PERUVIAN ECONOMIC ASSOCIATION

Balance Sheet and Currency Mismatch: Evidence for Peruvian Firms

Nelson R. Ramírez-Rondán

Working Paper No. 85, December 2016

Balance Sheet and Currency Mismatch: Evidence for Peruvian Firms*

Nelson R. Ramírez-Rondán
Central Bank of Peru

May 2016

Abstract

In the Peruvian economy, as in other emerging economies, a significant portion of the debt held by firms is denominated in US dollars. While an exchange rate depreciation likely increases firm debt and influences plans of investment and production, literature finds weak or no evidence of this balance sheet effect. In this paper I argue that this effect is observed in firms with a significant currency mismatch. I estimate the currency mismatch (defined as assets minus liabilities in USD and expressed as a percentage of total assets in domestic currency) from which the exchange rate has negative effects on firms' investment. Using financial information from 74 non-financial Peruvian firms from 2002 to 2014, I find significant balance sheet effects for firms with a currency mismatch below -10.4 percent.

JEL Classification: C33, E22, F31, F34
Keywords: Balance Sheet, Dollar Debt, Peru

*I would like to thank Guillermo Moloche, Renzo Castellares and Diego Winkelried for their valuable comments and suggestions. I also thank the participants of the Third Annual Conference of The Bilateral Assistance and Capacity Building for Central Banks Program in Geneva, Switzerland; the XXXIII Meeting of Economists of the Central Bank of Peru in Lima, Peru; the 20th Annual Meeting of the Latin American and Caribbean Economic Association in Santa Cruz, Bolivia; and the 2015 Annual Congress of the Peruvian Economic Association in Lima, Peru. I am grateful to Bryce Cruz, Yamily León and Nevenka Ciriaco for providing excellent research assistance. Special thanks to Patricia Paskov for kindly review the paper. All remaining errors are mine.
Nelson R. Ramírez-Rondán (nelson.ramirez@bcrp.gob.pe) is a researcher in the Research Division at the Central Bank of Peru, Jr. Miró Quesada 441, Lima, Peru.

1 Introduction

Since the recovery of the US economy and the beginning the normalization period of US monetary policy, the US dollar has strengthened worldwide. In this context, the Peruvian Sol has depreciated against the US dollar since 2013. As in conventional open economy models (Mundell-Fleming type), a depreciation of the local currency has a positive effect on the product because exported products become relatively cheaper and the country thus becomes more competitive in international trade.

In the Peruvian economy, as in other emerging economies, a significant portion of the debt held by firms is denominated in US dollars (40 percent of liabilities are held in US dollar), even when firms generate income in domestic currency. Exchange rate depreciation increases the debt-to-asset ratio, making access to alternative sources of financing more difficult. Thus, for firms in the private sector, these balance sheets negatively affect investment and production plans, and may lead to a contractive effect at the aggregate level.

Theoretically, a large body of literature has developed upon the work of Bernanke et al. (1999), which includes imperfection in the domestic financial market within an open economy model. In these models, if there exists a significant currency mismatch in the economy, a large devaluation will deteriorate the firm's net worth. As the firm's risk increases, credit becomes more expensive and more restricted, which finally affects investment and therefore aggregate demand. Using this balance-sheet channel, Krugman (1999), Aghion et al. (2001), and Orrego and Gondo (2011) present models with multiple equilibrium. Further literature on liability dollarization and currency mismatch has suggested that a balance-sheet effect induced by exchange rate depreciations could be an explanation for this negative impact (see Cespedes et al., 2004; Choi and Cook, 2004; Magud, 2010; Ize and Levy-Yeyati, 2005; Batini et al., 2007; Bleakley and Cowan, 2008; Carranza et al., 2009).

