

SHORT RUN MACROECONOMIC EFFECTS OF REMITTANCES IN EL SALVADOR

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1. Introduction

In 2003 remittances received by El Salvador reached \$203 million, an amount equivalent to 13.5 per cent of its GDP, 64.7 per cent of exports and 37.3 per cent of imports¹. This inflow of resources is the reflection of a strong emigration tide to the USA that started in the early 80's as a result of the civil war, and which continues to the present. This experience is not confined to El Salvador, but it is becoming the distinctive characteristic of Latin America's economic performance in the 00's. In 2003 remittances to Latin America were \$30 billion, a sum that is twice as large as the inflow of foreign investment.

The main thrust of research has been directed to studying the decision to remit and the use of remittances. Studies of the macroeconomic repercussions of remittances are rather scarce, particularly in the Latin American countries, where the majority of studies have been conducted for the case of El Salvador².

The ground breaking work is Montes'(1986) study of emigrants in the U.S., which permitted to draw profiles of their socioeconomic backgrounds, and quantify the amounts they sent to their relatives, and the determinants of such transfers. Lopez Calix, Roberto and Seligson(1990) conducted a survey to quantify the sums received by small business in the San Salvador area and to identify the use given to such transfers. They found that 86 per cent of remittances were destined to augment consumption expenditures.

Delgado and Siri(1995) study is of special importance as it presents a series of instruments that can be employed to promote the use of remittances in investment activities. These authors recommended the creation of special credit lines by the banking system to those households that receive remittances, so as to facilitate the purchase of housing and to start business enterprises.

Rivera Campos(1996) developed a macroeconomic model to quantify the current account deficit that would result from the gradual ending of remittances. It was estimated that this deficit would reach a maximum of 12.5 per cent of GDP. In a subse-

¹ La Prensa Gráfica, October 27, 2003.

² On the economics of remittances at the community level in Mexico, see Reichert (1981) and Durand and Parrado(1996).

The links described above may not function as argued, or may not function at all, given the high degree of economic openness prevailing in El Salvador's economy. Thus, the expected positive impact of remittances on international reserves may become undetected, by virtue of the large amounts of imports that would counteract the expansive effects from remittances. Similarly, their impact on the inflation rate may not be perceived, since the large amount of imported consumer goods enlarge aggregate supply³. In effect, as shown in Table 1 below, the annual amounts of remittances match the trade deficit very closely. Thus, the increases in money supply, or in prices, may not take place. This situation would make sterilization measures unnecessary⁴.

Table 1:

Trade Balance (Deficit) And Remittances, Million of US Dollars.		
Year	Trade Balance (Deficit)	Remittances
1996	1242	1259
1997	1143	1364
1998	1305	1534
1999	1345	1566
2000	1739	1830
2001	1912	2022

Source: International Monetary Fund. *International Financial Statistics*.

Moreover, given that in El Salvador one third of adults receive remittances from relatives in the U.S.⁵, the dependence on these transfers may be internalized in such a way that, in a given month, individuals are able to distinguish the unexpected amounts of remittances from the "normal" or expected amounts. In other words, for the individuals not only the amounts of remittances are important, but also the shocks to, or the deviation from the expected amounts. In addition, it can be assumed that the shocks and variance associated with remittances may have effects on economic activity. These hypothesis will be tested in the model presented in this paper.

³ The deflationary impact of aggregate industrial supply in Central America is analysed in Cáceres(1978).

⁴ This point is analyzed in detail in Cáceres(20003b).

⁵ Los Angeles Times, November 10, 2003.

3. Data and Results

The source of data was the International Monetary Fund's publication *International Financial Statistics*, except the data on remittances and index of economic activity, which were obtained from the Banco Central de Reserva's web page.

The first empirical investigation consisted of estimating the monthly shocks and the time-varying variance of remittances. To this effect, GARCH models on the monthly growth rate of remittances, DLREM, were estimated⁶. The results are shown on Table 2.

