

BLACK MARKET EXCHANGE RATES INTERDEPENDENCE IN CENTRAL AMERICA*

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1. Introduction

Considerable attention has been given to the analysis of black market exchange rates in recent years. Much of the research has focused on domestic inflation, relief of foreign exchange constraints and fiscal revenues losses. A review of the literature finds a wide diversity of approaches. Culbertson's (1975) analysis of black market exchange rates in India, Philippines and Turkey considered issues of purchasing power parity and changes in international reserves, while Blejer's (1977) study on Brazil, Chile and Colombia analyzed the black market exchange rate as a function of world inflation and domestic monetary disequilibrium. Gupta (1980) modelled the black market rate in India as a function of the nominal interest rate, domestic and world price indices, the official exchange rate, and the prices of gold and silver. Other studies such as Dornbusch et.al. (1983) modelled the black market premium in Brazil as a function of the depreciation of the official exchange rate adjusted for interest rate differentials. Grosse's (1991; 1992) studies on Peru and Colombia expressed the black market exchange rates as functions of the ratio of domestic to United States prices, the national trade balance and the inflow of narcodollars. In a subsequent work, Grosse (1994) postulated that Jamaica's black market exchange rate was a function of the domestic/U.S. inflation differential, marijuana exports, tourism receipts and the trade balance. Also of note, Phylaktis' (1992) study showed that the black market premium in Chile was determined by the official exchange rate, interest rate differentials and seasonal factors associated with tourism.

These studies have expressed the black market exchange rate as a function of domestic and other variables related to a foreign country, usually the U.S., or to world variables such as world inflation or interest rate¹. These models do not account fully for the case of countries which experience strong formal and informal economic integration. In the case of two countries which are strongly integrated, the cost of foreign exchange in each of them may be influenced by their own and by cross-border demand and supply functions for hard currency. Seeking better prices individuals can move their foreign exchange from one country to another or, for the same reason, can travel from one country to another to purchase it. This arbitrage process which occurs across national borders determines the domestic prices of hard currency.

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1. An excellent review of the literature on black market exchange rate is found in Saca (1995).

El Salvador and Guatemala, countries which have maintained strong economic interdependence, are examples of the case of economic integration's effect on the black market exchange rate. Their mutual trade is very significant. Guatemala's exports to El Salvador represented 51% of its total Central American exports in 1993 and 8% of total exports while El Salvador's exports to Guatemala are 56% and 7.4% respectively. Strong physical integration linkages between them also exist: an electric interconnection network has been in operation since 1986 and there are four highways that cross their common border facilitating the flows of tourists in both ways.

This interdependence explains Cáceres and Nuñez-Sandoval (1992a) finding that Guatemala's black market exchange rate is cointegrated and Granger-causes El Salvador's rate. These authors (Cáceres and Nuñez-Sandoval, 1992b) have also shown that El Salvador's black market rate is determined by its own money supply and by Guatemala's exchange rate and money supply². However, Cáceres and Nuñez-Sandoval (1992a) analyzed the existence of cointegration between both exchange rates, but did not derive a reduced form expression that would permit an assessment of the long term relationship between bi-national macroeconomic variables and black market exchange rates.

The purpose of this paper is to apply cointegration analysis to study the long term relationship among price and monetary variables of both countries in the determination of their domestic black market exchange rates. First, the paper proposes demand and supply functions for foreign exchange in each country, in terms of domestic money supply, inflation rate and the price of foreign exchange. A long term relationship between El Salvador's black market rate, money supply and inflation rate and Guatemala's money supply and inflation rate is estimated using Johansen's multivariable cointegration method. Finally, Granger causality tests are applied to variables from both countries to determine causality from one nation to another.

2. The Model

The model starts out with an equation describing the black market supply of U.S. dollars in El Salvador:

$$O_s = a + b E_s - c E_g \quad (1)$$

where:

2. The studies by these two authors were based on a previous analysis of El Salvador's exchange rate (Cáceres and Nuñez-Sandoval, 1991).

