

## **Comparative analysis of the degree of international capital mobility in Tunisia and Morocco: revised Feldstein Horioka approach**

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**Abstract .** *The main purpose of this paper is to assess the degree of capital mobility in Tunisia and Morocco. Using the methodology of Feldstein and Horioka [1980], we test the hypothesis of perfect capital mobility. The methodology that we have applied used time series econometric techniques, which included analyzing the stationary, co-integration and Error-Correction Model. On the other hand, we develop an Augmented Feldstein Horioka model by introducing additional variables to explain more effectively the degree of financial openness in these countries.*

*We interpret the relationship between domestic saving and investment in the long-run as reflecting the solvency constraint. We find that saving and investment display a cointegration relationship that is consistent with the interpretation that a solvency constraint is binding for each country. The short and long run coefficients of correlation are significant and presenting a low value of estimation. We conclude that the degree of capital mobility is relatively high in Maghreb countries (Tunisia and Morocco).*

**Key words:** Feldstein Horioka puzzle, capital mobility, cointegration, Error-Correction Model, Tunisia, Morocco.

**JEL codes:** F36, E20, C01, C22.

### **1. Introduction**

Recently, the trend in the world capital market has been toward increasing globalization. In the 1980s and 1990s, many developing countries have liberalized their financial markets and, in addition, have opened up their capital accounts.

Potentially, there are many gains from improving financial integration. In this context, capital mobility enhances global resources allocation since it allows smoothing consumption and reducing risk. Moreover, it stimulates investment and hence growth beyond the limits of domestic saving. Additionally, unrestricted capital flows facilitate diversification of financial services, and thus affect positively the international economy. However, financial liberalization and deregulation have increased the volatility in the financial markets and consequently created new class of risk.

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In addition, it seems clear that capital account liberalization influences largely the effectiveness of economic policies. Namely, national saving plays an important role in economic development and constitutes a fundamental determinant for long run growth since it stimulates investment, which, in turn, increases output and leads to higher income level. Therefore, policy-makers should focus on increasing national saving, by promoting domestic saving and reducing public deficits.

If capital is mobile across countries, the mainstream view is challenged. For instance, national saving should not finance domestic investment. On the contrary, in a country with high degree of capital mobility, domestic saving will be invested around the world, looking for a better remuneration. In this way, domestic saving will be uncorrelated with domestic investment. Feldstein and Horioka [1980] tried to test the following hypothesis: there is no relation between domestic saving and domestic investment in industrial countries.

The question of whether saving and investment are cointegrated has been baffling economists for decades, and is at the core of what is known as the “Feldstein-Horioka Puzzle”. While most economy models assume that capital is highly internationally mobile the so-called “Feldstein-Horioka puzzle”, which is considered by Obstfeld and Rogoff as one of the six major puzzles in international economics, showed that, across 16 OECD countries for the 1960-1974 period, domestic investment and saving were highly correlated, which implies low capital mobility.

Many papers attempt to resolve and explain F-H puzzle by tracking the evolution of saving and investment relationships over time and across different exchange rate and capital control regimes. Others studies argued that the correlation between saving and investment is due to alternative macroeconomic factors. These included long run current account targeting and inter-temporal budget constraint.

The reason usually invoked for the relatively poor performance of the Maghreb countries, is their limited financial market linkages with global economy, which amplify the impact of macroeconomic volatility on economic growth and reduce the potential gain from financial integration. Consequently, understanding the saving-investment relationship is important for this region. First, it may hold the key to the positive correlation between saving and growth and, second, if capital accumulation is important for growth, the saving-investment correlation is crucial for assessing the validity of the assumption that increasing saving means to enhance growth.

The objective of this paper is to examine the correlation between saving and investment in Tunisia and Morocco and to whether our findings match to common results of earlier studies on developing countries.

