

SAVINGS, INVESTMENT AND CAPITAL MOBILITY IN EL SALVADOR AND GUATEMALA

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1. Introduction

The international mobility of capital is a topic that has received considerable attention in recent years. This attention was initiated by Feldstein and Horioka¹ (1980) finding for a cross section of industrial countries that national savings and domestic investment are highly correlated. This result was interpreted as evidence of the immobility of capital at the international level: given that investment demand is satisfied by national savings, international capital flows have no role in financing domestic investment. Subsequent studies have arrived at similar results (Feldstein and Bachetta, 1990; Bayoumi, 1990), although there is evidence that the correlation between saving and investment has decreased in the 1980's (Penati and Dooley, 1984; Frankel and Engle, 1986). Studies for less developed countries have also found close associations between savings and investment (Cáceres, 1985; Dooley and Mathieson, 1987; Wong, 1990; Montiel, 1993), but other authors have questioned the usefulness of testing hypothesis about capital mobility with saving and investment rates data (Murphy, 1984; Obstfeld, 1987).

Several authors have presented alternative explanations for the correlation between saving and investment. According to Tesar (1991), these variables are correlated because they are subject to the influence of common macroeconomic factors, such as population growth, productivity shocks, and limited integration of international goods markets. Summers (1988), Artis and Bayoumi (1989) and Koskela and Viren (1991) explain the high correlation between saving and investment as a consequence of governments targeting of the current account, while Roubini (1988) explains it as a result of a public sector that follows policies conducive to smooth taxation. Levy (1995) presents the view that a positive investment-saving correlation can arise when fiscal policy is endogenous and that this correlation does not depend on capital mobility. His results indicated that in the U.S. the hypothesis of endogenous fiscal policy is compatible with the data during the flexible exchange rate period, but not during a fixed exchange rate period. Coakley, Kulasi and Smith (1996) explain the high correlation as a manifestation of the solvency constraint which requires that the current account is stationary, and hence that saving and investment are cointegrated. An interesting methodological point was introduced by Amirkhalkhali and Dar (1993), who estimated saving-investment regressions by a random coefficient model, with results indicating that the degree of capital mobility is much higher than implied by fixed coefficients approach.

* The points of view and opinions expressed in this paper are exclusive responsibility of the author. The author gratefully acknowledges helpful comments from Guillermo Fuentes.

Cointegration analysis has also been applied to this topic. Miller (1988) used cointegration to analyze the long term association between the US's saving and investment rates, concluding that there existed cointegration during the fixed exchange period but it disappeared under flexible rates. Different results were reported by Leachman (1991) who found no evidence of cointegration for a sample of OECD countries, thus inferring that capital markets are not closed to international capital movements. Similarly, Gulley (1992) reexamined Miller's results and concluded the inexistence of cointegration during both the fixed and flexible exchange rates regimes. Cáceres and Núñez-Sandoval (1993) studied the case of the Central American countries, concluding that there existed no cointegration between their saving and investment rates and thus, capital mobility was a fact in these countries. In the same vein, in a recent study for a sample of 30 developing countries Mamingi (1993) found no evidence of cointegration in the majority of countries. Bodman's (1995) application of Granger-Engle bivariate cointegration approach (the method followed by the previously cited authors) to a sample of OECD countries, indicated that there did not exist cointegration between these variables in any country. However, when national income and budget deficit were included in the cointegrated vector, and the equation was estimated by the Johansen method, the existence of cointegration was inferred. This author conclude that the absence of cointegration reported by previous studies could be the result of the omission of relevant variables in the cointegrated vector. Finally, it can be pointed out that Argimon and Roldan (1994) employed Johansen method to European Union countries finding that cointegration existed only in those countries where capital controls prevailed¹.

The purpose of this paper is to analyze the existence of capital mobility in Guatemala and El Salvador by means of a multivariate cointegration approach. These two countries were chosen because their strong economic interdependence may shed new light on this topic. First, a general model is proposed and estimated by Johansen method. Next, an error correction model is estimated which, besides providing information about short term interaction among the variables, permits to detect the presence of Granger-causality between different variables. Finally, the paper ends with a series of conclusions.

1. It should be pointed out that other analytical approaches have been used to detect capital mobility, among these interest rate differentials is paramount (Monadjemi, 1990; Haque and Montiel, 1991; Lemmen and Eijffinger, 1995).