Empirical analyses, however, have found only weak evidence for this effect (see Luengnaruemitchai, 2003, for a review), and usually only in the context of quite large depreciations (see, among others, Burstein et al., 2005; Galindo et al., 2003; Leiderman et al., 2006). These empirical findings suggest that the aggregate investment function may present a nonlinearity in its dependence on the real exchange rate. For the Peruvian economy, Carranza et al. (2011) show that the negative balance-sheet effect of an exchange rate depreciation may only be observable if the magnitude of the depreciation is large enough, while Azabache (2010) shows that the effects depend on the firm's leverage level.

If firms also hold assets and/or have income in US dollars that match their currency composition, then movements in the exchange rate should not affect their investment decisions. Although firms exhibit currency mismatch in the composition of their currencies, they could use derivatives to hedge undesired movements in the exchange rate; or they could repurchase their own debt in US dollars by issuing new debt in Peruvian soles. Nonetheless, in the Peruvian firms' financial statements, most firms that held liabilities in US dollars indicated that they do not use derivatives. Also, the Financial Stability Report (2015) of the Central Bank of Peru states that it has seen firms with currency mismatches; most of these firms are oriented to the domestic market, have borrowed in US dollars (whether in the local market or abroad), and have not taken derivatives. Thus, the threshold level of currency mismatch in which the exchange rate has negative effects on firms is relevant for the Peruvian economy.

In this paper, I argue that the balance sheet effect 1) depends on the currency mismatch level and 2) is observed in the context of large negative currency mismatch, where debt in foreign currency exceeds significant assets in foreign currency; I base these arguments on the nonlinear effects suggested by theory and empirics; I seek to prove these arguments by estimating a threshold currency mismatch in which the balance sheet effect dominates the competitiveness effect. The remainder of this paper is organized as follows: section 2 discusses empirical methodology such as specification, data, and estimation methods; section 3 presents the empirical results and estimations of the threshold models; section 4 concludes.

2 Empirical Methodology

2.1 Specification

Strong evidence suggests that a firm's investment activity depends on exchange rate movements and that this relationship will be positive if the competitiveness effect dominates the balance sheet effect, and negative otherwise (see Carranza et al., 2003; Bleakley and Cowan, 2008). Therefore, an initial specification is given by

$$I_{it} = \beta q_t + \alpha_i + \pi' z_{it} + u_{it}, \tag{1}$$

where I is the investment; q is the bilateral (Pen/USD) real exchange rate variation; α_i is an unobserved firm specific-effect (assumed to be fixed as is common in empirical applications); z is a set of other determinants (controls) of investment; i refers to non-financial firm; and t refers time (year).

However, the impact depends on the relative strength of the competitiveness effect and the balance sheet effect. As in Carranza et al. (2003), this effect can be decomposed as

$$\delta\beta = \delta + \theta D^*_{it-1} + \lambda X_{it}, \quad (2)$$

where D^* is the firm's liability denominated in foreign currency or US dollar debt and X is the firm's net export. Plugging (2) into (1) produces

$$I_{it} = \theta(D^*_{it-1} \times q_t) + \lambda(X_{it} \times q_t) + \alpha_i + \delta q_t + \pi' z_{it} + u_{it}. \quad (3)$$

Empirical analyses focused on the parameter θ, reveal that if this parameter is negative, evidence exists for the balance sheet effect. Nonetheless, empirical studies found little evidence or no evidence on the negative significance of such parameter (see Bleakley and Cowan, 2008; Carrera, 2016). This result exists because firms also hold assets and/or have income in US dollars that match their currency composition; thus, movements in the exchange rate should not affect their investment decisions.

In this paper, I argue that the balance sheet effect is observed in the context of large negative currency mismatch, where debt in foreign currency exceeds significant assets in foreign currency.[1] Thus, I estimate a threshold currency mismatch level from which the parameter θ is negative and significant. I estimate the following variation of an investment model with a threshold variable,

$$I_{it} = \theta_1(D^*_{it-1} \times q_t)1(CM_{it} \leq \gamma) + \theta_2(D^*_{it-1} \times q_t)1(CM_{it} > \gamma) + \alpha_i + \delta q_t + \lambda(X_{it} \times q_t) + \pi' z_{it} + u_{it}, \quad (4)$$

where CM is the currency mismatch; θ_1 captures the negative effect of the balance sheet effect; θ_2 is the parameter in the second regime when firms have a low mismatch in their currency composition and could hedge exchange rate risk; γ is a threshold currency mismatch level; and 1(.) is an indicator variable.

