on pooling along what is commonly referred to the "within-dimension" and other three statistics developed by Pedroni called group-mean panel co integration statistics, are based on pooling along what is commonly referred to "between-dimension". (Dahmardeh and Mahmoodi, 2012)

Hausman Test

It should be noted, in panel data models, to estimate the model we should select one of the Fixed Effects Model (FEM) or random Effects Model (REM). Hausman (1978) have presented a test for this aim. According to Hausman test under the null hypothesis and assumption of the lack of correlation between cross-sectional data and other explanatory variables, both estimator (LSDV and REM GLS) are inconsistent but the LSDV estimator is also inefficient. But, in contrast in terms of correlation between cross-sectional data and other explanatory variables (FEM), the LSDV estimator is consistent but GLS is inconsistent. (Greene, 2003, 301)

Briefly, this test introduces its assumptions as follows; H_0: The two estimators should not be significantly different from each other however, the random effects model is preferred, and H_1 implies the existence of fixed effects model and rejection of random effects model. (Shahiki tash & Ghodrat, 2012)

Empirical results

LR Test

As stated before, in order to identify the structure of data we can use the LR test. The results of this test have been shown in table 1.

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Table1. LR Test

Effects Test	Statistic	d.f.	Prob.
Cross-Section F	19.802	(12,267)	0.000
Cross-Section Chi-Square	178.877	12	0.000

Panel Unit Root Test

The results of Im et al. (IPS, 2003), Levin et al. (LLC, 2002), Breitung (2000) and Fisher-type panel unit root tests are reported in table 1.

Table 1.Panel Unit Root Tests

Test Variable	LLC (2002)	IPS (2003)	Breitung (2000)	ADF-Fisher	PP-Fisher
(I/Y)	-1.616 (0.052)	-2.315 (0.010)	0.893 (0.814)	47.717 (0.005)	40.563 (0.034)
(S/Y)	-3.978 (0.000)	-3.451 (0.000)	1.053 (0.854)	53.736 (0.001)	50.966 (0.002)

Note: Probability values have been reported in parenthesis.

As seen in table 1, in general, the results of different panel unit root tests indicate that all variables are stationary in levels.

Panel Co-integration Test

The results of Pedroni panel co- integration tests have been presented in table 3.

Table 3.Pedroni Panel Co-integration Test

Statistics	
Panel *v*-statistic	0.855 ***
Panel *ρ*-statistic	1.622**
Panel non-parametric (PP) *t*-statistic	1.920 **
Panel parametric (ADF) *t*-statistic	2.046 **
Group *ρ*-statistic	0.132
Group non-parametric *t*-statistic	1.608 **
Group parametric *t*-statistic	- 1.934 **

Note: *** and ** denote statistical significance at the 1and 5% levels, respectively.

According to the results of table3.Except Group ρ-statistic, other statistics show that the hypothesis of no co-integration is strongly rejected. So we can detect there is a long run relationship in the model.

Model Estimation

Finally, at the last stage, we should estimate the model. As mentioned before, in order to estimate the regression, we have to select one of the fixed effects model (FEM) or Random Effects Model (REM).

Table4. Results of hausman test

Test summary	Chi- sq. Statistic	d.f.	Prob.
Cross section random	1.962	1	0.161

The results of Hausman Test have been shown in table 4. Based on the results of table 4 the null Hypothesis which implies using Random Effect Model (REM) is accepted. So, we employed REM to estimate the regression. The result of model estimation has been reported in table 5.

Table5. Results of model estimation

Variable	Coefficient	Prob.
(S/Y) (t-statistic)	0.035 (1.880)	0.061
R^2	0.48	

As seen in table 5 the (S/Y) coefficient is equal to 0.035 and according to the F-H hypothesis, it implies that the capital is highly mobile in MENA countries during the 1990-2011 period.

Conclusion

This paper aims to investigate the extent of capital mobility in MENA countries for the period 1990-2011. To the best of our knowledge, there isn't any paper which probes the degree of capital mobility in MENA countries. To achieve this purpose, we used the F-H approach and investigated the Saving-investment relation. Several panel unit root tests indicated that saving and investment are stationary in levels. Also, according to the results of Pedroni (1999) co-integration tests the null hypothesis of no co-integration was rejected and existence of long run relation between saving and investment was confirmed. Based on the results of estimating the model, the saving- investment coefficient is equal to 0.035 which implies perfect capital mobility in MENA countries. So, on the contrary of common belief that the majority of developing countries including MENA countries constrain barriers and restrictions to international trade and capital flows, the results demonstrate that this belief should be modified. Also this result reveals that all the national saves in these countries don't invest in domestic country necessarily because capital is quite mobile.

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