The Political Economy of Exchange Rate Policy in Brazil: an Empirical Assessment*

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Key words: taxa de câmbio; economia política; ciclo eleitoral.
JEL Codes: F31 e F39.

This paper investigates whether political economy factors contribute to explain the exchange rate policy in Brazil from 1964 to 1997. An analytical framework presents the tradeoff between the positive effect of a depreciated exchange rate on the balance of payments and its negative effect on inflation as driving force affecting exchange rate policy. The exchange rate policy resulting from this tradeoff depends on the political environment. We test our hypotheses by modeling the exchange rate disequilibrium level as a Markov switching model with time varying transition probabilities, and the influence of political economy variables on the transition probabilities is tested. The results support partially the predictions of our analytical framework. According to our statistical results there is an election cycle: the probability of having an overvalued exchange rate is higher in the months preceding elections, while the probability of having an undervalued exchange rate is higher in the months succeeding elections.

Este artigo investiga se fatores de economia política ajudam a explicar a política cambial no Brasil entre 1964 e 1997. Uma estrutura analítica aponta o *tradeoff* entre o efeito positivo de uma desvalorização cambial sobre o balanço de pagamentos e o seu efeito negativo sobre a inflação como o principal fator na escolha da política cambial. A política cambial resultante desse *tradeoff* depende do ambiente político. Nossas hipóteses são testadas modelando o nível de desequilíbrio da taxa de câmbio como um modelo de *Markov*

This paper is based on a research report which was developed as part of a broader research program on the political economy of exchange rate policies in Latin America and the Caribbean, sponsored by the IDB. We are grateful for helpful comments and suggestions from Jeff Frieden, Ernesto Stein, Jorge Streb, Marcelo Neri, and seminar participants at FGV, PUC-Rio, IDB Workshop on The Political Economy of Exchange Rate Policies in Latin America and the Caribbean, and Lacea Meeting in Buenos Aires. We thank René Garcia for providing us with a Fortran program for estimating the Markov switching model, Ilan Goldfajn for sending us updated estimates of the real exchange rate series of Goldfajn and Valdés (1999), Altamir Lopes and Ricardo Markwald for kindly furnishing data on Brazilian external accounts, and Carla Bernardes, Gabriela Domingues, Juliana Pessoa de Araújo, and, specially, Marcelo Pinheiro for excellent research assistance. Both authors thank CNPq for a research fellowship, and Pronex/CNPq for financial support. This paper was received in Apr. 1999 and approved in Sept. 1999.

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switching com probabilidades de transição variáveis no tempo, sendo testada a influência de variáveis de política econômica sobre a probabilidade de mudança de regime. Os resultados sustentam parcialmente as previsões de estrutura analítica. De acordo com os nossos resultados estatísticos, há um ciclo em torno das eleições: a probabilidade de a taxa de câmbio estar valorizada é maior nos meses que precedem as eleições, enquanto a probabilidade de ela estar desvalorizada é maior nos meses que sucedem as eleições.

1. Introduction

What are the determinants of the exchange rate level? Economists like to think about this question in terms of the economic factors underlying an equilibrium real exchange rate level. We take an alternative and complementary point of view. We try to explain real exchange rate short-run departures from its equilibrium value using political variables.

This paper investigates whether political economy factors contribute to explain the exchange rate policy in Brazil over the past thirty years. We reason in terms of an analytical framework where the driving force affecting exchange rate policy is the tradeoff between the positive effect of a depreciated exchange rate on the balance of payments and its negative effect on inflation. The exchange rate policy resulting from this tradeoff depends on the political environment.

We test our hypotheses by modeling the exchange rate disequilibrium level as a Markov switching model with time-varying transition probability. Specifically, we characterize statistically the exchange rate regimes as overvalued and undervalued, and test for the influence of political economy variables on the probability of regime changes. The results support partially the predictions of our analytical framework. According to our statistical results, there is an election cycle: the probability of having an appreciated exchange rate is higher in the months preceding elections, while the probability of having a depreciated exchange rate is higher in the months succeeding elections.

We proceed as follows. Section 2 develops an analytical framework to interpret the real exchange rate evolution in Brazil. The third section provides a quantitative assessment of the main political economy factors that influenced the exchange rate regime in Brazil, as identified in the second section. Section 4 concludes.