I consider two groups of explanatory variables of a firm's investment: the first group is related to the firm's specific variables such as cash flow, dollar debt, total debt, working capital, firm size, leverage and net exports. The second group is related to macroeconomic conditions such as real exchange rate (PEN/USD), dollarization ratio, terms of trade, US dollar interest rate and Peruvian soles interest rate.

[1] Cowan et al. (2005) in a linear model include controls for the currency composition of assets and net derivative positions of Chilean corporations between 1994 and 2001. They found, once the currency composition of assets and income is accounted for, a significant negative balance sheet effect of US dollar denominated debt.

2.2 Data

The period of study spans from 2002 to 2014 for a sample of 74 non-financial firms. Data are constructed manually from the firms' financial information available from the *Superintendencia de Mercado de Valores*. Firms are distributed in the following sectors: manufacture (42 percent), services (26 percent), mining (14 percent), construction (8 percent), commerce (7 percent) and agriculture (4 percent). Table 1 shows constructions and definitions of the variables used in the estimation analysis.

Table 1: Definitions

Variable	Definition
Investment	Investment is the expenditure in machinery and equipment net of fixed asset sales divided by total assets.
US dollar debt	Total liabilities in foreign currency expressed in terms of domestic currency as a percentage of total liabilities.
Currency mismatch	Total assets minus liabilities in USD expressed as a percentage of total assets in domestic currency.
Cash flow	Cash flow divided by total assets.
Working capital	Difference between current assets and current liabilities divided by total assets.
Firm size	Total sales in logarithm.
Leverage	Total liabilities divided by equity.
Net export	Difference between export and import at FOB prices divided by total assets.
Total debt	Total debt divided by total assets.
Real exchange rate	Growth of the bilateral rate PEN per USD divided by consumer price index (CPI).
Terms of trade	Terms of trade growth.
Dollarization ratio	Credit in US dollar expressed in terms of domestic currency divided by total credit of depositary corporations to the private sector.
US dollar interest rate	Lending interest rates of commercial banks in foreign currency (annual effective rates).
Domestic interest rate	Lending interest rates of commercial banks in domestic currency (annual effective rates).

Note: All firm variables were deflated by the consumer price index.

As in Carranza et al. (2003) and Azabache (2010), I do not take information on the change in net fixed assets from the balance sheet; as those authors mention, change in net fixed assets include changes in valuation of asset values, which are not related to capital expenditure but rather to firm-specific accounting practices. In addition, data of firms' imports and exports are taken from the *Superintendencia Nacional de Administración*

Tributaria. Macroeconomic variables are taken from the Central Bank of Peru.[2] Summary statistics of the variables involved in the estimation analysis are given in Table 2.

Table 2: Summary statistics

Variable	Minimum	25% quantile	Median	75% quantile	Maximum
Investment	-30.2	1.1	3.2	6.1	41.0
US dollar debt	0.0	17.9	50.2	71.0	100.0
Currency mismatch	-62.3	-15.0	-3.3	3.4	99.1
Cash flow	-116.7	-1.1	0.2	2.0	47.1
Working capital	-88.4	-0.1	9.6	23.7	79.9
Firm size	4.2	7.4	8.4	9.8	12.6
Leverage	0.2	34.7	70.1	110.5	912.4
Net export	-103.8	-4.0	0.0	0.0	215.8
Total debt	0.2	25.6	40.8	52.1	90.1
Real exchange rate	-8.3	-3.4	-1.7	0.5	3.4
Terms of trade	-11.3	-2.3	4.5	7.3	27.9
Dollarization ratio	39.3	44.1	52.4	68.5	77.7
USD interest rate	7.6	8.4	9.6	10.0	10.6
Sol interest rate	15.7	19.0	21.0	23.7	25.5