Table 2: *Dependent variable: Rate of change of monthly sum of remittances*

	(1)	(2)
Constant	0.01777 (1.69)	0.0269 (2.37)
DLREM(-1)	-0.6888 (7.39)	-0.6886 (7.25)
DLREM(-2)	-0.3657 (2.93)	-0.2960 (2.51)
DLREM(-3)	-0.1155 (1.25)	-0.1560 (1.72)
Constant	0.0099 (1.25)	-8.3745 (6.42)
ARCH(1)	-0.1598 (4.28)	
GARCH(1)	0.1149 (0.14)	
/RES/SQRT(GARCH(1))		-0.0476 (0.18)
RES/SQRT(GARCH(1))		-0.3489 (2.13)
EGARCH(1)		-0.7926 (3.04)
R2	0.29	0.42
DW	1.90	1.93
F	6.32	8.08

Equation (1) in Table 2 indicates that the ARCH(1) effect is significant but the GARCH(1) effect is not. Next, EGARCH models were estimated to detect the exi-

⁶ DLREM represents the change of the logarithm of monthly values of remittances.

stence of asymmetric effects. It can be seen in equation (2) that there are asymmetric effects, in the sense that when the remittances grow faster than expected, that is, RES is positive, the volatility decreases more than when the increase in remittances is less than expected. The error term, RES, and the variance, VAR, from equation (2) were saved to test if they exert effects on macroeconomic variables.

To test the existence of a long-term relationship between remittances and macroeconomic variables, a cointegration estimation is applied to a vector composed of the logarithms of the monthly values of the index of economic activity, (LIMAE), the amount of remittances, (LREM), the interbank interest rate, (LR), the money supply narrowly defined, (LM1), and the inflation rate (LINF). All variables were tested for unit roots and in all cases it was found that they were integrated of order one. The cointegration analysis was performed using Johansen method with data for the period January 1995 to August 2003. The cointegration test results are presented on Table 3.

It can be noted that the null hypothesis of the inexistence of a cointegration vector can be rejected at the 5 per cent level, and it is thus inferred that there exists one cointegration vector. The normalized cointegration vector is also shown in Table 3. It can be seen that remittances exert a positive effect on the index of economic activity, denoting the importance of the income effect. The interest rate exerts a positive effect on LIMAE, which is unexpected. This indicates that economic activity grows faster when interest rates are rising. The inflation rate shows a negative coefficient, as expected.

The positive coefficient shown by the money supply is as expected.

These results indicate that periods of rapid economic growth are those with rapid remittance inflow, rapid money growth, low inflation and high interest rate. This may imply that remittances give rise to increases in both economic activity and money supply and, in response, the monetary authorities "apply the brakes" to money expansion, by selling bonds and thus sterilizing the increase in money, which leads to increasing interest rates. This is the mechanism that was identified for other countries by Lee(1996) as a response to foreign capital inflows. The point to stress is that such sterilization measures may be unnecessary, given that the monetary expansion is accompanied by an increase in the money demand resulting from the increase in income of those who receive remittances. As well, the expansionary effect of remittances on international reserves may be dissipated by imports. Sterilization activities under these conditions may lead to high interest rates and low rates of economic growth.

Table 3:

Eigenvalue	Likelihood Ratio	Critical Value	Hypothesis	No. of Cointegration Vectors.
0.2933	70.39964	68.52	None*	
0.2086	36.7246	47.21	At most 1	
0.0887	14.0363	29.68	At most 2	
0.0301	5.0243	15.41	At most 3	
0.0209	2.0582	3.76	At most 4	
Normalized Cointegration Vector:				
Variable:	Coefficient:			
LIMAE	-1.0000			
LREM	0.0792			
LINT	0.0303			
LINF	-0.0301			
LM1	0.2941			
Constant	2.7324			

4. Error Correction Models

Error correction models were estimated using the error term from the cointegration vector shown on Table 3. Only the most parsimonious equations are shown, that is, the equations that result after the insignificant coefficients are dropped.

Table 4 shows the equations for the change in the logarithm of the monthly index of economic activity. In equations (1) and (2) the coefficients of the lagged error term, $ER(-1)$, are significant, denoting that the LIMAE is an endogenous variable determined jointly by all other variables. The interest rate with a lag of two months exerts a significant and negative effect in all equations, indicating that as interest rate decreases, economic activity increases. Note that remittances show a coefficient with a positive sign, which is not significant. In equation (2) the lagged shock to remittances, $RES(-1)$, is introduced; it shows a positive sign which is not significant. The coefficient of the variance of remittances, VAR , is not significant either in equation (3), nor in equation (4). These results indicate that, in the short run, remittances exert no direct effect on the monthly index of economic activity; but in the long run, they do influence economic activity through the cointegration vector.

