Dollar denominated accounts in Latin America during the 1990s

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DOLLAR-DENOMINATED ACCOUNTS IN LATIN AMERICA DURING THE 1990s

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Abstract

In this paper we analyze the evolution of dollar-denominated accounts in Latin America and how they impact the stability of the banking system and the volatility of macroeconomic aggregates. Our findings reveal that dollar deposits are strongly influenced by depreciation expectations of the local currency even in an environment of fairly low inflation. We also find that having more dollar accounts increases the probability of future crises if the economy is already in a crisis. Finally, our findings suggest that for some macroeconomic aggregates there exists a positive correlation, in the long and short run, between their volatility and the volume of dollar-denominated accounts in the banking system. (JEL E31, E44)

The Dollar in Latin America

During the past three decades, the dollar has increased its presence in most Latin American countries. The process began in the early 1970s, fueled by financial reforms. As capital and foreign exchange controls were lifted, the U.S. dollar began to gradually replace local currencies in the domestic citizens' portfolio. In several countries the observed pattern has been as follows. The dollar has first been used as a store of value as residents maintained increasing portions of their wealth in dollar-denominated assets in order to avoid possible losses caused by macroeconomic instabilities. The dollar has then been used as a unit of account, mainly in the real estate sector, where prices have increasingly been quoted in dollars as a way to differentiate between changes in relative prices and changes in overall inflation. And finally the dollar has been used as medium of exchange.[1]

In some countries, like Brazil, Chile, and Venezuela, dollar-denominated accounts have not been used extensively. In others, such as Bolivia and Uruguay, dollar-denominated deposits have been a very important component of monetary aggregates. Finally, Panama and, more recently, Ecuador have adopted the dollar as legal tender, replacing completely the domestic currency.

While there is a good theoretical understanding of the implications of having two monies, the empirical consequences are still an open issue.[2] It is commonly believed that allowing foreign currency deposits to coexist with domestic-denominated accounts may provide the opportunity for greater domestic intermediation, promote financial sophistication by increasing the number of

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[1] For an excellent overview see Savastano (1992).

[2] Chang (1994) explores the relationship between currency substitution and inflationary finance in an overlapping generations model in which currency substitution is an endogenous equilibrium outcome. Chang (1994) shows that currency substitution may be a purely expectational phenomenon. On the other hand, Agenor and Khan (1996) investigate currency substitution in a dynamic, forward-looking model, where the actual currency holding is determined in a multiperiod cost-of-adjustment process. Similarly, Uribe (1997) employs a cash-in-advance model in which domestic currency is always in circulation and there is a reduction in the cost of using foreign currency as it is used in the economy.

available assets, and increase credibility by raising the cost of monetary indiscipline. Furthermore, the rapid development of foreign currency–denominated operations in the banking system may affect the stability of monetary aggregates, the dynamics of exchange rates, and government revenues from seigniorage.[3] In particular, the higher the elasticity of substitution between monies, the larger the shift from foreign to domestic currency-denominated accounts. Furthermore, allowing foreign currency–denominated deposits also reduces monetary independence, which may then endanger the ability of central bankers to implement stabilization programs. These types of accounts then magnify the possible fiscal problems since seigniorage revenue is reduced.[4] Finally, allowing dollar-denominated accounts lessens the central bank's ability to act effectively as a lender of last resort, since it loses control over part of its monetary base.

The empirical literature on currency substitution has primarily focused on the study of its main determinants. In general, several measures of macroeconomic instability have been used as explanatory variables—proxies for the expected depreciation being the most commonly used—from reduced money demand equations that allow for holdings of foreign currency. Throughout the literature we find several case studies: Ortiz (1983) on Mexico; Ramirez-Rojas (1985) on Argentina, Mexico, and Uruguay; Marquez (1987) on Venezuela; Rojas-Suarez (1991) on Peru; and Melvin and Afcha de la Parra (1989) on Bolivia. Some of these papers have found significant and positive signs on the coefficients for expected depreciation of the domestic currency and inflation.[5] These results suggest that depositors run away from local currencies whenever they expect losses associated with their domestic currency.[6]

However, there have been some cases where we find an increase in dollar-denominated accounts while the country is following a successful macroeconomic stabilization program. Bolivia, for example, experienced an increase in dollarization after the macroeconomic stabilization program of 1985. In fact, Clements and Schwartz (1992) find that interest rate differentials and other measures for expected depreciation performed poorly when used as explanatory variables for the degree of dollarization during the 1986–1991 period. Other countries in the region have experienced similar episodes where the level of foreign currency–denominated deposits increased after a decrease in inflation and expected depreciation.