According to Coakley and Kulasi [1997], we interpret the close relationship between domestic saving and investment in their long run as reflecting a solvency constraint, rather than as an evidence of limited capital mobility. Then we apply Johansen [1996, 1998] methodology in order to examine the short term saving investment relationship, especially the speed at which the variables return to their long run equilibrium.

This paper is organized as follows: in section II, we describe the Feldstein Horioka criterion for international capital mobility based on their underlying assumptions. In section III, we use cointegration tests and Error Correction Model to determine the existence of a long run relationship between saving and investment in Tunisia and Morocco. In section IV, we present the results of Augmented Feldstein Horioka estimation. In section V, we replicate our main findings and conclude this paper.

## **2. The Feldstein-Horioka approach**

The Feldstein-Horioka [1980] model is based on the following equation, which consists of the regression of domestic investment rate on domestic saving rate:

$$\left(\frac{I}{Y}\right)_i = \beta_1 + \beta_2 \left(\frac{S}{Y}\right)_i + \mu_i$$

$I$  : Gross domestic investment

$S$  : Gross domestic saving

$\beta_2$  : The coefficient of the saving and investment correlation, which is supposed to measure the international capital mobility.

In this model, perfect capital mobility involves a  $\beta_2$  coefficient equal to zero for a small country. For a relatively large country, the value of this  $\beta_2$  coefficient should not exceed country's share in the stock of the world capital. A  $\beta_2$  coefficient close to one signifies international capital immobility.

Using a sample of 16 OECD countries, Feldstein-Horioka find  $\beta_2$  equal to 0.89. The high value of this coefficient denotes that domestic investment and saving are highly correlated among OECD countries, which is in contradiction with the hypothesis of perfect capital mobility in industrialized countries.

This Feldstein-Horioka controversial work has engendered many researches related to the saving and investment correlations and the degree of international capital mobility. The common studies search to resolve Feldstein-Horioka puzzle by using alternative methodologies, estimations periods and providing different results, which confirm robustness of Feldstein-Horioka findings.

Some studies focus on empirical modeling equation like sample sensitivity (Caderot [2001]), common contemporaneous shocks and simultaneity bias due to the endogeneity of saving (Obstfeld and Rogoff [2000]), policy regime changes (Sarno and Taylor [1998], Ho [2003]). On the other hand, Coakley, Kulasi and Smith [1998] argue that saving and investment cointegration with unit coefficient implies current account solvency, irrespective to the degree of capital mobility. Consistent with interpretation, endogenous government policy actions targeting a sustainable current account have been postulated to explain the long-run saving-investment relationships (Bayoumi [1990]).

Other studies try to criticize the relevance and the robustness of Feldstein and Horioka results (Backus, Kehoe and Kydland [1992], Taylor [1994]).

Frankel [1992] argues that saving and investment co-movements may not necessarily indicate a low degree of financial integration: two alternative explanations are addressed. The first hypothesis is that common factors determine jointly domestic saving and investment. A second argument is that policy makers may try to attain a target current account balance through appropriate regulations, such as fiscal or monetary policies.

Bayoumi [1990] points out that a saving investment correlation may reflect the fact that the government uses fiscal and monetary policies to target the current account balances. The author finds, initially, that the correlation between the private domestic investment and gross domestic saving is much weaker than the correlation coefficient between gross domestic investment and gross domestic saving. Secondly, correlation between investment and saving is lower when saving series are adjusted to take account of ricardian equivalence.

Recent literature studying the cases of developing countries (Murphy [1984], Obstfeld and Rogoff [2000], Banerjee and Zanghieri [2003], Hoffman [2004]) tried to resolve Feldstein-Horioka Puzzle by adding arguments and factors concerning economic conditions in industrializing and emerging countries.

Trying to measure the degree of international capital mobility in the case of developing countries, numerous studies (Dooley *et al* [1987], Mamingi [1994], Vamvakidis and Wacziarg [1998], Isakson [2001], Coakley *et al* [1999], Sinha and Sinha [2004]) find a lower value of the correlation coefficient. Results, which conclude the presence of capital mobility in developing countries, given

that many arguments relating to structural characteristics of these countries have been set out to explain these counterintuitive findings.