O_s = black market supply of dollars in El Salvador

E_s = black market exchange rate in El Salvador (colones/dollar)

E_g = black market exchange rate in Guatemala (quetzales/dollars)

This equation indicates that the individuals who hold dollars in El Salvador may decide to sell their dollars there or in Guatemala, depending on the prices they receive in each market. Thus, if the price is relatively high in Guatemala, dollar holders would travel to Guatemala City and sell them there, reducing the supply in El Salvador which, *ceteris paribus*, would cause its price to rise.

The black market demand for dollars in El Salvador is given by:

$$D_s = z + xM_s - yP_s \quad (2)$$

where:

D_s = black market demand for dollars in El Salvador

M_s = El Salvador's money supply

P_s = El Salvador's inflation rate

This equation indicates that the demand for dollars is, in part, derived from the demand for domestic currency as individuals would wish to maintain proportional ratios of their liquidity in both domestic and foreign currencies because of portfolio considerations. Moreover, as inflation increases, the demand for dollars would increase as individuals resort to purchasing dollars as a storage of value.

Assuming market equilibrium: $O_s = D_s$, and hence:

$$E_s = \frac{1}{b} \left[(z - a) + cE_g + xM_s + yP_s \right] \quad (3)$$

Similarly, an expression for E_g is given by:

$$E_g = \frac{1}{b'} \left[(z' - a') + c'E_s + x'M_g + y'P_g \right] \quad (4)$$

Substituting (4) into (3), a reduced form expression for E_s is obtained:

$$E_s = \frac{1}{b} \left[(z - a) + \frac{c}{b'} \left[(z' - a') + c'E_s + x'M_g + y'P_g \right] + xM_s + yP_s \right] \quad (5)$$

and whence:

$$E_s = \frac{b b^I}{b^I - c c^I} \left[z - a + \frac{c}{b^I} (z^I - a^I) + \frac{c x^I}{b^I} M_g + \frac{c}{b^I} y^I P_g + x M_s + y P_s \right] \quad (6)$$

and thus a reduced form expression for E_s is given by:

$$E_s = A_0 + A_1 M_g + A_2 P_g + A_3 M_s + A_4 P_s \quad (7)$$

Since the above equation for E_s is underidentified the structural coefficients of the demand and supply equations cannot be obtained. However, cointegration analysis can be applied to equation (7) so as to determine the existence of a long term relationship between El Salvador's black market exchange rate, and its own and Guatemala's money supply and inflation rates.

3. Empirical Results

Cointegration analysis was performed using the multivariate maximum likelihood estimation technique proposed by Johansen (1988) and Johansen and Juselius (1990). This technique permitted testing for the existence of several cointegration vectors and provided estimates of the coefficients of each of the cointegrating vectors. The Johansen technique was applied to equation (7) above, using monthly data from August 1982 to December 1991, the period during which the black market for dollars existed in both countries.³ In early 1992 the black and official exchange rates were consolidated and a free market has been maintained since then. All variables are expressed in logarithms, except the inflation rates that are the differences of the logarithms of monthly consumer prices. Estimations were conducted with narrow (M1) and broad (M2) definitions of money in both countries.⁴

Unit root tests were conducted using the Augmented Dickey-Fuller (ADF) test statistic to determine the order of integration of the variables. In each case it was found that all

3. For an analysis of El Salvador's and Guatemala's black market for foreign exchange, see Cáceres and Núñez-Sandoval (1991).