2.3 Estimation Method

Threshold models have proven enormously influential in economics and especially popular in current applied econometric practice. The model splits the sample into classes based on the value of an observed variable, whether or not it exceeds some threshold; that is, the model internally sorts the data into groups of observations based on some threshold determinant. Each group obeys the same model. Hansen (1999) extended those models to a static panel data model, which proposes econometric techniques for threshold effects with exogenous regressors and an exogenous threshold variable, where a least squares (LS) estimation is proposed using fixed-effects transformation.

In threshold regression models, it is known that threshold estimate is superconsistent. Since the sum of squared errors (the objective function) is not smooth, it is found that the distribution of the threshold estimate is nonstandard. Meanwhile, the slope parameters are consistent and asymptotically normally distributed (see Chan, 1993; Hansen, 2000).

Hansen (2000) developed an asymptotic distribution for the threshold parameter estimate based on the small threshold effect assumption, in which the threshold model becomes the linear model asymptotically. The limiting distribution converges to a func-

[2]It is important to notice that I consider a balanced data since it is required for estimation method.

tion of a two-sided Brownian motion process, where the distribution can be available in a simple closed form. Thus, this asymptotic distribution yields a computationally attractive method for constructing confidence intervals, and is described in detail in Hansen (1999) in the context of the non-dynamic panel threshold models. Basically, Hansen (2000) argues that the best way to form confidence intervals for the threshold is to form the no-rejection region using the likelihood ratio statistic for testing on $\widehat{\gamma}$. To test hypothesis $H_0 : \gamma = \gamma_0$ (γ_0 is the true value of the threshold parameter), the likelihood ratio test is to reject large values of $LR(\gamma_0)$ where

$$LR(\gamma) = nT\frac{Sn(\gamma) - Sn(\widehat{\gamma})}{Sn(\widehat{\gamma})}, \tag{5}$$

where $S_n(\gamma)$ is the sum of squared residuals, n is the number of firms and T is the number of periods. Hansen (1996) shows the $LR(\gamma)$ converges in distribution to ξ as $n \to \infty$, where ξ is a random variable with distribution function $P(\xi \leq z) = (1 - exp(-z/2))^2$. Then, the asymptotic distribution of the likelihood ratio statistic is non-standard, yet free of nuisance parameters. Since the asymptotic distribution is pivotal, it may be used to form valid asymptotic confidence intervals. Furthermore, the distribution function ξ has the inverse

$$c(a) = -2\ln\left(1 - \sqrt{1-a}\right), \tag{6}$$

where a is the significance level. To form an asymptotic confidence interval for γ, the "no-rejection region" of confidence level $1-a$ is the set of values of γ, such that $LR(\gamma) \leq c(a)$, where $LR(\gamma)$ is defined in (5) and $c(a)$ is defined in (6). This is easiest to find by plotting $LR(\gamma)$ against γ and drawing a flat line at $c(a)$.

3 Estimation and Inference Results

3.1 Tests for threshold effects

It is important to determine whether the threshold effect is statistically significant. The hypothesis of no threshold effect in (4) can be represented by the linear constraint $\theta_1 = \theta_2$. Under the null hypothesis, the threshold γ is not identified, so classical tests have non-standard distributions. Thus, Hansen (1996) proposed a likelihood ratio, F, test and suggested a bootstrap to simulate the asymptotic distribution of the test.

To determine the number of thresholds, model (4) was estimated by least squares, allowing for zero, one, two, and three thresholds. The test statistics F_1, F_2 and F_3, along with their bootstrap p-values (300 bootstrap replications), are shown in Table 3. There is evidence for a single threshold, since F_1 is significant with a bootstrap p-value of 0.09; for the test for a double threshold, F_2 is strongly significant with a bootstrap p-value of 0.01. On the other hand, the test for a third threshold, F_3 is not close to being statistically significant, with a bootstrap p-value of 0.26. Therefore, I conclude that there is strong evidence that there are two thresholds in the regression relationship, but the two threshold estimates are close to each other, -10.4 and -11.2. As such, I estimate the model with only one threshold, since this paper seeks to identify the currency mismatch threshold with which the balance sheet effect dominates the competitiveness effect.