However, Harberger [1980] showed that the saving and investment correlation depends on the size of the economy. A large country is more diversified, so shocks on domestic saving and investment do not increase foreign capital inflows. Another explanation concerns the current account solvency approach. In this perspective, if the current account series is stationary, a high saving and investment correlation is justified; in contrast, if the current account series is not stationary,  $\beta_2$  coefficient will be low. Therefore, the correlation's coefficient reflects the long constraint of current account. In fact, this constraint implies that, in the long term, current account tends towards zero; thus imposes the stationary of current account. A cointegration relationship between saving and investment will be necessary. In this case, a high coefficient correlation is only the result of the validation of the external constraint even in the case of perfect capital mobility.

Mamingi [1994] estimates the Feldstein-Horioka regression using a sample of 58 countries. He finds that saving-investment correlation is much weaker in developing countries than in OECD countries. He argues that developing countries are presented as small open economies where fiscal policy uses for demand management purposes will be unable to crowd out private sector investment.

Coakley, Hassan and Smith [1999], show that stationary test frequently reject the current account stationary for developing countries. This result confirms the vulnerability of these countries to external shocks and explains the low value of the saving-investment correlation in developing countries.

Taylor [1996] and Schneider [1999] develop an Error Correction Model based on the procedure of Engle and Granger [1987]. This method makes possible to separate short run dynamics from long run dynamics of saving and investment. Schneider [1999] estimates saving investment correlation for a sample of 61 developing countries over the period 1970-1997. Firstly, the authors estimate the baseline equation using OLS technique. They find that several developing countries present a low saving investment correlation, which support capital mobility among developing countries. Secondly, the ECM method applied and the analysis of the stationary of current account was tested using Philips Perron test. Estimations demonstrate that only twenty developing countries present low value of coefficient with no stationary current account, result that implies large capital mobility for these countries.

Isakson [2001] uses Feldstein Horioka methodology to measure international capital mobility in developing countries. In this study, the sample of 90 developing countries is divided into four regions: Africa, Asia, Latin America and the Middle East. The period of estimation is 1975-1995. The results indicate that, for developing countries, capital is relatively immobile. There is also evidence that the access to international financial markets increases financial liberalization. Finally, including foreign aid in saving investment regression has an important positive effect on the saving coefficient.

Sinha and Sinha [2004] study the short run and long run relationships between saving and investment rates for 123 developing countries using Error correction Model. Results suggest that capital should be more mobile for the countries with high per capita income. Estimations show that capital is mobile for 16 countries most of which with low per capita income.

Ozmen [2007] investigates whether the argument of Feldstein and Horioka [1980] on domestic saving investment relationship is supported by the data of the countries in the Middle East and North Africa region when financial development levels and exchange rate regimes are taken into account. To this end, the author employs both the Autoregressive Distributed Lag Bounds cointegration test and panel mean groups' procedures. The magnitude of the mean of saving retention coefficient is close to those results of some samples of developing countries. The results support the view that a successful international financial integration requires compatibles levels of financial liberalization. The evidence also suggests that saving-investment cointegration is not invariant to exchange rate regimes.

On the overall, the Feldstein-Horioka econometric test does not produce a benchmark measure that can qualify capital mobility level. Even if the Feldstein-Horioka criterion measures integration properly and the econometrics yield a proper estimate, we are still left without a measure telling us what is “high” and what is “low”. However, potentially useful information can be obtained by analyzing the changes over time in the correlation between saving and investment.