The purpose of this paper is to analyze the evolution of dollar-denominated accounts in Latin America, how they impact the stability of the banking system. and the volatility of macroeconomic aggregates. Our findings reveal that dollar-denominated deposits are strongly influenced by depreciation expectations of the local currency even in an environment of fairly low inflation. We also show that having more dollar-denominated accounts increases the probability of future crises if the economy is already in a crisis. Finally, for some macroeconomic aggregates we find higher volatility, in the long and short run, when the volume of dollar-denominated accounts in the banking system increases.

Measuring Account Substitution

Following the tradition in the currency-substitution literature, we estimate two money demand equations for the two types of currency-denominated accounts. In order to take into account the increasing openness of Latin American economies during the 1990s, we consider two assets: foreign and domestic bonds.[7] In particular, we consider the standard money demand equations (1) and (2) where $m^d_{i,t}$ and $m^f_{i,t}$ denote the demand for deposits by domestic residents in country i at

[3] A good discussion of seigniorage losses due to the adoption of a foreign currency is provided in Fischer (1982).

[4] See Vegh (1989) for a discussion on this important point.

[5] In these studies they consider the ratio of foreign currency deposits in the financial system as a proxy for the degree of dollarization in the economy.

[6] These findings are just lower-bound estimates since these studies cannot account for dollars circulating in the economy that are not intermediated through the banking system.

[7] As financial markets further develop, the number of available assets increases, affecting the agent's portfolio decision.

time t in local and foreign currency, respectively; $y_{i,t}$ is the national income in country i at time t; $I^d_{i,t}$ is the domestic interest rate in country i at time t; and $I^f_{i,t}$ represents the interest rate paid on deposits in U.S dollars in country i at time t.

$$\log(m^d_{i,t}) = \beta_0 + \beta_1 \log(y_{i,t}) + \beta_2 I^d_{i,t} + \beta_3 I^f_{i,t} \tag{1}$$

$$\log(m^f_{i,t}) = \gamma_0 + \gamma_1 \log(y_{i,t}) + \gamma_2 I^d_{i,t} + \gamma_3 I^f_{i,t} \tag{2}$$

Subtracting equation (1) from (2), we obtain expression (3).

$$\log(m^f_{i,t}) - \log(m^d_{i,t}) = \delta_0 + \delta_1 \log(y_{i,t}) + \delta_2 I^d_{i,t} + \delta_3 I^f_{i,t} \tag{3}$$

According to the uncovered interest parity condition, rates of return on identical debt instruments in two different countries, inclusive of the exchange rate, should be equal. Thus, this parity condition implies the relation (4) where e_{t+1} is the exchange rate at time t+1.

$$\log(e_{t+1}) = \log(e_t) + \log(1 + I^d_t) - \log(1 + I^f_t) \tag{4}$$

McCallum (1994), among others, finds that there are large deviations in the uncovered interest parity equation. Thus, if we want to study account substitution, we have to take this phenomenon into consideration. In this paper, we consider the following approximation: $log(1+I^d_{i,t}) - log(1+I^f_{i,t}) \approx I^d_{i,t} - I^f_{i,t}$. Then the uncovered interest parity equation can be approximated by $log(e_{t+1}) \approx log(e_t) + I^d_{i,t} - I^f_{i,t}$. If we now allow for country-specific deviations in the uncovered interest parity condition, we have that $I^d_{i,t} = I^f_{i,t} + log(e_{t+1}) - log(e_t) + \varepsilon_{i,t}$. Thus, if we consider the approximation to the uncovered interest parity equation and allow for country-specific frictions, we can derive the estimable equation (5) where $R_{i,t} = m^f_{i,t} / (m^d_{i,t} + m^f_{i,t})$ is the ratio of foreign denominated accounts to total accounts.

$$\log(R_{i,t}) - \log(R_{i,t-1}) = \alpha + \theta_1 \log(y_{i,t}) + \theta_2 I^d_{i,t} + \theta_3 (\log(e_{i,t+1}) - \log(e_{i,t})) + \varepsilon_{i,t} \tag{5}$$

As we can see, equation (5) suggests that the ratio of dollar-denominated accounts to total accounts can be partially explained by changes in the exchange rate, domestic income, and domestic interest rates. If the two demands for deposits, domestic and foreign, are identical, the coefficients in equation (5) should be statistically equal to zero. Therefore, any departure of the estimates from zero may capture any uncertainty and economic frictions faced by depositors when making their portfolio decisions. Some of these frictions may result from the fact that only certain transactions can be conducted with local currency and dollars, or there might be different minimum deposit requirements for or different deposit insurance on the two types of accounts.