Table 3: Tests for threshold effects

Test for single threshold	
F_1	14.8
P-value	0.09
(10%, 5%, 1% critical values)	(13.7, 17.7, 20.9)
Test for double threshold	
F_2	46.1
P-value	0.01
(10%, 5%, 1% critical values)	(20.3, 27.4, 40.0)
Test for triple threshold	
F_3	7.7
P-value	0.26
(10%, 5%, 1% critical values)	(10.9, 13.5, 19.5)

3.2 Threshold parameter estimation

The point estimate of the threshold and its asymptotic 90, 95 and 99 percent confidence intervals are reported in Table 4. The estimate of the threshold level of currency mismatch (total assets minus liabilities in USD expressed as a percentage of total assets in domestic currency) is -10.4 percent. Thus, the two classes of regimes indicated by the point estimate are those with a "large negative currency mismatch" for currency mismatch lower than -10.4 percent, and a "moderate currency mismatch" for currency mismatch higher than -10.4 percent. The asymptotic confidence interval for the threshold level is not tight, indicating an important uncertainty about the nature of this division.

More information can be learned about the threshold estimates from plots of the concentrated likelihood ratio function $LR(\gamma)$. Figure 1 shows the likelihood ratio function, which is computed when estimating a threshold model. The threshold estimate is the point where the $LR(\gamma)$ equals zero, which occurs at $\hat{\gamma} = -10.4$ percent.

Table 4: Asymptotic confidence interval in threshold model

	Threshold estimate (%)	90% confidence interval	95% confidence interval	99% confidence interval
$\widehat{\gamma}$	-10.4	[-28.8, -0.5]	[-29.6, 2.0]	[-30.4, 6.6]

Note: Asymptotic critical values are reported in Hansen (2000).

Figure 1: Confidence interval construction

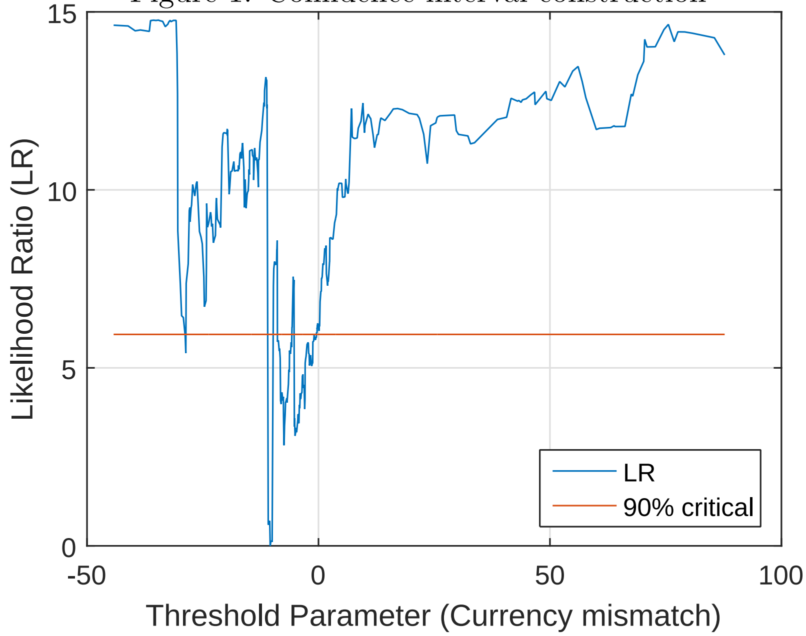

Table 5 reports the percentage of firms which fall into the two regimes each year. It can be seen that the percentage of firms in the "large negative currency mismatch" category ranges from 24 percent to 41 percent of the sample over the years. The "moderate currency mismatch" firms range from 76 percent to 59 percent of the sample in a given year. It is important to note that there is not an increase or decrease trend in the number of firms with significant currency mismatch over the years.