## 2. An analysis of the Feldstein-Horioka hypothesis in Tunisia and Morocco

In order to analyze the relationship between domestic saving investment in Tunisia and Morocco, this article uses an econometric model proposed by Feldestein and Horioka [1980] expressed in the formula as bellow:

$$\left(\frac{I}{Y}\right)_t = \alpha + \beta\left(\frac{S}{Y}\right) + \mu_t$$

where:  $I$  investment,  $S$  saving, and  $Y$  Gross Domestic Product,  $\alpha$  the absolute term of the formula, and  $\beta$  the investment sensitivity to saving increase (saving retention coefficient).

The  $\beta$  coefficient-nearing zero shows perfect international capital mobility, while  $\beta$  nearing one shows the lack of international capital mobility,  $\mu$  random parameter.

All of the above time series had an annual frequency and included the period between 1980 and 2010.

Before the model can be estimated, the stationary of the analyzed time series had to be determined. An augmented Dickey-Fuller test was used for this purpose. Then, we apply the Engel and Granger cointegration procedure for estimating the Error Correction model in order to examine a long run and short run relationship between investment and saving for each country and to measure the degree of capital mobility.

Jansen [1996] and Jansen and Schulze [1993] argue that the Error Correction Model is the only specification with theoretical support. Given that in steady state  $\frac{I}{Y} = \frac{S}{Y}$ , which is the current account equilibrium condition on the long run because of the solvency condition, the dynamics of saving and investment is temporary. An error correction model, then, is the best alternative to model the problem since it consists of a dynamic equation with steady-state solution that is compatible with the equilibrium.

The objective of the empirical investigation is to analyze the long run and the short run relationship between gross savings and gross investment. The time series are annual data and the sample period is from 1980 to 2010. All the variables are extracted from WDI World Bank. The data are in current prices and all are divided by nominal GDP at market prices.

We follow the work of Jansen and Schulze [1993], and use error correction model to examine the saving investment correlation.

We examine the saving investment correlations using the following equation:

$$\Delta(I_t) = \alpha + \beta_0 \Delta(S_t) + \beta_1 (S_{t-1} - I_{t-1}) + \beta_2 S_{t-1} + \varepsilon_t$$

Here  $\beta_0$  captures the short run saving-investment correlation and show which part of the increase in saving stays at home. Significant non-zero values for the coefficient  $\beta_2$  indicate that saving and investment rates are cointegrated, and in addition provide an estimate for the speed of adjustment of investment to the previous period’s deviation from the long run equilibrium. If the

coefficient  $\beta_2 = 0$ , the current account is stationary around some constant, and if  $\alpha = \beta_2 = 0$ , it is zero.

**Table 1. Unit Root Tests Results in Level**

	Variables	ADF			PP			Order of Integration
MAROCCO	Investment	-1.95099			-2.124976			I(1)
	Saving	-0.150967			-1.163776			I(1)
	Current account	-4.147020*			-4.689044			I(0)
TUNISIA	Investment	-2.757430			-2.451153			I(1)
	Saving	-1.744239			-2.669670			I(1)
	Current account	-4.148888			-7.486676			I(0)
Critical values		1%	5%	10%	1%	5%	10%	
		-4.3098	-3.5742	-3.2217	-4.2732	-3.5577	-3.2123	

**Table2. Unit Root Tests Results in first Difference**

	Variables	ADF			PP			Order of Integration
MAROCCO	Investment	-4.39824			-4.652099			I(0)
	Saving	-4.383158			-12.37656			I(0)
TUNISIA	Investment	-3.853751			-3.920406			I(0)
	Saving	-3.703005			-6.40093			I(0)
Critical values		1%	5%	10%	1%	5%	10%	
		-4.323	-3.5806	-3.2253	-4.284	-3.5628	-3.2152	

Tables 1 and 2 show the results of the unit root tests for each variable (Gross Domestic Saving, Gross Domestic Investment and Current Account) for Tunisia and Morocco during the period 1975-2010.

Results of ADF and Phillips-Perron tests show that gross domestic investment and gross domestic savings are stationary in first differences. These two series are integrated of order one. The current account series are stationary in level; they are integrated of order zero.