Table 4 :

Error Correction Models for D(LIMAE)				
	(1)	(2)	(3)	(4)
D(LIMAE(-1))	1.0822 (11.86)	1.0691 (11.56)	1.0697 (11.60)	1.0721 (11.54)
D(LIMAE(-2))	-0.4376 (4.93)	-0.4494 (4.99)	-0.4513 (5.03)	-0.4529 (5.02)
ER(-1)	-0.0002 (1.99)	-0.0002 (2.04)	-0.00006 (0.39)	-0.00005 (0.36)
D(LINT(-2))	-0.0024 (2.10)	-0.0024 (2.16)	-0.0023 (1.99)	-0.0022 (1.93)
D(LREM(-1))	0.0002 (0.11)			
RES(-1)		0.0003 (0.14)		0.0009 (0.38)
VAR(-1)			0.0298 (0.60)	0.0375 (0.69)
R ²	0.67	0.64	0.64	0.65
DW	1.85	1.83	1.83	1.84
F	45.68	40.57	40.81	32.37

The error correction equations for the interest rate are shown on Table 5. Equation (1) indicates that the coefficient of the error term is significant in all equations, which implies that the interest rate is endogenous. The inflation rate shows a positive and insignificant coefficient, while remittances show a negative and also insignificant coefficient. It can be seen in equation (2) that the shock to remittances, current and with a one month lag, show coefficients that are positive and negative respectively, but which are significant only at the levels of 12 and 18 per cent. The values of these coefficients are very close, so that in the short run the shocks to remittances would have small effects on the interest rate. Equation (3) introduces the variance of remittances, whose coefficient is negative and insignificant.

In equation (4) the variance is insignificant while the shock variables have significant coefficients.

Table 5:

Error Correction Models for D(LINT)				
	(1)	(2)	(3)	(4)
Constant	3.4440 (1.87)	3.8461 (2.18)	3.8225 (2.16)	3.7603 (2.12)
D(LINT(-1))	-0.3678 (3.64)	-0.3660 (3.69)	-0.3861 (3.88)	-0.3577 (3.57)
D(LINT(-2))	-0.3212 (3.12)	-0.2973 (3.07)	-0.3326 (3.33)	-0.3107 (3.13)
D(LINF(-2))	0.0020 (0.60)			
ER(-2)	1.0213 (1.88)	1.1400 (2.20)	1.1438 (2.19)	1.1049 (2.11)
D(LREM(-1))	-0.1863 (1.07)			
RES(-1)		-0.2716 (1.34)		-0.3324 (1.63)
RES		0.3145 (1.55)		0.3524 (1.67)
VAR(-1)			3.4083 (0.80)	-3.2156 (0.70)
R ²	0.22	0.24	0.21	0.25
DW	2.07	1.98	1.96	1.99
F	5.11	5.70	6.12	4.80

Table 6 show the equations for the increase in the monthly inflation rate. All equations show coefficients of the lagged error term which are significant only at the 20 per cent level. Thus, inflation is an exogenous variable. The money supply with a two month lag has a negative and significant coefficient in all equations, which is an unexpected result. Equation (2) shows that the shock variable with a four months lag has a coefficient with a negative sign that is significant at the 18 per cent level. Current and values with shorter lags were not significant. In any case, remittances would not be inflationary. The variance variable shows a positive sign in equation (3) but it is not significant. Both shocks to and the variance of remittances are introduced in equation (4); the shock has a coefficient with a negative sign and its significance level increases to 10 per cent, whereas the significance of the coefficient of the variance term increases to 21 per cent.