3.3 Slope parameters estimation

In order to avoid possible endogeneity, I consider a lag of the firm variables dollar debt, cash flow, working capital, firm size, leverage, net export and total debt. I also consider a lag of the macroeconomic variables terms of trade, dollarization ratio, dollar interest rate and domestic interest rate.

Table 5: Percentage of firms in each regime by year

Firm class	2003	2004	2005	2006	2007	2008
Currency mismatch $<$ -10.4	40.5	41.9	36.5	24.3	28.4	36.5
Currency mismatch $>$ -10.4	59.5	58.1	63.5	75.7	71.6	63.5
Firm class	2009	2010	2011	2012	2013	2014
Currency mismatch $<$ -10.4	28.4	24.3	29.7	33.8	33.8	29.7
Currency mismatch $>$ -10.4	71.6	75.7	70.3	66.2	66.2	70.3

First, I estimate the conventional linear model in equation (3), where there are no threshold effects. Table 6 shows the least squares (LS) coefficient estimates and the least squares standard errors (SE) of the linear model (columns 2 and 3, respectively). The coefficient of the interaction between dollar debt and the real exchange rate or, in other words, the coefficient that indicates the balance sheet effect, is practically zero and not significant as shown in Table 6. This result is found in many studies: for Latin American firms see Bleakley and Cowan (2008) and for Peruvian firms see Carrera (2016).

Table 6: Estimation results - Dependent variable: Investment

	Linear model		Threshold model	
Explanatory variables	Coefficient	LS SE	Coefficient	LS SE
Dollar debt×Real exchange rate (Currency mismatch $\leq$ -10.4)	–	–	-0.0043	0.0018
Dollar debt×Real exchange rate (Currency mismatch $>$ -10.4)	–	–	0.0019	0.0014
Dollar debt×Real exchange rate	-0.0001	0.0013	–	–
Real exchange rate	-0.0027	0.0866	0.0214	0.0861
Cash flow	0.0401	0.0194	0.0393	0.0192
Working capital	0.0138	0.0169	0.0139	0.0167
Firm size	-1.1589	0.5135	-1.4608	0.5098
Leverage	-0.0024	0.0052	-0.0009	0.0051
Net export×Real exchange rate	0.0008	0.0017	-0.0009	0.0017
Total debt	0.0108	0.0268	-0.0024	0.0268
Terms of trade	0.0408	0.0152	0.0415	0.0151
Dollarization ratio	-0.0553	0.0180	-0.0583	0.0179
Dollar interest rate	0.4849	0.2548	0.5001	0.2528
Domestic interest rate	-0.1431	0.1014	-0.1361	0.1006

Second, I estimate the threshold model in equation (4), where there is one threshold that determines two regimes. Table 6 shows the estimation results of equation (4). The coefficients of primary interest are those expressing the interaction between dollar debt and real exchange rate. The point estimates suggest that for non-financial firms under the "large negative currency mismatch," the interaction has a negative and significant effect (the parameter estimate is different from zero at the 5 percent significance level) on a firm's investment; meanwhile, for firms under the "moderate currency mismatch," the interaction has a positive, though not significant, effect on a firm's investment. Thus, the balance sheet effect is observed only for firms which fall into the regime of "large negative currency mismatch;" that is, firms with a currency mismatch lower than -10.4 percent.