These results imply the possibility of the existence of a cointegration relationship between savings and investment. Since the variables of the model are in the same order, we can use the Engel and Granger cointegration test to estimate error model correction to inspect the long run and short run relationship between them. The current account Stationary means that Morocco and Tunisia facing a solvency constraint and long-term savings and investment are potentially cointegrated.

**Table 3. Engel and Granger cointegration test**

		TUNISIA	MOROCCO
<b>t stat</b>		-3.96	-3.41
<b>Critical value</b>	<b>1%</b>	-4.07	-4.07
	<b>5%</b>	-3.37	-3.37
	<b>10%</b>	-3.03	-3.03

Table 3 reports results of individual Engel and Granger [1987] residual based test cointegration between domestic saving and investment relationship. A test of the null hypothesis of non-cointegration could be based on testing for unit root  $\hat{\mu}_t$  in using a Dicky Fuller test. If we cannot reject the null hypothesis  $\rho = 0$ , we can conclude that  $\hat{\mu}_t$  contains a unit root, suggesting that domestic saving and domestic investment are not cointegrated. If however, we can reject the null hypothesis  $\rho = 0$ , we conclude that the residual series is stationary and domestic savings and investments are cointegrated.

We use simulated critical values, which correctly take into account the number of variables in the cointegration regression (Engle and Yoo [1987]). The ADF test of the baseline equation residual indicates that saving and investment are cointegrated at 95 percent confidence level for Tunisia and Morocco

Absence of cointegration would imply the perfect capital mobility in the sense of Feldstein Horioka. The presence of cointegration implies the existence of a long-term equilibrium relationship between saving and investment. The presence of cointegration also allows us to examine the short run and long run adjustment dynamics of saving and investment in an Error Correction Model (ECM).

**Table 4. Estimation results based on Error Correction Model**

<b>Error Correction Model</b>						
<b>Country</b>	<b>A</b>	$\beta_0$	$\beta_1$	$\beta_2$	<b>R<sup>2</sup></b>	<b>DW</b>
<b>Tunisia</b>	4.776 (0.963)****	0.611 (2.206)**	-0.183 (-2.134)**	0.203 (2.209)**	0.790	1.89
<b>Morocco</b>	2.768 (0.802)****	0.52489 (1.895)*	-0.013 (-2.963)***	0.341 (5.025)***	0.854	1.95

\*, \*\*, \*\*\*, \*\*\*\* are respectively level of significance 1%, 5%, 10% and not significant

The estimations of Error Correction Model are presented in Table 4. The short run dynamics of saving and investment is captured by the coefficient  $\beta_0$ . This coefficient of correlation is significantly different from zero. Using the original criterion of Feldstein and Horioka, we can conclude that the hypotheses of perfect mobility and perfect immobility are rejected for Tunisia and Morocco.

The theoretical model show that the sign and the size of the short run correlation depend on the nature of the errors and the structure of the economy and the error correction term  $\beta_1$  of adjustment between short and long run which is significantly different from zero and negative for

Tunisia and Morocco, indicates that the ratio of investment and saving are adjusted in the long term. A low value for  $\beta_2$  indicates a weak cointegration relationship between the interest variables.

#### 4. Estimation of augmented Feldstein Horioka Model

A large number of studies have tried to explain the low saving-investment correlation in developing countries, based on the idea that foreign capital inflow can explain the low retention coefficient.

Payane and Kamuzawa [2005] estimate an Augmented Feldstein Horioka model to resolve the Feldstein-Horioka puzzle. The new specifications include the ratio of Foreign Aid, trade liberalization and the evolution of capital mobility over the time. The authors argue that Public Aid is a very important financial source for developing countries, especially as it is for a long time a very significant financial source of investment in these countries because of the low level of saving. The omission of this variable leads to a relatively low correlation between saving and investment, which is the common results of basic Feldstein Horioka model estimations for developing countries.