Data and Estimation Results

The data for this study are drawn from several sources: the 1999 International Financial Statistics (IFS) published annually by the International Monetary Fund (IMF); Levine, Loayza, and Beck (1998), Caprio and Klingebiel's (1999) data set; and several central banks.

The countries included in the study are Argentina, Belize, Bolivia, Costa Rica, Dominica, Ecuador, El Salvador, Honduras, Mexico, Nicaragua, Paraguay, Peru, and Uruguay. Due to data

limitations, we concentrate on the 1990–1998 period.[8] The resulting sample has 117 observations (13 countries, 9 years).

Table 1: Summary Statistics by Country: 1990–1998.

Country	R (%)	GDP	$\log(\frac{e_{t+1}}{e_t})$	I^d
Argentina	41.74	4877.09	0.03	183.28
	(5.76)	(1056.55)	(0.088)	(500.77)
Belize	1.486	1785.73	-.0005	8.64
	(0.88)	(152.50)	(0.019)	(0.47)
Bolivia	67.97	606.22	-0.476	19.66
	(8.03)	(92.61)	(0.062)	(3.98)
Costa Rica	30.38	1661.45	0.051	18.42
	(4.53)	(266.75)	(0.04)	(4.85)
Dominica	1.81	213.81	-0.0006	4.07
	(0.96)	(30.17)	(0.019)	(0.13)
Ecuador	13.12	868.18	0.111	38.86
	(01.23)	(165.16)	(0.057)	(6.22)
El Salvador	5.03	1017.64	0.004	13.87
	(1.78)	(296.61)	(0.025)	(2.42)
Honduras	13.21	490.85	0.104	13.80
	(9.49)	(155.86)	(0.142)	(4.08)
Mexico	13.77	2495.70	0.065	19.83
	(3.43)	(494.86)	(0.101)	(8.59)
Nicaragua	47.18	307.00	0.15	11.45
	(14.94)	(43.33)	(0.283)	(0.90)
Paraguay	32.33	1092.07	0.044	19.78
	(7.49)	(150.84)	(0.023)	(3.59)
Peru	54.57	1353.25	0.098	310.77
	(6.83)	(465.58)	(0.099)	(799.86)
Uruguay	77.62	3041.46	0.103	44.99
	(2.81)	(1039.13)	(0.051)	(26.83)

Standard Deviations are presented in parentheses.

The variables used in the estimation of equation (5) are calculated as follows. The ratio of foreign-denominated currency deposits (FCD) to domestic-denominated currency deposits measured at the end of the period is obtained from the IFS, some central banks, and the IMF Western Hemisphere Department.[9] The nominal GDP per capita is computed by dividing the nominal value of GDP by the total population and then multiplying it by the end-of-period exchange rate.[10] The interest rates employed in this study are the deposit rates reported by the IFS. The corresponding summary statistics for our sample are presented in Table 1.

[8] Although information on most monetary and macroeconomic variables is available since 1970 for all countries, we could only obtain data on foreign currency deposits for a subset of Latin American countries and just for the 1990s.

[9] FCD include all dollar-denominated bank accounts both from domestic and foreign banks.

[10] These variables were obtained from the IFS.

Although each country shows important peculiarities, some stylized facts can be drawn. The first observation is that the dollarization ratio, which is the ratio of FCD to total deposits, has been steadily increasing over time for the majority of countries in our sample. In particular, while in 1990 the average ratio for these countries was 0.23, in 1998 it rose to 0.37. A second interesting fact is that this increase comes in a period when the inflation rate has dramatically decreased. In 1990 the average inflation rate for the 13 countries was 1,353 percent (315 percent without counting the hyperinflation episodes of Argentina, Nicaragua, and Peru). On the other hand, it was 10 percent in 1998. As we can see, the increasing volume of dollar-denominated accounts in the banking system can significantly reduce the ability of central banks to act as a lender of last resort and to conduct monetary policy.