2. The Model

The model is based on a balance equation for total domestic assets accumulation by the private and public sectors. It is considered that the increase in domestic assets in a given year, assuming no increase in international reserves, is given by:

$$I_p + I_g + \Delta M + K \quad (1)$$

Where:

I_p = private investment

I_g = public investment

ΔM = increase in real domestic money

K = capital flight

The financing of the accumulation of these assets can, in turn, be expressed as:

$$S + F + L \quad (2)$$

Where:

S = national savings (public and private)

F = net inflows of foreign capital

L = credit to the public and private sector

It can be assumed that these variables influence each other, thus constituting a simultaneous equation model. Therefore, it can be assumed that the following reduced form expression exists for I_p :

$$I_p = f(S, F, L, I_g, M, K) \quad (3)$$

This expression indicates that the private sector has available for investment the sum of national savings, the net inflow of external resources and total domestic bank credit; these resources are also demanded by other users, that is, they can be channelled to public investment, additional money holdings or capital flight.

For the estimation of expression (3) a difficulty was encountered in that there does not exist data on capital flight, and thus, this variable was not considered further. Moreover, reliable data on total credit was not available as it involves several intricate mechanisms that the public sector uses for its financing, as well as grants and special lines of foreign aid. This variable, as well as the increase in money holdings, was considered to be

represented by the total money stock, which is plausible given that the money supply is proportional to total credit. Therefore, the expression for private investment becomes:

$$I_p = f(S, F, L, I_g, M) \quad (4)$$

The existence of cointegration among the variables in (4) would indicate that there exists one, or several, long term relationships among the variables. The inference on capital mobility would depend on the magnitude and sign of the coefficient of saving: a small or negative coefficient would indicate that foreign resources have an important role financing investment. However, this would not imply that the countries under study are necessarily financially integrated with the international capital markets. It would indicate that foreign resources enter the countries to sustain investment as a result of government negotiations with donor countries or with international financial institutions, or that the private sector has access to and obtains loans from external banks.

3. Empirical Results

Cointegration analysis was performed using the multivariate maximum likelihood estimation technique developed by Johansen (1988) and Johansen and Juselius (1990). This approach permits to test for the existence of several cointegration vectors and provides estimates of the coefficients of each cointegration vector. Data for public and private investment were obtained from International Finance Corporation (1994); the sources of data on national savings and money stock are the International Monetary Fund's *International Financial Statistics*, several issues, while data on net capital inflows was obtained from World Bank (1995). All data are expressed in logarithmic form taken to the respective variable as percentage of GDP. The estimations were performed using annual data for the 1970-1994 period.

Unit roots tests were conducted using the Augmented Dickey Fuller Test statistic, ADF, to determine the order of integration of the variables. In each case it was found that all variables are integrated of order one, as the ADF test failed to reject the presence of a unit root for each series in levels, but not in first differences.

3.1 Cointegration Results for El Salvador

Cointegration analysis was performed using a VAR length of 2. The test statistics for cointegration are presented on Table 1 and 2, where the subscripts G and S denote El

Salvador and Guatemala, respectively.

Table 1: El Salvador: Cointegration Likelihood Ratio Tests Based on Maximal Eigenvalues

List of eigenvalues in descending order				
0.85987	0.51795	0.40953	0.12018	0.000
Hypothesis				
Null	Alternative	Statistics	95% Critical Value	
$r = 0$	$r = 1$	43.2337	34.4000	
$r < = 1$	$r = 2$	16.0537	28.1380	
$r < = 2$	$r = 3$	11.5903	22.0020	
$r < = 3$	$r = 4$	7.4129	15.6720	
$r < = 4$	$r = 5$	2.8168	9.2430	

Table 2: El Salvador: Cointegration Likelihood Ratio Test Based on Trace of the Stochastic Matrix

Hypothesis			
Null	Alternative	Statistic	95% Critical Value
$r = 0$	$r > = 1$	81.1074	76.0690
$r < = 1$	$r > = 2$	37.8737	53.1160
$r < = 2$	$r > = 3$	21.8200	34.9100
$r < = 3$	$r > = 4$	10.2297	19.9640
$r < = 4$	$r > = 5$	2.81682	9.2430

The null hypothesis of no cointegration among the five variables is rejected by both the maximal eigenvalue and trace statistics, and both tests permit to infer the existence of one cointegrated vector. The cointegrated and adjustment vectors are shown on Table 3.