2. Analytical Framework

This section provides an analytical framework for the interpretation of exchange rate policy in Brazil. This framework does not intend to encompass all the complexity of the different forces affecting the making of exchange rate policy over the studied period. It does, however, identify and highlight the main recursive dilemmas around exchange rate policy choice.

During most of the period studied, exchange rate regime in Brazil has been a crawling peg.[1] There were clear changes in the administration of the peg. The frequency and size of exchange rate adjustments have changed over time, resulting in the alternation of periods of appreciation and periods of depreciation of the real exchange rate (RER). We believe that the choice of exchange rate adjustment procedure has been intentional, aiming the desired real exchange rate path.

If there are nominal rigidities in the economy, nominal exchange rate changes affect its real value. This enables exchange rate policy to be affected by political factors. There is a limit to this discretion, though. If one sets a RER that produces large imbalances on the balance of payments, this level should not be sustainable in the long run. It is plausible to assume that in the long run the RER level is determined by economic variables: external constraints and structural economic variables. Thus, the concept of equilibrium RER is appropriate as representing the RER long-run trend. It, then, makes sense to study the short-run misalignment produced by the exchange rate policy, as determined by political economy variables.

2.1 The inflation vs. balance of payments tradeoff and the policymaker preferences

It is out of the scope of this paper to formulate a rigorous model which encompass all the aspects of exchange rate determination in the short run in Brazil. However, it is useful to characterize the policymaker preferences in terms of the main tradeoff identified in Brazilian recent history: a more devalued exchange rate is bad for inflation and good for the balance of payments. The government preferences can be modeled in terms of the variables included

[1] *There are two exceptions: from 1964 to 1967 exchange rate policy was characterized by infrequent and large devaluations, and from July 1994 to February 1995 there was a floating exchange rate regime.*

in this tradeoff. Policymakers dislike current account deviations from the level compatible with the country's intertemporal budget constraint, and they also dislike inflation rate deviations from its optimal level.

Policymakers' indirect preferences can then be represented as a weighted average of a function of the discrepancy between the current account and its intertemporal equilibrium level, and a function of inflation rate deviations from its optimal level:

$$U(e) = \alpha f_c(CA(e, X) - CA^*(e^*(X), X)) + f_\pi(\pi(e, X) - \pi^*)$$

where:

- α is a relative weight which measures the importance to the policymaker of current account *vis-à-vis* inflation;
- $CA(e, X)$ represents the current account as a function of the RER e and a vector X of exogenous (to our simple framework) variables;
- $\pi(e, x)$ represents the inflation rate also as a function of e and X;
- CA^* is the current account level consistent with an equilibrium RER;
- π^* represents the optimal inflation level.

We assume that both f_c and f_π functions increase in the negative range up to zero, and then start to decrease. We also assume that they decrease at an increasing rate when the absolute value of the discrepancy increases. It is usual in the political economy literature to have quadratic functions, for its simplicity, although here it is plausible to assume that the first function is asymmetric, with negative deviations from the sustainable level being more penalized than positive deviations.

Current account is posited as a positive function of the RER due to its effect on trade balance. As we argued before, the short-run RER behavior is different from that of its long-run trend. The equilibrium RER is the rate that would produce a smooth trajectory for the current account path, compatible with the country's intertemporal budget constraint.

As for the effect on inflation rate, first observe that to depreciate the RER, it is necessary to devalue the nominal exchange rate at a faster pace than

the difference between domestic and foreign inflation. The faster devaluation pace fosters tradables prices inflation, fueling back into the overall inflation rate. This short run inflationary impact becomes permanent when there is widespread formal and informal indexation. To keep the RER at the new more depreciated level, its devaluation rate must be the same as the new (higher) inflation differential. Hence, in indexed high inflation economies, a more depreciated RER will engender, *ceteris paribus*, a higher inflation rate.

The weights attributed to the two functions describing the policymaker's preferences, as political objectives, should vary through policymakers. A more appreciated exchange rate has impacts, such as lower inflation and cheaper import products, that benefit a large number of dispersed economic agents, in detriment of a small number of concentrated economic interests, as exporters and domestic tradable producers. A policymaker may place a very high weight on current account balance in detriment of inflation control because he favors exporters and import competing producers. On the other extreme, he could have very low weight on current account adjustment because he needs political support, and inflation control is essential for that. We argue that a democracy tends to favor a lower current account weight, as compared to a dictatorship. This is because, in a democracy, elections become important and the interest of a dispersed large number of small economic agents has a better chance of being represented. However, even a dictatorship needs some political support. Sometimes the dictatorship is in a fragile political situation and needs to make decisions geared to gain, or at least not loose, political support. In this case it will place a higher weight on inflation.