Table 2: Account Substitution: 1990–1998.

Specification	Variable	Estimates	t-stat
Fixed Effects			
	log(y)	-0.02	-0.12
	I^d	0.258	1.213
	$\log(e_{t+1}/e_t)$	-0.588*	-1.78
Random Effects			
	constant	-2.054	-1.175
	log(y)	-0.026	-0.209
	I^d	0.282*	1.423
	$\log(e_{t+1}/e_t)$	-0.597**	-1.833

Notes: Adjusted $R^2 = 0.948$ (Fixed Effects); Adjusted $R^2 = 0.897$ (Random Effects); Hausman specification test for H_0: FE vs RE: $\chi^2(3) = 0.72$. *(**) represents 10 percent (5 percent) significance level.

Due to the nature of our data, the best approach to analyze account substitution is through panel data estimation. A priori, it is not clear that differences in account substitution in different countries can be viewed as parametric shifts since we only have data on a subset of Latin American countries. Thus, a fixed and random effect treatment is warranted. The results corresponding to the account substitution are presented in Table 2. The coefficient of expected appreciation of the local currency is negative and significant, corroborating previous findings in the literature even in an environment where inflation has been greatly reduced. The data suggest that account substitution in Latin America strongly depends on the expected relative returns between currencies, emphasizing the role of future expectations. The significance of the expected relative returns between currencies in explaining account substitution is observed both in the fixed and random effect models. Typically, with small samples such as ours, the magnitude, sign, and significance of the estimates vary widely from one specification to the next. However, our findings yield similar estimates and significance levels for both specifications, highlighting the importance of the expected relative returns between currencies. Finally, we also perform a Hausman specification test, which suggests that restrictions on the intercept of the random-effects model are not observed in the data. There is no justification for treating the individual effects as uncorrelated to the regressors as is assumed in the random effects model. If this is the case, the random effects treatment may then suffer from the inconsistency of omitted variables. See Table 2 for specific estimates and specification tests.

As we can see, our specification is able to partially explain the relative movements between dollar- and domestic-denominated accounts in Latin America in the 1990s. Such movements are mainly explained by appreciation expectations of the domestic currency even in a moderately low-inflation environment. These findings then demonstrate that depositors in Latin America face some uncertainty and economic frictions when making their portfolio decisions since our estimates are statistically different from zero.

Dollar Accounts and Banking Crisis

In the 1980s and early 1990s, a number of Latin American countries experienced severe banking crises. Some of these banking crises also had associated currency crises. A variety of theoretical models try to explain the link between currency and banking crises. One chain of causation runs from balance-of payment problems to banking crises. For example, Mishkin (1996) argues that, if a devaluation occurs, the position of banks could be weakened further if a large share of their liabilities is denominated in foreign currency. On the other hand, models such as Velasco (1987) point to the opposite causal direction. Financial sector problems give rise to currency collapses. Kaminsky and Reinhart (1999) provide evidence that, most often, the chain of causality runs from banking crises to currency crises rather than in the other direction.

As we can see, the effect that foreign currency deposits may have on the banking system is ambiguous. A high level of dollar deposits in an economy in which the dollar is used as a store of value but not as a medium of exchange will result in higher exchange rate risk in the banks' balance sheets. Banks that take deposits in dollars do not typically lend in domestic currency, since they are restricted to maintain small foreign exchange positions by regulation. The problem arises when there is lending in dollars to corporations and individuals that do not have dollar revenues. On the other hand, allowing domestic- and foreign-currency denominated deposits can help prevent capital outflows by increasing the ability of the banking system to better absorb adverse shocks. In this section we explore the relationship between dollar-denominated accounts and the stability of the banking system while explicitly taking into account currency crises.

As preliminary evidence, we investigate how the probability of a banking crisis is influenced by the degree of dollarization in the economy. Using the Caprio et al. (1999) database, which reports banking crises for a large set of countries, we calculate the probability of a banking crisis given a certain degree of dollarization.[11] We find that the probability of a banking crisis increases with the degree of dollarization by threefold. In particular, the probability of a banking crisis given that the economy is highly dollarized is 0.381. On the other hand, if the economy is not highly dollarized, the probability of a banking crisis is 0.130. Thus, the data suggest that dollar-denominated accounts may bring instability to the banking system.