In the cointegrated β vector, it can be seen that public investment exerts a positive impact on private investment, such that if the first variable increased by 1%, private investment would increase by 1.05%. In effect, the propulsive influence of public on private investment in Latin America has been detected in several recent studies (Cardoso, 1993; Cáceres, 1995). Net external resources exerts a positive impact on private investment, but its elasticity is small (0.19109). It is worth noting that the domestic accumulation variables, money and national savings, are negatively cointegrated with private investment. Their negative impact may be a necessity so as to create space for the inflows of

foreign resources. That is, in order for private investment to grow foreign capital inflows displace domestic resources. In effect, the crowding out effect of foreign resources on national savings has been detected by several authors (Masson, et.al., 1995; Schmidt-Hebbel, Servén and Solimano, 1994).

The coefficients of the α vector can be interpreted as the average speed with which the equation adjusts to equilibrium, and relatively high coefficients indicate more rapid speed of adjustment. It can be seen in Table 3 that foreign resources have the most rapid adjustment, followed by national savings.

Table 3: El Salvador. Estimated Cointegrated Vector (β vector) and Adjustment weights (α Matrix). Normalized in brackets.

Variable	Cointegrated Vector (β Vector)	Adjustment Vector (α)
SI ₁	0.40932 (-1.0000)	0.052706 (-0.021574)
SI ₂	-0.43091 (1.0528)	0.054893 (-0.022469)
SS	0.46049 (-1.1250)	0.92560 (-0.37886)
SM	3.3882 (-8.2777)	-0.20140 (0.08243)
SF	-0.0782 (0.19109)	3.9917 (-1.6339)
Intercept	-1.3183 (3.2208)	

3.2 Cointegration Results for Guatemala

Both the maximal eigenvalue and trace cointegration tests for Guatemala indicate the existence of three cointegration vectors (Table 4 and 5). The cointegrated vectors are shown in Tables 6. The first cointegrated vector indicate that public investment exerts a positive impact on private investment, as do national savings and domestic money. The impact from public investment is smaller than the one detected in the case of El Salvador. However, foreign resources show a negative impact on private investment, result which has also been detected in other studies (Hadjimichael and Ghura, 1995). This would indicate that the financing provided by domestic resources (national savings and money) has to counteract or compensate for the disfinancing caused by external resources. In the

second cointegrated vector all variables exert a negative impact on private investment, except public investment. In the third β vector the only variable with a positive sign is national savings.

Table 4: Guatemala: Cointegrated Likelihood Ratio Tests Based on Maximal Eigenvalues

List of eigenvalues in descending order:					
0.83248	0.76071	0.64039	0.41309	0.061193	0.0000
Hypothesis					
Null	Alternative	Statistics	95% Critical Value		
$r = 0$	$r = 1$	39.3066	34.4000		
$r = 1$	$r = 2$	31.4617	28.1380		
$r = 2$	$r = 3$	22.4999	22.0020		
$r = 3$	$r = 4$	11.7235	15.6720		
$r = 4$	$r = 5$	1.3892	9.2430		

Table 5: Guatemala: Cointegrated Likelihood Ratio Test Based on Trace of the Stochastic Matrix

Null	Alternative	Statistics	95% Critical Value	
$r = 0$	$r > 1$	106.3809	76.0690	
$r \leq 1$	$r > 2$	67.0744	53.1160	
$r \leq 2$	$r > 3$	35.6126	34.9100	
$r \leq 3$	$r > 4$	13.1127	19.9640	
$r \leq 4$	$r > 5$	1.3892	9.2430	

Table 6: Guatemala: Estimated Cointegrated Vectors (β vectors) - (Normalized in Brackets)

Variable	Cointegrated Vector		
	Vector 1	Vector 2	Vector 3
GI_t	1.45558 (1.0000)	-0.88888 (-1.0000)	0.78557 (-1.0000)
GI_t	0.18333 (0.12596)	0.88101 (0.99124)	0.27378 (-0.34850)
GS	-1.6215 (1.1141)	-0.48621 (-0.54704)	-0.20113 (0.25603)
GM	-4.5097 (3.0984)	-2.7494 (-3.0933)	2.2390 (-2.8501)
GF	0.68849 (-0.47302)	-0.036082 (-0.0405)	0.00359 (-0.00457)
Intercept	0.89215 (-0.6129)	2.4706 (2.7797)	-2.0198 (2.5711)

The adjustment vectors are shown in Table 7. It can be seen that foreign resources show the most rapid adjustment, as in the case of El Salvador.