4. Data on exchange rates were obtained from the Central Banks of both countries. Data on consumer prices and money supplies were obtained from IMF, International Financial Statistics, several issues.

variables are integrated of order 1, 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

The cointegration analysis was performed using a VAR length of 4. The test statistics for cointegration are reported in Tables 1 and 2:

Table 1: Cointegration Likelihood Ratio Tests Based on Maximal Eigenvalue

List of eigenvalues in descending order:			
.34864	.16955	.14345	.081954
Hypothesis			
Null	Alternative	Statistic	95% Critical Value
$r = 0$	$r = 1$	46.2985	33.4610
$r < = 1$	$r = 2$	20.0653	27.0670
$r < = 2$	$r = 3$	16.7230	20.9670
$r < = 3$	$r = 4$	9.2349	14.0690
$r < = 4$	$r = 5$.088397	3.7620

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

Hypothesis			
Null	Alternative	Statistic	95% Critical Value
$r = 0$	$r > = 1$	92.4101	68.5240
$r < = 1$	$r > = 2$	46.1116	47.2100
$r < = 2$	$r > = 3$	26.0463	29.6800
$r < = 3$	$r > = 4$	9.3232	15.4100
$r < = 4$	$r > = 5$	0.88397	3.7620

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

Table 3: Estimated Cointegrating Vector (β Matrix) and Adjustment Weights (α matrix) (Normalized Values in Brackets)

Variable	Cointegrated Vector (β Vector)	Adjustment Matrix (α Vector)
Es	-0.8956 (-1.000)	0.0356 (0.0317)
M2 _s	-0.2852 (-0.3184)	0.0637 (0.0637)
M2 _g	0.6239 (0.6958)	-0.0757 (-0.0678)
P _s	7.1130 (7.9484)	-0.0164 (-0.0646)
P _g	11.3137 (12.3137)	-0.0735 (-0.0658)

The β vector indicates that Guatemala's and El Salvador's inflation rates exert a positive influence on El Salvador's black market exchange rate. This would indicate that as prices increase in Guatemala and El Salvador, more dollar are purchased in both markets to maintain or store value.⁵ Moreover, it indicates that there exists a demand spillover from Guatemala to El Salvador, such that if inflation increased in Guatemala by 10%, the price of dollars in the other country would increase by 1.2%. This effect is stronger than the 0.79% black market rate increase experienced by El Salvador when its inflation increases by 10%. Additionally, the purchase of dollars by Guatemalans in El Salvador implies that increasing the holdings of quetzales as a precautionary action that would permit the purchasing of dollars when opportune moments arise. This would explain the positive sign shown by M2g in the cointegrated vector. The negative sign shown by El Salvador's money supply is contrary to expectations but can be explained by assuming that as dollars increase in value, the demand for domestic currency decreases as individuals prefer to hold liquidity in foreign exchange.

The coefficients of the α vector can be interpreted as the average speed with which the equation adjusts to equilibrium. Relatively high coefficients indicate more rapid speed of adjustment. It can be seen that all money and inflation variables have very similar adjustment speeds.

5. Garcia Dubón (1994) has presented data showing that the Central American individuals' domestic bank deposits in dollars increase in direct proportion to inflationary pressures.

3.2 Test of Exclusion Restrictions

Test of exclusion restrictions are reported in Table 4. These tests confirm that each variable has to enter the cointegrating vector and thus maintains a long term relationship with El Salvador's black market exchange rate.

Table 4: Tests of Restrictions on the Model:

$b_1Es + b_2M2s + b_3M2g + b_4Ps + b_5Pg$	
Null Hypothesis	LR (1) Statistic *
$b_1 = 0$	13.1055 (0.000)
$b_2 = 0$	4.9376 (0.026)
$b_3 = 0$	12.9790 (0.000)
$b_4 = 0$	4.3913 (0.000)
$b_5 = 0$	22.4042 (0.000)

* The likelihood ratio test statistic is distributed as a Chi-Square distribution with rk degrees of freedom, where r is number of cointegrating vectors and k is the number of restrictions. Significance levels are shown in parenthesis.