We then investigate the relationship between the severity of banking crises and the degree of dollarization.[12] The probability of a severe banking crisis increases with the degree of dollarization also by threefold. In particular, the probability of a severe banking crisis given that the economy is highly dollarized is 0.302. On the other hand, if the economy is not highly dollarized, the probability of a severe banking crisis is 0.130.

As we can see, having dollar-denominated accounts not only increases the frequency of banking crises but also their severity. These findings emphasize the potential shortcomings of not placing adequate restrictions on foreign-denominated accounts in the banking system.

In order to present stronger evidence, it is necessary to introduce some additional controls. Following Demirgüç-Kunt and Detragiache (1998), we consider a multivariate logit specification.

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[11] Following Balino, Bennett, and Borensztein (1997), when the average dollarization ratio is above 30 percent for the period 1990 to 1998, the economy is classified as highly dollarized.

[12] Caprio et al. (1999) classify banking crises into two major groups: systemic banking crises, where most or all of banking system capital is eroded, and mild banking crises.

This approach can identify a number of interesting correlations. However, since we are estimating reduced forms, such correlations should be interpreted with caution because they do not specify the direction of causality.[13]

Within a macroeconomic framework, previous work on banking crises has not systematically addressed the issue of persistence. Some authors ignore the issue altogether, others consider observations up to the first crisis, and finally some studies introduce the length of the crisis as an indicator of persistence. We propose a two-stage Markov process allowing for the possibility that previous outcomes may affect future crises.[14] In particular, we consider the following conditional probability where $P(Y_{i,t}|Y_{i,t-1})$ is the probability that a banking crisis takes place given what happened in the previous period, F is the logistic distribution function, $X_{i,t}$ is the set of explanatory variables, and β and α are the parameters to be estimated.

$$P(Y_{i,t} \mid Y_{i,t-1}) = F(X_{i,t}\beta + X_{i,t}Y_{i,t-1}\alpha)$$

This conditional probability can be interpreted in terms of the following Markov transition probabilities.

$$P_{01} = F(X_{i,t}\beta)$$

$$P_{11} = F(X_{i,t}\beta + X_{i,t}Y_{i,t-1}\alpha)$$

The Markov transition probabilities that we consider in this paper examine the interaction between the degree of dollarization and past banking crises. Unfortunately, due to data limitations we can only consider a subset of controls used in the literature of banking crises. We consider a constant, per capita GDP, the real interest rate *(INT),* the exchange rate *(E),* domestic currency devaluation dummies *(DUM),* and the ratio of dollar denominated accounts to total deposits *(R).*

The estimates obtained from the different specifications show that banking crises are strongly persistent over time since past banking crises are always positive and significantly different from zero at the 5 percent level. The estimates of past banking crises, while taking into account the current degree of dollarization, are the largest among all other controls. This finding then suggests that once in a crisis we are more likely to observe a banking crisis in the future when the economy is substantially dollarized. We also find standard results in the literature. An increase in the domestic interest rate and the exchange rate augment the probability of banking crises. With higher interest rates the opportunity cost of holding reserves is greater, so banks tend to reduce them, increasing the chances of banking failures. Furthermore, the data also suggest a small and negative effect of GDP on the probability of experiencing banking crises. Thus, a healthier economy is less likely to experience banking crises. These findings then may reflect the possibility that an increased exchange rate exposure of dollar accounts in an already weak banking system is likely to augment the probability of banking crises. The different estimates are presented in Table 3.

As we can see, these correlations suggest a gradual process when deregulating the banking system because of the potential negative effects of dollar accounts in weaker economies. In particular, before foreign currency deposits are allowed, the banking system should have as many resources as possible in order to minimize the increased exchange rate exposure from these dollar accounts. Thus, some sort of adequate capital requirements should be in place before these types of accounts are allowed, possibly reducing future chances of bank failures.

[13] In this paper we do not perform a Granger causality test because this test strongly depends on having the appropriate conditioning information set. Unfortunately, due to data limitations we are not able to control for all known factors that help explain banking crises.

[14] See Amemiya (1997) for a complete discussion on Markov processes.

Table 3: Banking Crisis: 1990–1998.

