

Dollarization and money demand stability in Bolivia

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Abstract

This paper investigates the long-run money demand stability in Bolivia over the period 1990-2014 using a variety of estimators, namely, dynamic OLS, fully modified OLS, and canonical co-integrating regressions. Our results are robust and reveal that long-run money demand instability has been reversed even with persistent inflation volatility. We also show that de-dollarization is associated with money demand stabilization.

Keywords: money demand, financial dollarization, Bolivia

JEL Classification Codes: E41, E52

1. Introduction

From a theoretical standpoint, the seminal papers of Miles (1978) and McKinnon (1982) show that the currency substitution—i.e. dollarization—can create instabilities in money demand. Some researchers have empirically examined money demand in a dollarized economy. For example, Rogers (1992) and Ortiz (1983) using data for Mexico found that the high dollarization in the Mexican economy has important consequences for the monetary sector. Money demand instability could become persistent if dollarization becomes irreversible. On top of that, some authors argue that dollarization could be permanent¹ even with low inflation due to the cost of switching currencies.

In this paper, we analyze the stability of money demand in Bolivia over the period 1990-2014. The Bolivian case is interesting for several reasons. First, hyperinflation in the Bolivian economy (1984-1985) had prolonged effects on the expectations of economic agents, which in turned got reflected in their preference for foreign currency i.e. dollarization (Melvin and Afcha, 1989). Hence, it is interesting to analyze the consequences of hyperinflation on long-run

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¹ For a review see Kamin and Ericsson (2003).

money demand. Second, the high degree of financial dollarization that followed the hyperinflation has been slowly reverted; therefore, it is worth analyzing how money demand has been affected by this shift in economic agents' preferences. Third, determining whether or not money demand has changed has important policy implications for the monetary policy makers. Fourth, Bolivia has moved to a market oriented economy (Morales, 2008) and therefore represents a good example of transition economies.² Finally, other countries in Latin America such as Paraguay, Peru and Uruguay are moving towards a financial de-dollarization; consequently, the case of Bolivia could be a good example of what will follow in the neighborhood.

The paper is divided as follows: in section II we present the model and the data. Section three presents the results and section four concludes.

2. Model and data

In figure 1 we present some data on inflation and the composition of deposits. The figure shows that from 1990 until 2009 the vast majority of deposits have been in foreign currency; however, starting in 2004 there has been a change in this pattern and the economy has become less dollarized³. Actually, in 2013 financial dollarization was only slightly above 20%, while in 1990 it was above 80% with a peak of 90% in years 1993-1994.

In the same figure we can observe that in both of these periods inflation behaved erratically. As a matter of fact, as observed in table 1, the mean and standard deviation of inflation are somewhat higher for the stabilized period (i.e. 2004-2013).

Figure 1. Inflation rate and the composition of deposits.

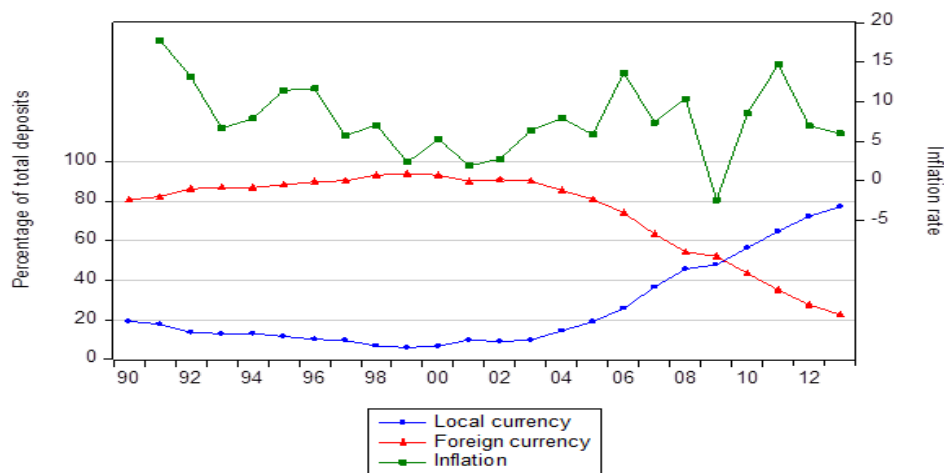


Table 1. Summary statistics for inflation.

<i>Period</i>	<i>Mean</i>	<i>St. Dev.</i>	<i>C.V.</i>
1990-2013	7.79	4.57	0.59
1990-2003	7.7	4.65	0.60
2004-2013	7.90	4.71	0.60

² Bolivia shifted to a market economy by the second half of the 1980's. Although the market fundamentals are still present, in the last 10 years Bolivia has been slowly reversing this process. (We thank an anonymous referee for this observation).

³ For an explanation on the causes behind the financial de-dollarization in Bolivia see del Río and Montero (2014).