3.3 Granger Causality

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

$$\Delta Es_t = C + a_1 \Delta Es_{t-1} + \sum_{i=1}^n (a_{2i} \Delta M2s_{t-i} + a_{3i} \Delta Ps_{t-i} + a_{4i} \Delta M2g_{t-i} + a_{5i} \Delta Pg_{t-i}) + a_6 ER_{t-1} + V_t \quad (8)$$

Where C and V are constant and disturbance terms respectively, and ER is the error term from the estimated cointegration equation. The equation above was estimated for all different dependent variables using one and two lags. The results are presented in Table 5. The first set of equations examine the influence of Guatemala's and El Salvador's money supplies and inflation rates on the latter's black market exchange rate. The results show that the lagged values of $\Delta M2s$, ΔPs and $M2g$ are insignificant in the regression explaining ΔEs . Thus, these variables do not Granger-cause El Salvador exchange rate. The results show, however, that two lagged values of ΔPg are significant in explaining ΔEs , and thus Guatemala's inflation does Granger-cause El Salvador's black market exchange

rate. Guatemala's inflation rate also Granger-causes El Salvador's broad money supply as can be seen in the set of equations number 2.

Table 5: Tests of Granger Causality

Number	Dependent Variable	Regressors	Excluded Variables	F _q Statistic (p value)
1	ΔE_s	C, ER(-1), $\Delta M2_g$, $\Delta M2_g$, ΔP_s , ΔP_g	$\Delta M2_g$	0.1186 (0.888)
			$\Delta M2_g$	0.0674 (0.935)
			ΔP_s	0.573 (0.566)
			ΔP_g	4.081 (0.020)
			ER(-1)	2.2559 (0.136)
2	$\Delta M2_g$	C, ER(-1), $\Delta M2_g$, ΔP_s , ΔP_g , ΔE_s	$\Delta M2_g$	0.5923 (0.555)
			ΔP_s	1.4659 (0.236)
			ΔP_g	6.6778 (0.002)
			ΔE_s	0.7784 (0.462)
			ER(-1)	10.7048 (0.001)
3	ΔP_g	C, ER(-1), $\Delta M2_g$, $\Delta M2_g$, ΔP_g , ΔE_s	$\Delta M2_g$	1.5433 (0.219)
			$\Delta M2_g$	0.1614 (0.851)
			ΔP_g	1.4397 (0.2441)
			ΔP_s	0.8773 (0.419)
			ER(-1)	5.0923 (0.026)
4	$\Delta M2_g$	C, ER(-1), $\Delta M2_g$, ΔP_s , ΔP_g , ΔE_s	$\Delta M2_g$	0.1052 (0.900)
			ΔP_s	0.0131 (0.987)
			ΔP_g	1.0127 (0.367)
			ΔE_s	0.7784 (0.462)
			ER(-1)	4.7901 (0.0311)
5	ΔP_g	C, ER(-1), $\Delta M2_g$, $\Delta M2_g$, ΔP_g , ΔE_s	$\Delta M2_g$	0.5244 (0.594)
			$\Delta M2_g$	0.6572 (0.521)
			ΔP_s	4.8622 (0.010)
			ΔE_s	1.8790 (0.158)
			ER(-1)	27.6458 (0.000)

Equation sets number 3 and 4 indicate that El Salvador's inflation rate and Guatemala's money supply are influenced by the other variables only through the error correction mechanism, since the lagged error terms are the only significant variables in the estimated equations. The equation set number five shows that El Salvador's inflation Granger-causes Guatemala's inflation rate. The chain of Granger causality then, runs from El Salvador's inflation rate to Guatemala's, which in turn Granger-causes El Salvador's black market exchange rate and broad money supply. Additionally, all variables affect one another through the error correction mechanism. El Salvador's inflation influence on

Guatemala's could be explained by the fact that the latter imports consumer goods from El Salvador representing 6% of its total imports. Thus, it is plausible that El Salvador's inflationary pressures spill over to Guatemala through trade. This in turn would stimulate the demand for dollars in Guatemala, which would spill over to El Salvador, causing increases in the price of the dollar.