In summary, the government chooses the optimal RER so as to maximize its welfare function, balancing the tradeoff between current account and inflation. The weight given to each policy objective depends, among other variables, on political economy factors, as the policy choice affects different groups in society in a distinct way.

2.2 Different policymakers and asymmetry of information

The RER tends to be more appreciated in periods preceding elections and more depreciated after elections. This pattern is captured for Brazilian data in the econometric exercise performed in section 3, and for other Latin American countries in Frieden, Stein and Ghezzi (1999). We will argue that the observed electoral cycles can be explained by imperfect information on the

policymaker's preferences. Let us consider the situation where there are two different types of policymakers: one type places a higher relative weight on the current account than the other. As a consequence, the type that places a higher relative weight on the current account would choose a more depreciated real exchange rate.

If policymakers' preferences were known by the public, the policymaker more concerned with inflation would always win elections. An interesting, and realistic, situation arises when the public cannot observe the policymakers' preferences. In such a situation, it may be worth for the policymaker concerned with the external sector performance to mimic the policymaker concerned with inflation so as to have some chance of being reelected.

Bonomo and Terra (1999a) construct a formal model inspired by this insight. The model assumes two possible types of policymakers: one type is committed to the tradable sector and the other to the non-tradable sector.[2] However, since the non-tradable sector has a higher number of votes, if the the policymakers' preferences were known by the public, the policymaker which represents the non-tradable sector would always win the elections. The policymaker may affect the relative gains for the two sectors by choosing its expenditures on non-tradable goods, and in this way altering the equilibrium real exchange rate. The public tries to extract information about the policymaker's preferences by observing the RER. However, economic policy is observed with a noise, since there are exogenous shocks to the external sector after the policy is chosen. Thus, a given external sector performance is compatible with different combinations of policies and shocks. The policymaker that represents the tradable sector tries to disguise himself by choosing expenditures so as to appreciate the real exchange rate and improve the likelihood of his reelection. However, due to the noise, it is not necessary for him to imitate perfectly the other type to maintain a chance of being reelected. Moreover, since the tradable sector is hurt by a more appreciated exchange rate, the policymaker will choose the exchange rate policy by weighting her immediate interests (the depreciated exchange rate raises the sector's gain), against its long-run interests, that depend on his reelection (the probability

[2] *Policymakers in Alesina (1987) also have different preferences. However, in that paper the probability of reelection is exogenous, whereas in Bonomo and Terra (1999a) the probability of reelection depends on the policymakers' actions.*

of which increases with a more appreciated RER). A political budget cycle is also generated in the model, as government intervenes in the exchange rate market by taxing the tradable goods producers and spending in non-tradable goods.

There is a vast literature on economic policy cycles generated by political economy considerations of policymakers, in asymmetric information contexts. In Persson and Tabellini (1990) unemployment cycles are generated during elections periods, whereas in Rogoff and Sibert (1988) and Rogoff (1990) cycles are in taxes and expenditures. Stein and Streb (1998) relate more closely to the idea presented here. They explain exchange rate valuation/devaluation cycles during elections periods, but the motive for the cycles is different from the one presented in this paper. In the one good model of Stein and Streb (1998), exchange rate devaluation is equal to inflation rate, and inflation tax is one financing source for the government. There are two types of policymakers: competent and incompetent. The competent policymaker needs to tax less than the incompetent one does. Hence, the incompetent policymaker could be willing to mimic the competent policymaker by devaluing less before election, and raise his chances of being reelected.

Here, we think of exchange rate policy as being used to deal with the external and internal imbalances, and different policymakers will have different tradeoffs between the two policy objectives. The main difference is that one preference is more popular than the other is, and therefore yields more chances of reelection. Similarly to Stein and Streb (1998), before elections policymakers, independently of their tastes, would have a bias towards fighting inflation and pursuing a more valued than average RER. If the policymaker committed to the tradable goods sector is elected, there will be a real devaluation after the election. As a consequence one should observe an electoral cycle, where, on average, the RER appreciates before elections and depreciates after them.