Hansan [1992] and Montiel [1994] argue that foreign Aid should be taken into account in estimating the saving-investment correlation regarding the fact that foreign Aid was usually used to finance national investments in many developing countries and that domestic investment do not depend only on domestic savings. The omission of this variable would make the investment function as misidentified.

External financing has played also an important role in financing investment and economic growth in Tunisia and Morocco. Since the adoption of the SAP, it plays a less important role and really serves only to the repayment of debt service.

According to economic theory the total investment is the sum of domestic savings and net external financing, and we will introduce in the Feldstein Horioka model [1980] The ratio of net external financing to GDP to show the structure of finance domestic investment, in other words, whether domestic investment is financed by foreign capital.

To better analyze financial integration, it is necessary to take into account the rise in foreign direct investment. Indeed, this type of financing is not debt creative, creates jobs, promotes technology transfer and stimulates growth.

The need for consideration of FDI to the extent of financial integration is that the most integrated countries are those that receive the largest FDI share. This is the case of Latin America and South East Asia.

We introduce foreign direct investment to GDP ratio in the baseline. The integration ratio of FDI to GDP in the base model FH (1980) shows whether FDI is sufficient to influence the mobility of capital in Tunisia and Morocco.

We introduce the ratio of worker remittances in baseline equation to assess whether the remittances are sufficient to influence the international capital mobility in Tunisia and Morocco and other term finance domestic investment.

By agreeing to these theoretical arguments, we estimate a model of Feldstein-Horioka increased, which aims to explain and argue some aspect of this paradox for developing countries in general and particularly Tunisia and Morocco.

The Augmented Feldstein Horioka model is as follow:

$$\left(\frac{I}{Y}\right)_t = \alpha + \beta_1 \left(\frac{S}{Y}\right)_t + \beta_2 \left(T * \left(\frac{S}{Y}\right)_t\right) + \beta_3 op + \beta_4 \left(\frac{FDI}{Y}\right)_t + \beta_5 \left(\frac{WR}{Y}\right)_t + \beta_6 \left(\frac{OAD}{Y}\right)_t + \varepsilon_t$$



$\frac{I}{Y}$  : Ratio of domestic investment,  $\frac{S}{Y}$  : Ratio of domestic saving,  $OP$  : Trade openness ,  $\frac{FDI}{Y}$  : Ratio of Foreign Direct Investment,  $\frac{WR}{Y}$  : Ratio of Worker Remittances,  $\frac{OAD}{Y}$  : Ratio of Official Aid of Development

We assume that the correlation between saving and investment is positive which is our measure of the degree of capital mobility in accordance with the criteria Feldstein-Horioka. Foreign Aid should have a positive impact on the investment rate. While foreign Aid is important, but omitted, this reduces the retention coefficient of savings would imply that the largest capital mobility than is actually the case. The interactive variable trend with the savings rate should be negative if capital mobility increases over time (that is to say, the coefficient on savings drop in some time).

The measure of economic openness, worker remittances and the FDI should have a positive impact on the investment rate.