3.4 Cointegration Results Using Narrowly Defined Money

Cointegration tests were conducted, introducing the narrowly defined measures of money and maintaining the same VAR length of four. The results are shown in Tables 6 and 7.

Table 6: Cointegration Likelihood Ratio Tests Bases on Maximal Eigenvalues

List of eigenvalues in descending order:				
.28524	.20394	.15441	.11109	.0067909
Hypothesis				
Null	Alternative	Statistic	95% Critical Value	
$r = 0$	$r = 1$	36.2680	33.4610	
$r < = 1$	$r = 2$	24.6328	27.0670	
$r < = 2$	$r = 3$	18.1142	20.9670	
$r < = 3$	$r = 4$	12.7186	14.0690	
$r < = 4$	$r = 5$.73592	3.7620	

Table 7: Cointegration Likelihood Ratio Test Based on Trace of the Stochastic Matrix

Hypothesis			
Null	Alternative	Statistic	95% Critical Value
$r = 0$	$r > = 1$	92.4695	68.5240
$r < = 1$	$r > = 2$	56.2016	47.2100
$r < = 2$	$r > = 3$	31.5688	29.6800
$r < = 3$	$r > = 4$	13.4545	15.4100
$r < = 4$	$r > = 5$	0.73592	3.7620

According to the maximum eigenvalue test there is only one cointegration vector, whereas the trace test indicates the existence of three vectors. Johansen (1988) has pointed out that the eigenvalue test is more powerful and, thus, only one cointegration

vector will be accepted, but for illustration purposes the second vector is also shown in Table 8.

It can be seen in Table 8 that the signs of the coefficients of the first cointegrated vector are contrary of those obtained in the previous estimation when broadly defined money was used, excepted for the P_g variable. However, the signs of the coefficients of the second cointegrated vector are the same as those resulting when broad money was used. The same pattern is shown by the α vectors. Moreover, tests of exclusion restrictions were performed on each of the variables of the first vector and it was found that P_g was the only variable that could not be excluded from the cointegrated vector at a probability level 0.10 or lower. This would indicate that the firms and individuals' decisions to purchase dollars are made on the basis of their total wealth portfolio, which is represented by the broad definition of money.

Table 8: Estimated Cointegrated β and Adjustment α Matrix (Normalized in Brackets)

Variable	Cointegrated Vector (β Vector)		Adjustment Matrix (α Matrix)	
	Vector 1	Vector 2	Vector 1	Vector 2
E_t	-38668 (-1.0000)	63769 (-1.0000)	036805 (0.14231)	(-0.10826) (-1.0826)
$M1_t$	1.2195 (3.1538)	2.2405 (-3.5134)	-010081 (-38979)	016216 (0.10341)
$M1_{it}$.82893 (-2.1437)	-1.9549 (3.0656)	6126E-3 (-2369E-3)	.10305 (-0.65713)
P_t	-7.3597 (-19.0332)	-15.2057 (23.8448)	.011041 (.0042693)	027520 (-.017549)
P_{it}	10.9387 (28.2891)	-1.3985 (2.1931)	.067332 (-.026036)	-.036913 (-.023539)

Granger causality tests were conducted for the M1 case using the error term from the first cointegrated vector. The results, not shown here, indicate the existence of reciprocal Granger causality between the El Salvador's exchange rate and Guatemala's inflation rate. The tests did not indicate other causality relationships, at the 0.05 or 0.10 probability levels.