3. Exchange Rate Levels as Regimes: a Quantitative Assessment

In this section we characterize statistically the exchange rate behavior by estimating a Markov switching model (MSM) with time-varying probabilities. In our characterization, the dependent variable is the RER misalignment and our political explanatory variables affect the transition probabilities. We begin by rationalizing our choice for both the dependent variable and the statistical specification.

The choice of an RER level results from pure economic factors and political economy factors. We assume that economic factors should have a more permanent effect on the RER, whereas the political economy factors should influence its cyclical component. Were the economic factors constant, it would suffice to look at the behavior of the observed RER in order to extract the impact of political economy components on exchange rate policy choice. That is not the case, however. Over the period studied there were substantial changes in the terms of trade, in the international financial environment, and in domestic imbalances, just to name a few variables which have affected the equilibrium RER.

The equilibrium RER evolution captures the RER long-run trend, and, hence, the economic variables effect on it. The difference between the actual RER and its equilibrium value, denoted by RER *misalignment*, is the part of RER movements that is not being explained by the economic variables used. In this empirical study, we will test if political economy variables can explain this RER misalignment.

We characterize the political economy variables influence in the following way. The government has a discrete policy choice of maintaining the misalignment fluctuating around an overvalued or undervalued level, that is, it chooses from two different regimes for the misalignment rate mean. Since changing policy is costly, one should expect this choice to have some persistence. Explanatory variables of misalignment regime choice can be divided into two types: observable and unobservable. Due to the presence of unobservable variables, the regime choice seems stochastic. In this context, observable political economy variables should be modeled as affecting the probability of changing regimes, rather than determining the regime.

An MSM captures the exchange rate regime choice characterization described above. In such a model, the dependent variable time series behavior follows an auto-regressive process ruled by alternative states (or regimes), which have different means and/or variances. In the model specification used, there are two possible states, which differ on their means: an overvalued and an undervalued regime. Hence, the RER misalignment is modeled as following an auto-regressive process, and the process mean may change over time, depending on which regime is prevalent. Political economy variables enter the model by affecting the probability of regime change.

An important advantage of using the MSM over other empirical specifications that characterize discrete choices is that it does not require previous identification of the regimes by the researchers. The characterization of regimes is a result of the estimation procedure.

The choice of the Markov switching model can be justified both by its good characterization of the empirical features of the exchange rate series (see Kaminsky, 1993; Bollen, Gray & Whaley, 1998; and Diebold, Lee & Weinbach, 1993), and by its appealing interpretation.

3.1 Markov switching model

In the specification of the Markov switching model we chose, there are two possible states (or regimes), that we will label 0 and 1. If the economy in t is in state 0, the dependent variable behavior in t will be that of an AR1 with auto-regressive parameter α and mean $\mu(0)$. Otherwise, the behavior in t will be that of an AR1 process with the same auto-regressive parameter α but with mean $\mu(1)$, which is different from $\mu(0)$. That means that our dependent variable fluctuates randomly around a certain mean. That stochastic oscillation is modeled through the AR1 specification. A change of policy regime would be reflected in the change of mean. The policy regime is modeled as an unobservable state variable which is governed by a first order Markov process.

Let e be the degree of RER misalignment, and S an unobservable variable, which takes values 0 or 1, depending on the regime. Then:

$$e_{t+1} - \mu(S_{t+1}) = \alpha(e_t - \mu(S_{t+1})) + \sigma\varepsilon_{t+1} \tag{1}$$

where the mean $(\mu(S_{t+1}))$ is a function of the regime, and $\{\varepsilon\}$ are i.i.d. with the standard normal distribution.

The regime variable is a discrete variable with two possible values. The transition matrix M gives the probabilities of switching states:

$$M = \begin{vmatrix} p_t^{00} & p_t^{01} = (1 - p_t^{00}) \\ p_t^{10} = (1 - p_t^{11}) & p_t^{11} \end{vmatrix}$$

where p_{ij} gives the probability of moving from state i to state j.

If $\mu(0)$ is higher than $\mu(1)$ we can identify state 0 with an overvalued exchange rate regime and state 1 as an undervalued exchange rate regime.

A higher p^{ii} means a higher probability of continuing on state i, therefore a lower probability of changing states. Thus, the expected time of permanence in state i, when it is visited, is increased, yielding a higher unconditional probability of being in state i.