While models (3) and (4) are static panel data models, most economic models also exhibit dynamic, lagged investment capture the accelerator effect of investment in which past investments have a positive effect on future investments (Aivazian et al., 2005). The Methodology developed by Hansen (1999) allows one to estimate threshold models only in the context of static models. However, the threshold currency mismatch estimated as -10.4 can be fixed, and thus I can estimate models (3) and (4) via maximum likelihood following the procedure developed by Hsiao et al. (2002).[3]

Table 7: Estimation results - Dependent variable: Investment

	Linear model		Threshold model	
Explanatory variables	Coefficient	ML SE	Coefficient	ML SE
Dollar debt×Real exchange rate (Currency mismatch $\leq$ -10.4)	–	–	-0.0029	0.0015
Dollar debt×Real exchange rate (Currency mismatch $>$ -10.4)	–	–	0.0017	0.0013
Dollar debt×Real exchange rate	0.0002	0.0012	–	–
Real exchange rate	-0.0026	0.0709	0.0141	0.0707
Cash flow	0.0473	0.0174	0.0476	0.0173
Working capital	0.0121	0.0146	0.0118	0.0146
Firm size	-1.2598	0.4375	-1.1973	0.4356
Leverage	0.0011	0.0048	0.0018	0.0047
Net export×Real exchange rate	0.0002	0.0014	-0.0011	0.0014
Total debt	-0.0093	0.0243	-0.0166	0.0243
Terms of trade	0.0527	0.0143	0.0527	0.0142
Dollarization ratio	-0.0419	0.0162	-0.0446	0.0162
Dollar interest rate	0.4032	0.2312	0.4194	0.2300
Domestic interest rate	-0.1500	0.0893	-0.1444	0.0888
Lagged dependent variable	0.2728	0.0330	0.2601	0.0330

Table 7 shows the dynamic estimation of models (3) and (4), models that include the lagged dependent variable as a regressor. In both models, the coefficient of the lagged

[3] Hsiao et al. (2002) show that the maximum likelihood estimator of dynamic panel data models has a lower bias compared to the traditional generalized method of moments estimator.

dependent variable is strongly significant. In the dynamic version of model (3), the coefficient estimated of the interaction between US dollar debt and real exchange rate is not significant. In the dynamic version of model (4), the estimated coefficient is negative and significant for firms with a currency mismatch lower than -10.4, similar to the results of Table 6.

Regarding the other firm's determinants of investment, all estimated models generally reveal a positive and negative effect of cash flow and firm size, respectively, on a firm's investment, while other firm variables have no effects. Terms of trade and dollar interest rate have positive effects, dollarization ratio has a negative effect, and the domestic (Peruvian sol) interest rate has not a significant effect at the 5 percent significance level.

4 Conclusion

In this paper, I identify the balance sheet effect for a sample of 74 non-financial firms during the 2002-2013 period. I estimate a panel data threshold model, where I find that such effects depend on the specific regime.

I find significant balance sheet effects for firms with a currency mismatch below than -10.4 percent, implying that the interaction between US dollar debt and the real exchange rate negatively affects investment decisions.

Other variables should be included in the analysis, including derivatives to hedge undesired movements in the exchange rate; information on repurchasing firms own debt in US dollars by issuing new debt in Peruvian soles; and term structure of liabilities. However, those variables are not available in Peruvian firms' financial information.

References

Aghion, P., P. Bacchetta and A. Banerjee (2001). "Currency Crises and Monetary Policy in an Economy with Credit Constraints." *European Economic Review* 45(7), 1121-1150.

Aivazian, V.A., Y. Ge and J. Qiu (2005): "The Impact of Leverage on Firm Investment: Canadian Evidence." *Journal of Corporate Finance* 11(1-2), 277-291.

Azabache, P. (2010). "Decisiones de inversión en empresas con dolarización financiera: un modelo umbral del efecto hoja de balance." Consorcio de Investigación Económica y Social.

Batini, N., P. Levine and J. Pearlman (2007). "Optimal Exchange Rate Stabilization in a Dollarized Economy with Inflation Targets." Mimeo, London Metropolitan University.

Bernanke, B., M. Gertler and S. Gilchrist (1999). "The Financial Accelerator in a Quantitative Business Cycle Framework." In Taylor, M. and M. Woodford (eds), Handbook of Macroeconomics 1. North-Holland.