Table 6:

	Error Correction Models for D(LINF)			
	(1)	(2)	(3)	(4)
Constant	-6.6639 (1.22)	-7.1855 (1.24)	-6.9095 (1.25)	-7.1802 (1.24)
D(LINF(-1))	-0.3274 (3.11)	-0.3320 (3.08)	-0.3201 (3.01)	-0.3231 (2.99)
D(LINF(-2))	-0.1758 (1.73)	-0.1691 (1.63)	-0.1759 (1.72)	-0.1672 (1.62)
D(LM1(-2))	-2.1326 (1.98)	-2.3539 (2.09)	-2.3447 (2.10)	-2.7193 (2.34)
ER(-1)	-1.9595 (1.22)	-2.1085 (1.23)	-2.0000 (1.23)	-2.0564 (1.20)
RES(-4)		-0.8241 (1.33)		-1.0704 (1.65)
VAR			9.1341 (0.74)	16.5566 (1.24)
R2	0.18	0.20	0.18	0.21
DW	2.06	2.05	2.07	2.05
F	4.97	4.29	4.05	3.85

The equations for the money supply are shown in Table 7. It can be seen that the lagged error term is significant in all equations. Remittances show coefficients with negative signs in all equations, which are significant at the 8 per cent level, whereas the lagged money supply shows coefficients that are not significant, except in the case of equation (4). It can be seen in equation (2) that the significance of the three variables included in equation (1) increase appreciably, and that the coefficient of the shock variable is significant and positive. Equation (3) includes the variance term with a 2 month lag, which shows a significant and positive coefficient. In equation (4) both the shock and variance terms are included, which show positive and significant coefficients. These results indicate that the most significant effects of remittances on the money supply are exerted through the shock and variance variables.

Table 7

Error Correction Models for D(LM1)				
	(1)	(2)	(3)	(4)
Constant	0.8372 (1.73)	0.8739 (1.84)	0.8112 (1.69)	0.8451 (1.89)
D(LM1(-1))	-0.0922 (0.86)	-0.1252 (1.18)	-0.1404 (1.30)	-0.2100 (2.05)
D(LREM(-1))	-0.0730 (1.52)	-0.0831 (1.74)	-0.1404 (1.39)	-0.2708 (1.68)
ER(-1)	0.2452 (1.72)	0.2554 (1.83)	0.2560 (1.82)	0.2708 (2.06)
RES		0.1522 (2.82)		0.2026 (3.82)
VAR(-2)			6.6668 (2.79)	8.6981 (3.80)
R2	0.08	0.15	0.15	0.27
DW	2.02	1.96	2.06	1.97
F	2.59	4.08	3.97	6.58

5. Conclusions

The results indicated that remittances can be represented as a time varying variance EGARCH model with asymmetric effects, implying that when the monthly values of remittances are less than expected, the increase in its time-varying variance is larger than when the monthly values of remittances reach sums that are larger than expected. The cointegration analysis indicated that there is a long-term relationship between monthly values of the logarithms of the index of economic activity, remittances, inflation and interest rates, and the money supply. An interesting result from the cointegration analysis is that remittances do exert a positive impact on the monthly index of economic activity, and a negative effect on the interest rate.

The error correction models indicated that these variables are endogenous, with the exception of the inflation rate. When remittances enter the error correction equations they have no effect on any of the other variables. However, the shocks to remittances were significant in the case of the money supply variable, and to a lesser degree in the case of the interest and inflation rates. As well, the variance of remittances was significant in the case of the money supply equations. These results indicate that in the short run the effects of remittances on the macroeconomy are felt through its deviations from expected values and through the uncertainty surrounding the inflow of remittances.

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Abstract

This paper analyses the macroeconomic effects of remittances in El Salvador. After a review of the literature, a cointegration vector is estimated which shows that there is a long-term relationship between the logarithms of the monthly values, the remittances, the index of economic activity, the interest and inflation rates and the money supply. The cointegration vector indicates that remittances exert positive effects on the index of economic activity and on the inflation rate, as well as negative effects on the interest rate and the money supply. Egarch models were estimated to obtain the time-varying variance and shocks to remittances. These two variables were introduced in the estimation of error correction models. When remittances entered the ECMs they had no effect on any of the variables. However, the shocks to remittances were significant in the equations for the money supply and for interest and inflation rates, and the variance of remittances was significant in the estimations for the money supply. The paper concludes that the short-run macroeconomic effects of remittances are felt through its deviations from expected values and through the uncertainty that surround the inflow of remittances.