The transition probabilities may be assumed constant, as Hamilton (1989), or time varying, as in Diebold, Lee and Weinbach (1993). When the transition probabilities are constant, the MSM amounts to a pure univariate time series model. In this case we are not introducing the influence of any other variable in the behavior of the exchange rate variable: only its past behavior is explaining its future behavior.

Alternatively, we assume that the probability of switching states depends on political economy variables. The specification of the explanatory variables effect on the probability transitions is:

$$p_t^{ii} = \frac{\exp(q_t^{ii})}{1+\exp(q_t^{ii})} \tag{2}$$

$$q_t^{ii} = \beta_i + \sum_{k=1}^{K} \lambda_i^k X_i^k + \xi_t, \quad \text{for } i = 0, 1$$

where X_i^k is an explanatory variable of the transition probability.

Note that p^{ii}, being defined as a logistic function of q^{ii}, has value between 0 and 1. Then, q^{ii} is modeled as depending linearly on the explanatory variables.

The model is estimated by maximum likelihood (Hamilton, 1994, and Diebold, Lee & Weinbach, 1993).

3.2 Empirical implementation

The empirical investigation performed has two objectives. One is to identify whether an MSM can characterize our exchange rate variable. For that purpose we estimate an MSM with constant probabilities and compare it to an AR(1) specification. Then, the equation that specifies the transition probabilities, equation (2), becomes:

$$p_t^{ii} = \frac{\exp(\beta_i + \xi_i)}{1+\exp(\beta_i + \xi_i)} \tag{2a}$$

The other objective is to test whether political economy variables affect the probability of being in an appreciated exchange rate regime. That is achieved

by using the MSM with time varying transition probabilities, where the transition probabilities are functions of political economy variables, and comparing it to the constant probability specification. The exercise was performed using at most two political economy variables at a time, because otherwise the number of parameters to be estimated would be too big as compared to the number of observations available. In this specification, equation (2) becomes:

$$p_t^{ii} = \frac{\exp(\beta_i + \lambda_i^1 X_t^1 + \lambda_i^2 X_t^2 + \xi_i)}{1 + \exp(\beta_i + \lambda_i^1 X_t^1 + \lambda_i^2 X_t^2 + \xi_i)} \tag{2b}$$

where X_t^1 and X_t^2 are two political economy variables.

The political economy variables used are the following.

- *Dummy variable for the dictatorship period* – This variable takes the value of 1 during the dictatorship periods, and value of 0 otherwise. Our conjecture is that dictatorship governments did not have to worry with election results. The expected result in that during the dictatorship the probability of either remaining or changing to the undervalued regime should be lower during dictatorship than during democracy.
- *Dummy variable for pre-election periods* – In Brazil elections are always during the months of September, October or November. This value is 1 from March of the election year to the month elections take place. We chose this periodicity for the election dummy because election campaigns in Brazil start peaking up only after carnival time, which occurs in February. We observe that, although there were elections during the dictatorship period, they had less influence on power, and therefore the policymaker should not have as much electoral considerations when choosing economic policy. Hence, the estimations were also performed for a pre-election dummy taking the value of 1 only for elections occurring during the democratic period, and the two first elections of dictatorship, when there was still the expectation that the military government would not stay in power for long.
- *Dummy variable for after-election periods* – This dummy variable takes the value of 1 during the 12 months following an election, for the elections occurring during democratic periods, and the first two elections of dictatorship.

The dependent variable, RER misalignment,[3] is calculated as the difference between the logarithm of the RER and of its equilibrium value. Both the RER and its equilibrium value used are the series calculated and estimated in Goldfajn and Valdés (1999). They calculate the RER as a trade-weighted average of bilateral RERs, including trade partners responsible for at least 4% of Brazilian trade. The equilibrium RER is the predicted value from the regression of the RER on the fundamentals, which are the terms of trade, the level of government spending, and the degree of openness (see Goldfajn & Valdés, 1999, for details). The data range is from 1964 to 1996.

A real exchange rate overvaluation indicates that the RER is more valued than it should be according to its equilibrium level, and the opposite is true for the undervalued regime.