Table 7: Guatemala: Adjustment Weights (α Matrix)

Variable	Adjustment Vectors		
	Vector 1	Vector 2	Vector 3
GI_t	-0.33684 (0.49028)	-0.22723 (-0.20196)	0.28488 (0.22379)
GI_t	0.32320 (-0.47042)	-0.40752 (-0.36261)	-0.27875 (0.21898)
GS	0.21392 (0.311136)	0.12177 (0.10822)	0.03546 (0.02786)
GM	0.00899 (-0.01309)	0.14467 (0.12859)	-0.20593 (0.16677)
GF	-1.2480 (1.8165)	1.5853 (1.4090)	-0.61687 (0.4846)

3.3 Error Correction Model for El Salvador

In order to test for causality, error correction models were estimated using the error term of the cointegrated vectors as one of the explanatory variables. The general form of the estimated model, for the case of El Salvador, is:

$$\Delta SI_{it} = C + a_1 \Delta SI_{it-1} + a_2 \Delta SI_{it-2} + a_3 \Delta SS_{it} + a_4 \Delta SM_{it} + a_5 \Delta SF_{it} + a_6 ERS_{it} + V \quad (5)$$

Where C and V are constant and disturbance terms respectively and ERS is the error term from the estimated cointegrated vector. The variables that resulted not significant in the estimation of the equation above were deleted until a most parsimonious equation was obtained. It has to be pointed out in the equations for private and public investment neither of the lagged explanatory variables nor the lagged error term were significant, which indicates that investment is exogenous. The results are shown in Table 8.

Table 8: El Salvador: Error Correction Model*

Independent Variables	Dependent Variable		
	ΔS	ΔSM	ΔSF
C	-0.0856 (0.86)	-0.0005 (0.08)	0.1523 (0.29)
ΔSI_{it-1}		-0.0558 (2.00)	-5.4708 (2.21)
ΔSI_{it-2}			5.5368 (2.06)
ΔSS_{it}	-0.5481 (2.14)	0.0570 (3.74)	-4.5040 (3.96)
ΔSM_{it}	5.7604 (2.78)	-0.0104 (4.23)	
ΔSF_{it}	0.0723 (1.59)	-0.0104 (4.23)	
ERS _{it}	0.4465 (2.38)	-0.0762 (7.57)	2.0887 (3.23)
R ²	0.44	0.81	0.62
F	3.16	17.20	6.56

* "t" statistic are shown underneath the corresponding coefficients

It can be seen that in the equations for national savings, domestic money and foreign resources, the lagged error term resulted significative; this indicates that these variables are influenced by all other through the error correction mechanism. Moreover, saving's own lagged value was significative and negative, denoting the presence of an inventory process in the build up of savings.

It is also interesting to note that money exerts a positive impact on savings, as was also found to be the case by Edwards (1995) for a sample of developed and developing countries, while Schmidt-Hebbel, Webb and Corsetti (1992) reported negative effects of money on saving in developing countries. On the other hand, private investment shows a negative impact on domestic money thus indicating that, contrary to the McKinnon-Shaw

hypothesis, money and physical capital are substitutes. National savings does exert a positive impact on money, there thus exists a reciprocal causality between these two variables. It can be seen that foreign resources show a negative impact on domestic money. It can also be seen that public investment exert a positive impact on foreign resources, that is, public sector investment programs call for the inflows of the required external resources. However, private investment and national savings exert negative impacts on foreign resources, this indicates the national accumulation of resources displaces external funds. The endogeneity shown by external resources can be interpreted as proof of the international mobility of capital, as has been proposed by Schmidt-Hebbel, Servén and Solimano (1994). However, this "mobility" may in fact be created by the public sector's negotiation of external loans when its own savings do not suffice to finance public investment programs.

3.4 Error Correction Model for Guatemala

In the case of Guatemala, the error correction equations were estimated using the lagged error terms from the first and second cointegrated vectors. The most parsimonious equations are shown in Table 9.

Table 9: Guatemala: Error Correction Model

Independent Variables	Dependent Variable					
	ΔGS	ΔGS	ΔGM	ΔGF	ΔGF	ΔGL
C	0.0212 (0.76)	-0.0227 (0.87)	-0.0085 (0.59)	0.0208 (0.11)	0.0111 (0.10)	0.0080 (0.17)
ΔGL_{t-1}	0.4104 (2.02)	0.4539 (2.17)		4.6191 (2.23)		
ΔGL_{t-2}				-1.3681 (1.64)		0.4247 (2.18)
ΔGS_{t-1}						
ΔGM_{t-1}						-1.7096 (2.80)
ΔGF_{t-1}	0.0616 (1.99)		0.0506 (3.14)			0.1418 (2.67)
ERG1 _{t-1}		0.1921 (1.91)			1.5582 (2.50)	
ERG2 _{t-1}			-0.1040 (2.73)	-1.5935 (2.23)		0.2205 (1.82)
R ²	0.31	0.43	0.45	0.26	0.25	0.49
F	4.27	6.82	7.39	2.03	3.05	3.92