To analyze money demand in Bolivia we use a standard money-demand function, similar to the one used in Ball (2001):

$$m - p = \beta_0 + \beta_y y + \beta_r r + \varepsilon \quad (1)$$

where m , p and y are the logs of the money stock (M1 and M2)⁴, price level (GDP deflator) and real output while r is the nominal interest rate in saving accounts. The coefficients β_y and β_r represent the income elasticity and interest rate semi-elasticity which are expected to have positive and negative signs respectively.

Although the signs of the coefficients are theoretically unambiguous, empirically the sign of β_r could be different than expected due to instabilities in money demand; we will show that this is the case for Bolivia. As for the β_y coefficient, its expected size varies depending upon the theoretical framework. Strictly speaking, the Baumol-Tobin model for transactions demand (Baumol, 1952; Tobin, 1956) implies an income elasticity of one half; however, the Cash-in-advance model predicts a unitary income elasticity.

Our data is quarterly for the period 1990:I-2014:III and has been extracted from the Bolivian Central Bank and UDAPE⁵.

3. Results

The Phillips-Perron test show that all our variables are integrated of order (1) while the Johansen and Phillips-Oularis co-integration tests show that they are co-integrated. These are standard results in the literature on money demand and allow us to find a long-run stable relationship.

In table 2, we show the results of using a similar methodology to that of Stock and Watson (1993) which is Dynamic OLS (DOLS) estimators. We also present the results of using canonical co-integrating regressions (CCR), and fully-modified OLS (FMOLS) estimators of the Bolivian long-run money demand for the period 1990-2014.

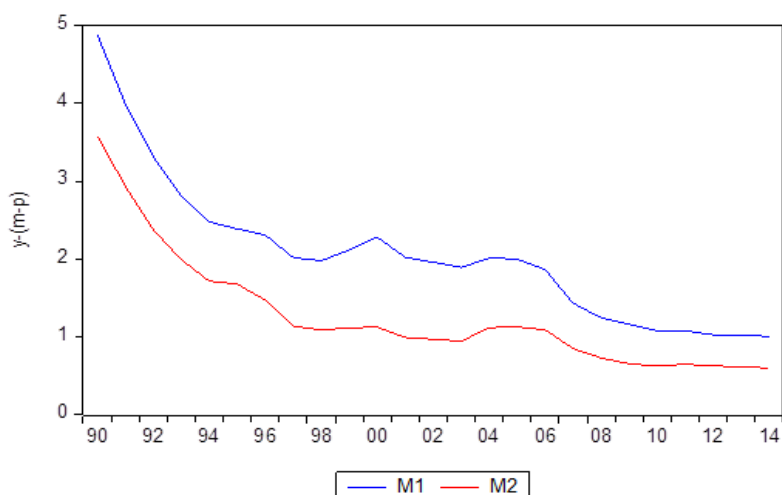
Table 2. Money demand for M1 and M2. Period 1990-2014.

Estimator	Coefficient	M1	M2
DOLS	β_y	2.922*** (0.216)	2.406*** (0.310)
	β_r	0.018** (0.008)	-0.011 (0.012)
CCR	β_y	2.842*** (0.213)	2.410*** (0.286)
	β_r	0.015* (0.008)	-0.012 (0.011)
FMOLS	β_y	2.792*** (0.198)	2.359*** (0.264)
	β_r	0.013* (0.007)	-0.014 (0.011)

⁴ Given the high degree of dollarization, the Bolivian Central Bank includes deposits in foreign currency when measuring the money stock.

⁵ www.bcb.gob.bo and www.udape.gob.bo. UDAPE (Unidad de Análisis de Política Económica) is a branch of the Bolivian government that conducts Economic analysis.

Figure 2. Velocity of money.



The observed income elasticity is greater than one (see table 2). This can be explained by the income velocity of money shown in figure 2. The downward trend in velocity for the entire period suggests that the income elasticity of money demand β_y is larger than one, an outcome that is confirmed by our results. More interesting is the positive and highly significant coefficient for the interest rate semi-elasticity when using M1. Theoretically the coefficient β_r should be negative; however, our results consistently show a positive sign for the cost of holding money. This result is not consistent with the theory, but given the high degree of financial dollarization is not surprising either⁶. When using M2 we observe a negative sign for the interest rate semi-elasticity; however, the coefficient is never statistically different from zero.

The positive sign for the interest rate coefficient is certainly puzzling. However, a standard Mundell-Fleming type explanation could shed some light on this issue. The traumatic experience of hyperinflation (1984-1985) increased economic agents' demand for foreign currency. An increase in the demand for foreign money leads to a higher interest rate, which attracts the foreign currency into the economy. Because the money supply consists of both domestic and foreign currency, this increases the quantity of money supplied. We thus observe a positive relationship between the interest rate and the money supply. The positive coefficient on β_r is therefore understandable provided money demand was increasing over the period of estimation. This is consistent with figure 2.