**Table 5. Estimation Results of Augmented Feldstein Horioka Model**

	M(1)	M(2)	M(3)	M(4)	M(5)					
	Tunisia	Morocco	Tunisia	Morocco	Tunisia	Morocco	Tunisia	Morocco	Tunisia	Morocco
S	0.860 (4.22)** *	0.4911 (3.401)** *	0.58037 (2.28)** *	0.5259 (6.089)** *	0.471751 (2.076)** *	0.5090 (4.20)***	0.46952 (1.976)* *	0.48328 (3.538)** *	0.5184 (2.221)**	0.5206 (6.223)***
T*S			-0.0030 (-2.751)* *	-0.0027 (-4.66)***	-0.0023 (-3.348)***	-0.0009 (-1.935)*	-0.0013 (-2.227)**	-0.00287 (-1.897)*	-0.0038 (-3.019)**	-0.00257 (-3.622)***
OP			0.42560 (2.574)* *	1.5144 (6.675)** *					0.2845 (1.247)*** *	1.42919 (5.878)***
FDI					0.02554 (2.7408)** *	0.04998 (2.903)** *			0.0233 (2.374)**	0.0255 (1.9221)*
WR							-0.03469 (-3.045)** *	0.01243 (3.68)***	-0.0367 (1.103)*** *	-0.0208 (-1.701)*** *
OA D									-0.0291 (-1.730)*** *	0.00716 (0.681)*** *
R <sup>2</sup>	61	59	72	81	77	68	78	72	82	81
DW	1.025	1.123	0.871	1.767	1.270	1.171	1.298	0.871	1.876	1.767
P(F- tat)	0.0001	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Table 5 presents the estimation results of both baseline and Augmented Feldstein Horioka model for Tunisia and Morocco. The model M (1) is the basic equation of Feldstein Horioka. The retention coefficient of saving in Tunisia is 0.861 for Morocco is lower 0.491. We can conclude that Morocco is relatively more financially open in comparison to Tunisia.

Model M (2) is an augmented model, in which we introduce trade openness and the interactive trend with the savings rate. The coefficients related to last variable is significantly negative, implying that the degree of mobility increased slightly in both countries. Trade openness positively affects the rate of investment in the two countries but also promotes greater financial openness in the case of

Tunisia (the correlation coefficient decreased from 0.8 to 0.58 while in Morocco remained constant (0.49-0.52)).

Model M (3) search to measure the effect of the inclusion of FDI. The introduction of this variable is irrelevant. On the one hand, these flows are a major source of financing of the economy, particularly investment that leads to a significant reduction in the retention coefficient of savings. In other words, FDI and domestic savings are the main sources of financing domestic investment, which reduces the strain of internal funding for these investments. This prediction is easily identifiable in the case of Tunisia, where FDI positively affect the rate of investment and at the same time strengthens the financial openness coefficient decrease (0.81 to 0.47). It should be noted that the impact on the investment rate is very low (0.02 and 0.04 for Tunisia to Morocco) reflecting the very small part of these financial flows in the economy of these countries.

The role of worker remittances is detected in the model M (4). In the case of Tunisia, this variable negatively affects investment, meaning that these transfers are assigned mainly to the consumption, and the altruistic motive is the argument most likely to send the funds to Tunisia. In the case of Morocco, the retention coefficient remains unchanged and transfers act positively on the rate of investment, thus providing an additional source of investment financing and the reason for sending in this country is rather an opportunistic pattern of investment.

The model M (5) is a model in which full grown we have introduced the most relevant variables in our analysis. Added to the trade openness, the trend, FDI and worker remittances, we reject foreign aid as a potential source of explanation of the degree of capital mobility. It follows from our estimates that transfers and subsidies are not significant. Consequently, the investment rate and the degree of openness are stimulated by economic liberalization and FDI flows. For these two variables Morocco stimulate investment level leaving unchanged the mobility of capital.

## 5. Conclusion

The objective of this paper was to measure and compare the degree of capital mobility in Tunisia and Morocco during the period 1975-2010. We used the approach of Feldstein and Horioka [1980].

In order to separate the impact of temporary shocks affecting the economy in the short term from the long-term relationship between saving and domestic investment, we adopt a representation of the Error Correction Model using the procedure of Engel and Granger. This model allows us to estimate a correlation coefficient of short term representing the measurement of the degree of capital mobility in Tunisia and Morocco. This coefficient is close to 0.4 indicating that Morocco and Tunisia are considered as half-open countries over their capital account.

In order to further develop our econometric macro econometric measurement of international capital mobility we precede to an extension of the basic model via an estimate of an augmented model in which we have introduced additional variables: trade openness, FDI, Worker Remittances and Foreign Aid. The results of the estimates show that these variables explain effectively the investment rate and especially the degree of financial openness. We conclude that the mobility of capital is stimulated mainly by the degree of economic openness and FDI.

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