4. Conclusions

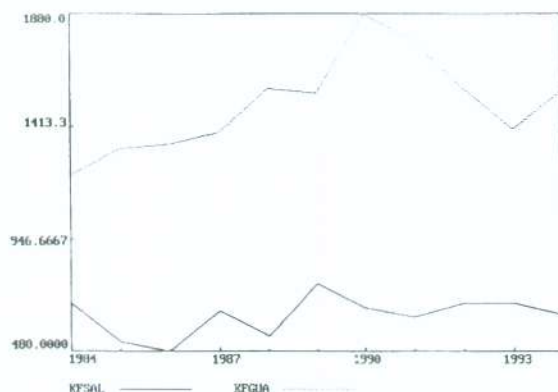
This study has presented evidence of a long term linkage between El Salvador's black

market exchange rate and El Salvador's and Guatemala's money supply and inflation rates. Moreover, evidence of Granger causality running from El Salvador's inflation rate to Guatemala's was found, as well as causality from Guatemala's inflation to El Salvador's exchange rate and broad money supply. This indicates the existence of a strong interrelationship between money markets in these countries, a topic that has received attention in recent years.⁶ These results indicate also the existence of contagious attacks between money markets of both countries, arising from the cross border purchase of dollars. In this case, the way to fend off speculative attacks on each currency would be maintaining a binational coordination framework in terms of policy consistency and credibility. Otherwise, stabilization efforts undertaken by one country could be nullified by "spill over" attack from the other country whose policies suffer from uncertainty.⁷ This study also confirms the existence of currency substitution in these countries, as dollars are held in detriment of corresponding local currencies, given that quetzales may be held in El Salvador, as well as Colones in Guatemala, as means to purchase dollars.⁸ Moreover, it is worth mentioning that capital flight data from both countries show an inverse negative relationship (Cáceres 1993), and that dollar deposits held abroad by Salvadorean and Guatemala nationals, as reported by García Dubón (1994), show an inverse trajectory see (Graph 1) such that an increase in one tends to coincide with a decrease by the other. This would indicate that Guatemalan and Salvadorean individuals and firms compete for dollars in an integrated market and this competition determines the black market exchange rate.

6. The interrelationship between money markets has received considerable attention in recent years. See, among others, Lin and Swanson (1993) and Leachman and Francis (1995).

7. A survey of literature on speculative attacks is found in Eichengreen, Rose and Wyplosz (1995) y Gerlarch y Smets, (1995).

8. Currency substitution in, and between, El Salvador and Guatemala, are analyzed in Cáceres and Suay (1989a, 1989b).

Graph 1: El Salvador (KFSAL) and Guatemala (KFGUA) bank dollar deposits abroad (Millions US\$)

These results have implications in terms of monetary management. In fact, neither Guatemala nor El Salvador can have reliable control of inflation, exchange rates and monetary aggregates, relying exclusively on their own domestic programs. The spillover effects between these countries are so strong that domestic actions in one country may be nullified or disrupted by actions taken in the other. Cáceres and Peñate (1981) found that the Central American countries' demand for money functions were unstable; this instability probably has been exacerbated by the supply and demand for dollars in both countries. There is thus a strong case for the coordination of monetary and exchange rate management programs by both countries.