Bleakley, H. and K. Cowan (2008). "Corporate Dollar Debt and Depreciations: Much Ado about Nothing?" *Review of Economics and Statistics* 90(4), 612-626.

Burstein, A., M. Eichenbaum y S. Rebelo (2005). "Large Devaluations and the Real Exchange Rate." *Journal of Political Economy* 113(4), 742-784.

Carranza, L., J.M. Cayo and J.E. Galdon-Sanchez (2003). "Exchange Rate Volatility and Economic Performance in Peru: A Firm Level Analysis." Working Paper No.12/03, Universidad de Navarra.

Carranza, L., J.E. Galdon-Sanchez and J. Gomez-Biscarri (2009). "Exchange Rate and Inflation Dynamics in Dollarized Economies." *Journal of Development Economics* 89(1), 98-108.

Carranza, L., J.E. Galdon-Sanchez y J. Gomez-Biscarri (2011). "The Relationship between Investment and Large Exchange Rate Depreciations in Dollarized Economies." *Journal of International Money and Finance* 30(7), 1265-1279.

Carrera, C. (2016). "Identifying the Exchange-Rate Balance Sheet Effect over Firms." Working Paper 67, Peruvian Economic Association.

Chan, K.S. (1993): "Consistency and Limiting Distribution of the Least Squares Estimator of a Threshold Autoregressive Model." *Annals of Statistics* 21(1), 520-533.

Cespedes, L., R. Chang y A. Velasco (2004). "Balance-Sheet and Exchange Rate Policy." *American Economic Review* 94(4), 1183-1193.

Choi, W.G. and Cook, D. (2004). "Liability Dollarization and the Bank Balance Sheet Channel." *Journal of International Economics* 64(2), 247-275.

Cowan, K., E. Hansen and L.O. Herrera (2005). "Currency Mismatches, Balance Sheet Effects and Hedging in Chilean Non-Financial Corporations." Inter-American Development Bank working paper 521.

Financial Stability Report (2015). *Financial Stability Report November 2015.* Central Bank of Peru.

Galindo, A., U. Panizza F. Schiantarelli (2003). "Debt Composition and Balance Sheet Effects of Currency Depreciation: A Summary of the Micro Evidence." *Emerging Markets Review* 4, 330-339.

Hansen, B.E. (1999): "Threshold Effects in Non-Dynamic Panels: Estimation, Testing and Inference." *Journal of Econometrics* 93(2), 345-368.

Hansen, B.E. (1996): "Inference When a Nuisance Parameter is not Identified Under the Null Hypothesis." *Econometrica* 64(2), 413-430.

Hansen, B.E. (2000): "Sample Splitting and Threshold Estimation." *Econometrica* 68(3), 575-603.

Hsiao, C, M. Pesaran and K. Tahmiscioglu (2002): "Maximum Likelihood Estimation of Fixed Effects Dynamic Panel Data Models Covering Short Time Periods." *Journal of Econometrics* 109(1), 107-150.

Ize, A. and E. Levy-Yeyati (2005). "Financial De-Dollarization: Is It for Real?" IMF Working Paper 05/187.

Krugman, P. (1999). "Balance Sheet, the Transfer Problem, and Financial Crises." *International Tax and Public Finance November* 6(4), 459-472.

Leiderman, L., R. Maino and E. Parrado (2006). "Inflation Targeting in Dollarized Economies." IMF Working Paper 06/157.

Luengnaruemitchai, P. (2003). "The Asian Crisis and the Mystery of the Missing Balance Sheet Effect." Mimeo, University of California, Berkeley.

Magud, N. (2010). “Currency Mismatch, Openness and Exchange Rate Regime Choice.” *Journal of Macroeconomics* 32(1), 68-89.

Orrego, F. and R. Gondo (2011). “Dedollarization and Financial Robustness.” Working Paper 2011-022, Central Bank of Peru.