Variable	(1)	(2)	(3)
constant	-1.482**	-1.636**	-2.666**
	(-3.1)	(-2.88)	(-2.45)
R	0.281	0.363	2.343
	(0.25)	(0.28)	(0.30)
$R_t Y_{t-1}$	4.4**	4.066**	4.546**
	(4.02)	(3.53)	(3.02)
DUM	0.438	0.429	0.203
	(1.23)	(1.12)	(0.53)
E	1.28E-03	7.88E-03*	1.22E-02**
	(0.92)	(1.54)	(3.43)
GDP		-1.48E-07	-2.45E-07**
		(-1.22)	(-2.45)
INT			3.09E-03**
			(1.8)
ρ	0.334	0.447	0.8
χ^2	4.37	6.16	12.65

t-statistics are in parentheses. *(**) represents 10 percent (5 percent) significance level.

Dollar Accounts and Volatility

According to Friedman (1960, p. 23), "the central problem [of monetary policy] is not to construct a highly sensitive instrument that can continuously offset instability introduced by other factors, but rather to prevent monetary arrangements from themselves becoming a primary source of instability." Friedman's observation is even more relevant when the monetary authority allows other currencies to coexist in the banking system.

Previous literature on currency substitution has not provided much empirical evidence linking the degree of dollarization and volatility. The studies that have addressed this issue focus on money demand and money multipliers. Baliño et al. (1997) argue that money demand appears to be more volatile in highly dollarized economies since the coefficient of variation on the velocity of money is markedly higher than that of moderately dollarized economies. The authors find mixed evidence with respect to the volatility of the money multiplier.

Table 4: Long-Run Correlations between Dollarization and Volatility Measures.

	Correlation
GDP	0.322
INT	0.373
E	0.327
INF	0.350
BM	0.430

In this paper we attempt to provide additional evidence linking volatility and dollar-denominated accounts. Our measure for long-run volatility is defined as the coefficient of variation so cross-country comparisons can be made. As preliminary evidence, we explore the long-run effects of dollar-denominated accounts on volatility across countries. In particular, we compute the correlations between the degree of dollarization (*R*) and broad money (*BM*), the exchange rate (*E*), per capita GDP, real interest rates (*INT*), and the inflation rate (*INF*). Our results confirm that volatility increases as the degree of dollarization in the economy rises. Furthermore, the correlations range from 0.43 for broad money to 0.31 for per capita GDP. The correlations corresponding to several macroeconomic variables are reported in Table 4.

Unfortunately, our sample is very small. We just have 13 long-run observations (one for each country); therefore, we do not have a robust statistic to test our null hypothesis on the previous correlations. In order to avoid this small sample problem, we perform several bootstraps. We randomly choose 13 pairs from our original data set and compute the corresponding correlation, repeating the process a thousand times.[15] We then obtain an empirical distribution of the resulting correlations. We can then use it to test the null hypothesis that higher dollarization is associated with higher volatility in the long run. Our long-run results reveal that two macroeconomic variables, real interest and inflation rates, have a statistically positive correlation with the degree of dollarization at the 10 percent level.[16] The characteristics of the empirical distributions corresponding to the bootstrap correlations are presented in Table 5. These findings suggest that economies that are more dollarized tend to experience higher volatility in the real interest and inflation rates.[17]

Table 5: Empirical Distribution of the Bootstrapped Correlations.

Variable	Max	Min	Stdev	Kurtosis	Skewness	Mean
GDP	0.931	-0.833	0.308	0.524	-0.702	0.291
INT	0.962	-0.646	0.193	1.618	-0.221	0.404**
E	0.965	-0.855	0.301	0.425	-0.597	0.304
INF	0.965	-0.751	0.229	1.289	-0.059	0.356*
BM	0.944	-0.705	0.232	0.787	-0.73	0.42

*(**) represents 10 percent (5 percent) significance level.

In order to provide further evidence, we consider the short-run relationships between volatility and dollar accounts. In particular, we propose a panel that controls for other factors that might affect volatility, as suggested by the expression (6) where $X_{i,t}$ is the logarithm of the variable under study, A_i is its corresponding sample average, is the percentage of dollar-denominated accounts to

[15] The pairs consisted of the degree of dollarization and the measure of volatility for each macroeconomic variable under study.

[16] Since the inflation rate was computed using the CPI and most of the goods in the basket are purchased using local currency, the volatility of the price level may be accentuated.