The next subsection presents the results and their interpretation:

Results

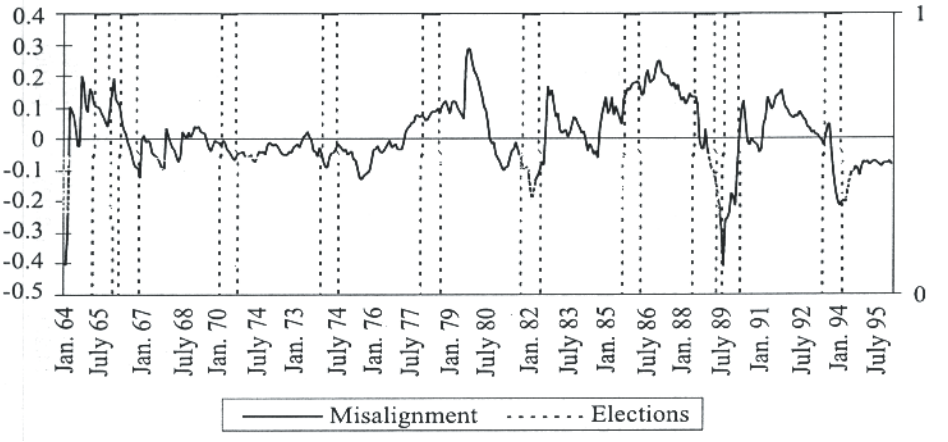
The figure presents RER misalignment and election dummy evolution through time (the left axis shows the value of exchange rate misalignment, and the right axis presents the value of the elections dummy). This figure shows a concentration of negative misalignments or exchange rate overvaluation during the periods prior to elections. The effect is especially strong during the democratic period.

Table 1 presents the estimation results summary. Each row presents the result of a different specification, depending on which variables are being used to explain the transition probabilities between exchange rate regimes. Table 2 presents the estimated transition probabilities for each specification of table 1.

We start by estimating an univariate model, which is a Markov switching model with constant probabilities. The results in row (1) of table 1 suggest the existence of two regimes. The overvalued regime has mean -0.081, and the undervalued regime has mean 0.012. As for the constant transition probabilities, if the economy is in the overvalued regime, the probability it will

[3] *A different set of estimations using RER as a dependent variable was performed, and the results are presented in Bonomo and Terra (1999b). The results using an RER misalignment dependent variable were more robust and in conformity with the predictions of the analytical framework presented above. As argued above, RER misalignment is in fact the more appropriate variable to look at when explaining the effect of political economy variables on exchange regime choice.*

remain there is 84.5%, whereas if the economy is in the undervalued regime, the probability the economy will remain there is 96.4%, as shown in table 2.



Then we test if the MSM specification is justified. An AR(1) model for the RER misalignment is then estimated, and the results are presented in row (0) of table 1. The hypothesis of two regimes against the null of an AR(1) can be tested based on an likelihood ratio test. However, the asymptotic distribution of the statistics is not chi-squared as usual. Garcia (1998) derives the asymptotic distribution for this statistics. For the case of an auto-regressive factor of 0.95, the 1% and 5% critical values of this distribution are 12.08 and 8.48. The likelihood ratio in this case is 35.55 – the linear model is rejected at less than 1% level.

After the estimation of the univariate two regime specification, different political economy variables are included as possible variables that affect the transition probabilities. Row (2) presents the results when a political regime dummy is used as an explanatory variable of the transition probabilities. It is interesting to note that in this specification the misalignment mean in the overvalued regime is not significantly different from 0. During the dictatorship, the probability of remaining in the overvalued regime is higher (this probability is 73.3% during democracy and close to 97.4% during dictatorship), and the probability of remaining in the undervalued regime is lower compared to the probabilities during the democratic period (95.3% during democracy and 70.6% during dictatorship). If we perform a likelihood ratio test for the inclusion of the political regime dummy, the null of constant probability is rejected at 1% level.