The only exogenous variable is private investment as neither the lagged variables nor the lagged error term were significant. It can be seen that money is caused by external resources but it is also influenced by the lagged second error term. For its part, national savings are positively influenced by private investment, and negatively by external resources and by the first lagged error term. Foreign resources are caused by private and public investment and influenced by all variables through the first and second lagged error term. Thus, again there is evidence for international mobility of capital. Finally, it is worth noting that public investment is caused by external resources and by money, which shows a negative sign. Moreover, its lagged value shows a positive sign, denoting that public investment is subject to a "habit formation" effect. It is also influenced by the lagged second error term.

3.5 Cross - Border Causality

Given the strong economic interdependence existing between El Salvador and Guatemala, it is possible that economic shocks occurring in Guatemala have impact on El Salvador's economic variables, and viceversa. To investigate this possibility, error correction models were estimated again including, in the case of El Salvador, the lagged error terms from Guatemala's. Significant results were obtained only in the case of El Salvador's saving equation, where Guatemala's second error term was significative. This indicates that El Salvador's saving rate is also caused by Guatemala's macroeconomic variables. The estimated equation is the following:

$$\Delta SS = -0.1905 + 5.0808 \text{ DSM}_t - 0.3450 \Delta SS_{t-1} + 0.6709 \text{ ERG2}_{t-1}$$

(2.01) (2.75) (1.70) (2.61)

$$R^2 = 0.45 \quad F = 4.78$$

4. Conclusions

In this paper evidence was found that in El Salvador and Guatemala there exists long term relationships between private and public investment, national savings, domestic money and foreign resources. In these relationships public investment exerts a positive impact on private investment; moreover, foreign resources displace both national savings and money on the financing of investment.

The error correction model for El Salvador showed that private and public investment

are exogenous, and both Granger-cause foreign resources. In turn, this variable is displaced by national savings. For its part, domestic money is propelled by national savings but displaced by foreign resources. The key to national accumulation would depend, then, on mobilization of money and savings, variables that show reciprocal causality, in such a way that foreign resources are sufficiently displaced so that a "debt crisis" is avoided. In Guatemala, it was found that private investment is exogenous while public investment is sustained by foreign resources, which in turn is Granger-caused by public and private investment. For its part, money receives a positive impact from foreign capital inflows and has an impact on savings, through the lagged first error term.

It has to be pointed out that the exogeneity of private investment may be due to factors of non-economic nature, such as uncertainty and political instability, which has been documented by a recent literature. Thus, in these countries there may exist an accumulation process that does not end in domestic investment but in capital flight. A result that deserves further study is the cross border causality effect, as it has important implications in the effectiveness of national economic policies and on policy coordination.

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Abstract

The international mobility of capital is a topic that has received considerable attention in the Economics literature. Most studies have relied on quantifying correlations between saving and investment ratios. In this paper capital mobility is analyzed employing Johansen's multivariate cointegration approach to time series data. It is found that in Guatemala and El Salvador there exist long term relationships between public and private investment, domestic money, national savings and external capital inflow. It is found that investment is exogenous, while foreign resources displace domestic money and savings. The result that the inflow of foreign resources is caused by investment leads to the conclusion that there exists international capital mobility in these countries.

EPARGNE, INVESTISSEMENT ET MOUVEMENT DE CAPITAUX À EL SALVADOR ET AU GUATEMALA**Résumé**

La mobilisation internationale du capital est un sujet qui a fait l'objet d'une attention considérable dans la littérature Economique. La plupart des études ont été basées sur les relations quantitatives épargne-investissements. Dans ce document, la mobilisation du capital est analysé en employant l'approche cointégrante de la multivariable de Johansen pour mesurer les données en série.

Au Guatemala et au Salvador, on a trouvé qu'il existe une relation à long terme entre l'investissement public et privé, l'argent national, l'épargne nationale et l'injection du capital externe. On a trouvé que l'investissement est exogène tandis que les ressources étrangères déplacent l'argent national et l'épargne. Le résultat de l'injection de ressources étrangères produit par l'investissement, mène à la conclusion qu'il existe une mobilisation internationale du capital dans ces pays.