[17] Our test does not indicate the direction of causality.

total deposits, and $Z_{i,t}$ are other factors that might affect the volatility of $X_{i,t}$. The controls we use are the inflation rate (*INF*) and the exchange rate (*E*).[18]

$$V_{X_{i,t}} \equiv (X_{i,t} - A_i)^2 = \alpha_i + \beta_1 R_{i,t} + \beta_2 Z_{i,t} + \varepsilon_{i,t} \tag{6}$$

Due to the nature of our data, we analyze the relationship between volatility and dollarization using panel data estimation techniques. *A priori,* it is not clear that differences in volatility in the different countries can be viewed as parametric shifts since we only have data on a subset of Latin American countries. Our results show that the short-run volatility of GDP and the exchange rate are positively related to dollar-denominated deposits when fixed effects are considered. We tend to observe higher volatility in GDP than in the exchange rate. When random effects are considered, we find a positive correlation between the degree of dollarization and the short-run volatility in GDP, the exchange rate, domestic inflation, and domestic interest rates. Furthermore, we tend to find higher volatility in the inflation rate than in the exchange rate and per capita GDP. Finally, we also perform a Hausman specification test, suggesting that restrictions on the intercept of the random-effects model are not observed in the data.

Table 6: Short Run Volatility: 1990–1998.

Specification		V_{GDP}	V_E	V_{INF}	V_{I_d}
Fixed Effects					
	R	1.201**	0.879**	0.803	0.198
		(2.115)	(1.873)	(1.141)	(1.236)
	INF	0.001**	0.001**	0.643E-03**	-0.1E-5**
		(2.605)	(3.327)	(2.568)	(-5.003)
	E	0.001	0.001	-0.004*	0.001**
		(0.536)	(0.567)	(-1.449)	(1.985)
	R^2	0.907	0.903	0.817	0.917
	Adj. R^2	0.905	0.889	0.790	0.905
Random Effects					
	C	18.578**	-0.249	4.087**	13.743**
		(2.5)	(-0.273)	(4.726)	(27.673)
	R	1.073**	0.684*	1.1**	0.206*
		(1.989)	(1.579)	(2.040)	(1.367)
	INF	0.001**	0.001**	0.001**	0**
		(2.474)	(2.988)	(3.140)	(-5.089)
	E	0.003	0.003**	-0.004*	0.001**
		(1.080)	(1.696)	(-1.361)	(2.107)
	R^2	0.907	0.875	0.746	0.909
	Adj. R^2	0.905	0.871	0.740	0.907

Notes: t-statistics are in parentheses. *(**) represents 10 percent (5 percent) significance level. Hausman specification test for H_o: FE vs RE: $\chi^2(3) = 0.72$.

[18] High inflation erodes the value of income and savings and leads to high nominal interest rates. It also implies considerable inflation volatility and overall volatility because it increases the uncertainty about future relative prices and the price level. Finally, it has been observed that the type of exchange regime followed by the monetary authority can induce volatility in the overall economy.

As we can see from Table 6, there is some evidence, in the long and short run, that there is a positive correlation for some macroeconomic aggregates between their volatility and the volume of dollar-denominated accounts. Allowing another currency in the banking system seems to be associated with an increase in the volatility of the economy. Thus, any stabilization plan aimed at controlling economic fluctuations should take into account the existence of dollar-denominated accounts since they may directly affect the overall volatility in the economy.

Conclusions

In this paper we study how agents in Latin America allocate part of their savings between dollar- and domestic currency–denominated accounts. In particular, we show that the relative movements between these accounts are explained by devaluation expectations of the local currency. Our findings suggest that depositors in Latin America face some uncertainty and economic frictions when making their portfolio decisions.

We also explore some macroeconomic consequences of having dollar accounts in the banking system. In particular, we find that past banking crises and the current degree of dollarization are good predictors of future crises. In particular, once the crisis has occurred, having more dollar-denominated deposits in the banking system increases the probability of a crisis in the future. This may reflect the increased exchange rate exposure associated with dollar accounts in an already weak banking system.

Finally, we present some evidence, in the long and short run, that there is a positive correlation for some macroeconomic aggregates between their volatility and the volume of dollar-denominated accounts. Thus, any stabilization plan aimed at controlling economic fluctuations should take into account the existence of dollar-denominated accounts since they may directly affect the overall volatility in the economy.

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