Table 1
Estimation results summary
Dependent variable: exchange rate misalignment

$$e_{t+1} - \mu(S_{t+1}) = \alpha(e_t - \mu(S_{t+1})) + \sigma\varepsilon_{t+1}$$

$$p_t^{ii} = \frac{\exp(\beta_i + \lambda_i^1 X_t^1 + \lambda_i^2 X_t^2 + \xi_i)}{1 + \exp(\beta_i + \lambda_i^1 X_t^1 + \lambda_i^2 X_t^2 + \xi_i)}, \text{ where } p_t^{ii} = Pr[S_{t+1} = i \mid S_t = 1]$$

Explanatory variables of the transition probabilities	Mean		Constant part of probability		X1 coefficient		X2 coefficient	
	Overvalued $\mu(0)$	Undervalued $\mu(1)$	Overvalued β_0	Undervalued β_1	Overvalued λ_0^1	Undervalued λ_1^1	Overvalued λ_0^2	Undervalued λ_1^2
0. AR(1) - One regime case	0,000							
	(0.14)							
1. Constant probabilities	-0,081	0,012	1,702	3,293				
	(-2.07)	(13.48)*	(3.85)	(9.85)				
2. X1-Political regime	-0,036	0,056	1,008	3,007	2,596	-2,131		
	(-0.92)	(15.30)*	(1.89)	(6.24)	(3.81)	(-2.76)		
3. X1-Pre-elections	-0,083	0,011	1,272	3,902	0,784	-1,692		
	(-2.2)	(12.64)*	(2.17)	(7.53)	(0.92)	(-2.41)		
4. X1-Pre-election during democracy	-0,082	0,011	1,425	3,788	0,432	-2,201		
	(-2.11)	(13.17)*	(2.59)	(8.23)	(0.50)	(-3.08)		
5. X1-Pre-election during democracy	-0,082	0,011	1,226	3,897	0,635	-2,321	14,881	-0,575
X2-Pre-election during dictatorship	(-2.50)	(13.19)*	(2.18)	(8.04)	(0.74)	(-3.27)	(0.01)	(0.51)
6. X1-After-election during democracy	-0,078	0,015	2,184	3,421	-0,745	-0,996		
	(-1.92)	(14.34)*	(-3.12)	(8.84)	(-0.83)	(-1.34)		
7. X1-Political regime	-0,037	0,057	0,455	18,372	3,119	-17,498	0,407	-16,659
X2-Pre-election during democracy	(-1.01)	(15.68)*	(0.59)	(0.02)	(3.70)	(-0.02)	(0.43)	(-0.02)
8. X1-Political regime	-0,040	0,055	-0,090	3,481	4,328	-2,953	-2,791	0,884
X2-After-election during democracy	(-1.01)	(14.19)*	(-0.11)	(5.74)	(4.27)	(-3.32)	(-2.96)	-0,90

(continuation)

Explanatory variables of the transition probabilities	Auto-regressive factor α	Standard deviation σ	Likelihood function value	Likelihood ratio test X^2 p-value Inclusion of X1	Inclusion of X2
0. AR(1) - One regime case	0,940 (54.32)	0,035	756,11		
1. Constant probabilities	0,964 (70.39)	0,027 (23.78)	791,66		
2. X1-Political regime	0,964 (67.76)	0,027 **	798,45	0,000	
3. X1-Pre-elections	0,962 (70.1)	0,027 **	794,70	0,014	
4. X1-Pre-election during democracy	0,963 (69.03)	0,027 **	795,65	0,005	
5. X1-Pre-election during democracy X2-Pre-election during dictatorship	0,962 (70.78)	0,027 (24.98)	796,60		0,168
6. X1-After-election during democracy	0,965 (71.94)	0,027 **	792,73	0,144	
7. X1-Political regime X2-Pre-election during democracy	0,963 (69.93)	0,027 **	802,87	0,000	0,003
8. X1-Political regime X2-After-election during democracy	0,964 (69.33)	0,028 **	800,49	0,000	0,043

Asymptotic t-ratios are in parentheses.

*This is the t-ratio of the difference between the mean of the two regimes.

**Value larger than 99.99.

Table 2
Estimated transition probabilities for each specification on table 1
Dependent variable: exchange rate misalignment

Explanatory variables of the transition probabilities	Probabilities when dummies equal 0		Probabilities when dummy X1=1		Probabilities when dummy X2=1	
	Overvalued	Undervalued	Overvalued	Undervalued	Overvalued	Undervalued
1. Constant probabilities	0,846	0,964				
2. X1-Political regime	0,733	0,953	0,974	0,706		
3. X1-Pre-elections	0,781	0,980	0,887	0,901		
4. X1-Pre-elections during democracy	0,806	0,978	0,865	0,830		
5. X1-Pre-elections during democracy X2-Pre-elections during dictatorship	0,773	0,980	0,865	0,829	1,000	0,965
6. X1-After-elections during democracy	0,899	0,968	0,808	0,919		
7. X1-Political regime X2-Pre-elections during democracy	0,612	1,000	0,973	0,706	0,703	0,847
8. X1-Political regime X2-After-elections during democracy	0,478	0,970	0,986	0,629	0,053	0,987
9. X1-Minister of Finance change	0,841	0,975	0,817	0,925		