To clarify the positive sign on the interest rate, we include the change in the nominal exchange rate and an indicator for the period of dollarization in our estimation. Empirically, Phylaktis and Taylor (1993) showed that variation in the exchange rate is an important determinant of the composition of domestic portfolios⁷ in countries experiencing hyperinflation⁸. We estimate the following equation:

$$m - p = \beta_0 + \beta_y y + \beta_r r + \gamma \Delta E + \phi D + \varepsilon \quad (2)$$

where ΔE refers to the change in the nominal exchange rate (local currency/US dollar) and D is a dummy variable equal to one from 1990 to 2003, the period in which the economy was highly

⁶ Carrera (2012) found a small, yet statistically significant interest rate semi-elasticity coefficient of -0.001 for Bolivia. However, his data set comprised the period 1948-2003; that is, it includes the pre-1985 period of low dollarization.

⁷ The authors support the view that expected returns to holding foreign assets is important in determining money demand; however, they argue that expectations of inflation are the main factor.

⁸ In our data set, we do not include the hyperinflation period; however, hysteresis is evident.

dollarized (as shown in figure 1). Table 3 shows that when controlling for the dollarization period and fluctuations in the exchange rate, the interest rate coefficient becomes negative as expected for M2. Although this coefficient is positive for M1, it is no longer significant.

The negative sign on the interest rate suggests that fluctuations in the nominal exchange rate captures the effect of shifts in money demand during the dollarized period. The positive coefficient on the dollarization dummy implies that money demand was high during this period. This may be explained by the fact that holdings of foreign currency increased as a hedge against inflation. Furthermore, Asilis et al. (1993) mentioned that during the dollarization period, the exchange rate remained considerably overvalued which further reinforces the positive coefficient for the dummy variable. The negative sign on the exchange rate indicates that exchange rate appreciation is associated with a higher money demand.

A stable money demand

Our second step is to perform rolling regressions with a window of 10 years (i.e. 40 observations). For the first rolling regression, our starting period is 1990:I-1999:IV, for the second regression it is 1990:II-2000:I and so on for a total of 60 regressions; results are shown in figure 3 for DOLS. The rolling regressions results show a slightly different story compared to that presented in table 2, more specifically we observe that the interest rate semi-elasticity became negative as we move from the dollarized period before 2003 to the de-dollarized one afterwards.

The results from the rolling regressions imply that money demand has become more stable in the de-dollarization period. This is reflected in the negative sign on the interest rate coefficient. To test whether or not β_r stabilized, we divided our data into two periods: 1990-2003 and 2004-2014, before and after dollarization.

The results for the sub-samples are shown in table 4. We can clearly observe that regardless of the estimation method, the results for the period 1990-2003 show instability in the money demand in the sense that the sign for the interest rate semi-elasticity coefficient is not as theoretically expected; furthermore, it is not only positive but statistically highly significant. On the other hand, for the period 2004-2014 the signs of the coefficients are as the theory predicts whether we use M1 or M2 as our monetary measure. These results are evidence that in the last decade the economic agents' preferences have changed and as a consequence the money demand has stabilized. This stabilization has occurred despite the persistence of inflation volatility that may be observed in figure 1.

Table 3. Money demand for M1 and M2. Period 1990-2014.

<i>Estimator</i>	<i>Coefficient</i>	<i>M1</i>	<i>M2</i>
DOLS	β_y	2.911***	2.66***
	β_r	0.011	-0.025***
	γ	-1.183***	-1.284***
	φ	0.234***	0.519***
CCR	β_y	2.741***	2.516***
	β_r	0.004	-0.031***
	γ	-0.934**	-0.949**
	φ	0.216**	0.488***
FMOLS	β_y	2.682***	2.462***
	β_r	0.003	-0.033***
	γ	-0.932**	-0.954**
	φ	0.205**	0.479***

Figure 3. Interest rate coefficient from rolling regressions - DOLS.