References

- Cáceres, Luis René and Héctor A. Peñate, "La Inestabilidad de la Demanda de Dinero en Centroamérica", *Revista de la Integración y el Desarrollo de Centroamérica*, January 1981, 103-116.
- Cáceres, Luis René and José R. Suay, "La Sustitución de Monedas en El Salvador", *Revista de la Integración y el Desarrollo de Centroamérica*, July-December 1989a, 167-176.
- ____ and _____, "La Sustitución entre las Monedas de El Salvador y Guatemala", *Realidad Económica y Social*, March 1989b, 5-19.
- Cáceres, Luis René and Oscar A. Núñez-Sandoval, "La Determinación del Tipo de Cambio en el Mercado Negro de El Salvador", *El Trimestre Económico*, April-June, 1991, 249-262.
- ____ and _____, "La Relación de Equilibrio de Largo Plazo entre los Mercados Negros de Guatemala y El Salvador", *El Trimestre Económico*, July-September, 1992a, 571-586.
- ____ and _____, "Influencias Domésticas y Externas en la Determinación de los Tipos de Cambio en los Mercados Negros de El Salvador y Guatemala", *El Trimestre Económico*, April-june, 1992b, 297- 310.
- Cáceres, Luis René, "Capital Flight from Central America Countries," *Savings and Development*, June 1993, 137-152.
- Culbertson, William P. Jr., "Purchasing Power Parity and Black Market Exchange Rates", *Economic Inquiry*, June 1975, 287-297.
- Dornbusch, R. et.al., "The Black Market for Dollars in Brazil", *The Quarterly Journal of Economics*, February 1983, p.25-40.
- Eichengreen, Barry, Rose, Andrea K., and Wyplosz, Charles, "Exchange Market Mayhem: the Antecedents and Aftermath of Speculative Attacks", *Economic Policy*, October 1995, 249-312.
- García Dubón, Enrique, "Notas sobre el Costo de Oportunidad de la Sustitución de Dinero en Centroamérica", *Boletín Económico del Banco Central de Reserva de El Salvador*, August 1994, 5-15.
- Gerlach, Stefan and Frank Smets, "Contagious Speculative Attacks," *European Journal of Political Economy*, vol. 11, 1995, 45-63.
- Gupta, Sanjiv, "An Application of the Monetary Approach to Black Market Exchange Rates", *Weltwirtschaftliches Archiv*, Band 116, Heft 2, 1980, 235-251.
- Grosse, Robert, "Peru's Black Market in Foreign Exchange", *Journal of Interamerican Studies and World Affairs*, Fall 1991, 135-167.
- ____, "Colombia's Black Market in Foreign Exchange", *World Development*, August 1982, 1193-1207.
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- _____, "Jamaica's Foreign Exchange Black Market", *The Journal of Development Studies*, October 1994, 17-43.
- Johansen, Soren, "Statistical Analysis of Cointegrating Vectors", *Journal of Economic Dynamics and Control*, 1988, 231-254.
- _____, and K. Juselius, "Maximum Likelihood Estimation and Inference on Cointegration: With Applications to the Demand for Money", *Oxford Bulletin of Economics and Statistics*, May 1990, 169-210.
- Leachman, Lori E., and Bill Francis, "Long-Run Relations among the G-5 and G-7 Equity Markets," *Journal of Macroeconomics*, Fall 1995, 551-579.
- Lin, Antsong and Peggy E. Swanson, "Measuring Global Money Market Interrelationships," *Journal of Business and Finance*, June 1993, 611-627.
- Phylaktis, Kate, "The Black Market for Dollars in Chile", *Journal of Development Economics*, February 1992, 155-172.
- Saca, Nolvía, "Black Market Exchange Rate, Unification of the Foreign Exchange Markets and Monetary Policy: The Case of El Salvador", Ph.D. Dissertation, Kiel University, 1995.

Abstract

This paper presents a bi-national model for the determination of El Salvador's black market exchange rate. The model is estimated by Johansen multivariate cointegration approach. The main finding of the paper is that Guatemala's money supply and inflation are the main determinants of El Salvador's exchange rate. Granger causality is investigated among the variables of both countries and cross-border causality is found in monetary and exchange rate variables. Policy makers have to ensure an economic policy coordination framework allowing for stable monetary policy to prevent contagious speculative attacks.

MODÈLE BI-NATIONAL POUR LA DÉTERMINATION DE TAUX DE CHANGE DU MARCHÉ NOIR**Résumé**

Ce document présente un modèle bi-nationaux pour la détermination de taux de change du marché "noir" de El Salvador. Le modèle a été estimée selon la multivariable de cointegration de Johansen. On trouve que la masse monétaire au Guatemala et l'inflation, sont les déterminantes principales des taux de change de El Salvador. La causalité de Granger est étudié entre les variables de les deux pays et la causalité après frontière se trouve dans les variables de la monnaie et de taux de change. Les conclusions sont présentés sur la convenance d'établir un cadre pour la coordination de la politique économique qui permettra la conduite d'une politique monétaire dans une voie prédictible et la que pourra être effective pour défendre les attaques spéculatives contagieux.