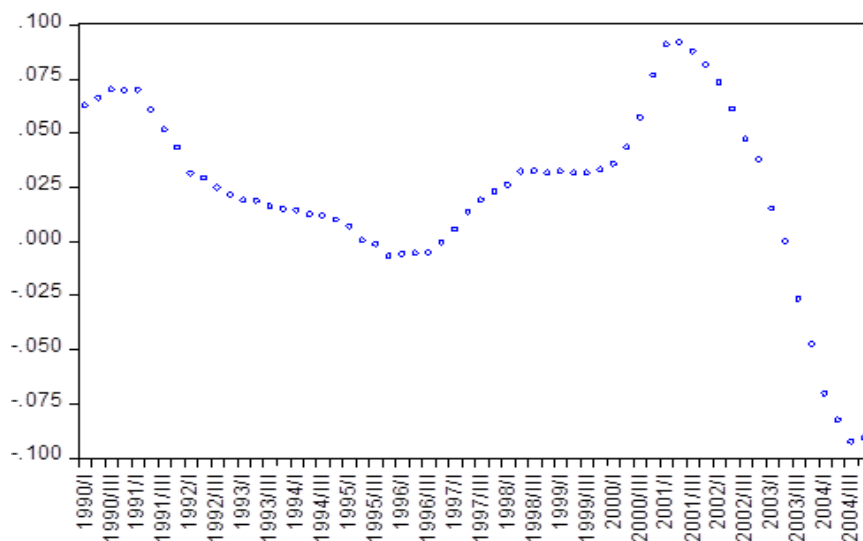


Table 4. Money demand for M1 and M2.

Estimator	Coefficient	M1		M2	
		1990-2003	2004-2014	1990-2003	2004-2014
DOLS	β_y	4.295*** (0.380)	2.114*** (0.399)	4.872*** (0.344)	1.960*** (0.433)
	β_r	0.049*** (0.010)	-0.088* (0.049)	0.033*** (0.009)	-0.089* (0.053)
CCR	β_y	3.930*** (0.382)	1.943*** (0.331)	4.279*** (0.254)	1.86*** (0.356)
	β_r	0.038*** (0.011)	-0.103*** (0.039)	0.018 (0.011)	-0.097** (0.042)
FMOLS	β_y	3.817*** (0.355)	1.902*** (0.284)	4.199*** (0.367)	1.811*** (0.308)
	β_r	0.035*** (0.010)	-0.107*** (0.036)	0.015 (0.010)	-0.102*** (0.039)

4. Concluding remarks

This paper estimates the long-run money demand for Bolivia using quarterly data for the period 1990-2014. Our econometric results suggest that the instability in the long-run money demand has been associated with the high degree of financial dollarization. Money demand has stabilized as the economy has become less dollarized over the past 10 years in spite of persistent inflation volatility. A theoretical examination of the relationship between the instability of money demand and dollarization in the Bolivian context is an interesting topic left for future research.

Our findings have policy implications given the importance of a stable money demand function to determine the money growth consistent with price stability in the long-run; furthermore, it is important from an international perspective since not only Bolivia, but also other countries in Latin America such as Paraguay, Peru and Uruguay are moving toward a financial de-dollarization.

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References

- Asilis, C. M., Honohan, P. and McNelis D. (1993) Monetary Demand during Hyperinflation and Stabilization: Bolivia, 1980-1988, *Economic Enquiry*, 31, 262-273.
- Ball, Lawrence (2001) Another look at the long-run money demand, *Journal of Monetary Economics*, 47, 31-44.
- Baumol, W. (1952) The Transactions Demand for Cash: An Inventory Theoretic Approach, *Quarterly Journal of Economics*, 66, 545-56.
- Carrera, C. (2012) Long-Run Money Demand in Latin-American countries: A Nonstationary Panel Data Approach, *Working Papers 2012-016*, Banco Central de Reserva del Perú.
- Del Río, M. and Montero C. (2014) Desdolarización financiera en Bolivia, *Estudios Económicos*, 29, 3-25.
- Kamin, S. and Ericsson N. (2003) Dollarization in post-hyperinflationary Argentina, *Journal of International Money and Finance*, 22, 185-211.
- McKinnon, R.I. (1982) Currency Substitution and Instability in the World Dollar Standard, *American Economic Review*, 72, 320-333.
- Miles, M. (1978) Currency Substitution, Flexible Exchange Rates and Monetary Independence, *American Economic Review*, 68, 428-436.
- Melvin, M. and Afcha, G. (1989) Dollar Currency in Latin America. A Bolivian Application, *Economic Letters*, 31, 393-397.
- Morales, J.A. (2008). Bolivia: La Experiencia Populista de los Años Ochenta. *IISEC*. Documento de Trabajo No. 03/08.
- Ortiz, G. (1983) Currency substitution in Mexico: the dollarization problem, *Journal of Money, Credit and Banking*, 15, 74-85.
- Phylaktis, K. and Taylor, M. P. (1993) Money demand, the cagan model and the inflation tax: Some latin american evidence, *Review of Economics and Statistics* 75, 32-37.
- Rogers, J. (1992). The currency substitution hypothesis and relative money demand in Mexico and Canada, *Journal of Money, Credit and Banking*, 24, 300-18.
- Stock, J. and Watson, M. (1993) A simple estimator of cointegrating vectors in higher order integrated systems, *Econometrica*, 61, 783-820.
- Tobin, J. (1956) The Interest-Elasticity of Transactions Demand for Cash, *Review of Economics and Statistics*, 38, 241-47.