The second set of political economy variables used to explain the transition probabilities are the pre-election dummies, and the results are in rows (3), (4), and (5) in table 1. Rows (3) and (4) present the results when a dummy variable for the pre-election period is used as a possible explanatory variable of the transition probabilities. Both the pre-election during the whole period and the pre-election during democracy dummies have the same qualitative impact over the transition probabilities: the proximity of elections increases the probability of remaining in the overvalued regime, and decreases the probability of the economy remaining in the undervalued regime. The impacts of these variables on the transition probability are significant for the undervalued regime, but not for the overvalued one. Both results indicate that there is a higher unconditional probability for having an overvalued regime before elections.

Comparing rows (3) and (4) in table 2, the negative impact of the pre-election dummy is larger when only democratic periods are taken into account. For the pre-election dummy, the probability of the economy remaining in the undervalued regime changes from 98% in normal times to 90.1% during pre-election periods, whereas for the pre-election during democracy dummy the probability changes from 97.8% during normal times to 83% during pre-election periods.

The likelihood ratio test indicates that the inclusion of the pre-election during democracy dummy is significant at 1% level, while the inclusion of the pre-election dummy is significant at 2% level.

The difference between the impact of pre-election during democracy and during dictatorship is made clear in estimation (5), which uses both a pre-election during democracy dummy and a pre-election during dictatorship dummy. All coefficients have the expected sign, but only the coefficient of the pre-election during democracy dummy for the undervalued regime is significant (table 1). The probability of the economy remaining in the undervalued regime when it is there in normal times is 98%. In pre-election during dictatorship the probability changes to 96.5%, whereas in pre-election periods during democracy this probability changes to 82.9% (table 2). In summary, during pre-election periods, the probability of the economy remaining in the undervalued regime decreases, and the effect is larger during democratic periods than during dictatorship periods. The inclusion of the pre-election during dictatorship dummy (row 5) in the model with only pre-election during democracy dummy (row 4) is rejected at any conventional significance level.

After-election during democracy dummy has a negative impact on both transition probabilities, producing an ambiguous effect on the regime unconditional probabilities. However, neither one is significant, as shown in table 1, row (6). Moreover, the inclusion of that variable on the constant probability model is rejected.

Row (7) combines the political regime and the pre-election during democracy dummies. The probability of remaining in the overvalued regime is higher during dictatorship and during pre-election periods, although only the impact of dictatorship is significant. The impact of these dummies on the probability of remaining in the undervalued regime is not significant. We test for the inclusion of the political regime dummy by comparing the specification in row (7) with the specification in row (4). As for the inclusion of the pre-election during democracy dummy, we compare the specification in row (7) with the specification in row (2). Both tests reject the null hypothesis of the restricted specification at any conventional significance level.

The next specification uses the political regime and the after-election dummies as explanatory variables for the transition probabilities. As shown in table 1, row (8), the political regime dummy has a positive impact on the probability of remaining in the over-valued regime (during democracy the probability is 47.8% and during dictatorship it is 98.6%), and a negative impact on the probability of remaining in the undervalued regime (the probabilities are 97.0% and 62.9% for the democratic and dictatorial periods, respectively). The after-election dummy has a negative impact on the probability of remaining in the overvalued regime, and a positive impact on the other probability. The after-election dummy coefficient for the undervalued regime is the only one that is not significant. Both the inclusions of the political regime and the after-election dummies pass individually the likelihood test at 5% significance level.

In summary, we found that the dictatorship favored an overvalued currency. We identified a misalignment cycle around elections: an overvalued currency is more likely before elections, while there is a higher probability of changing from a overvalued to an undervalued currency immediately after elections. The election cycle showed to be stronger during the democratic period than during the dictatorial period.

Interpretation

We divide the results into two groups: those related to political regime, and those related to election. We will interpret them in turn.

The results related to the political regime we found are not in accordance with our initial predictions. Our prior was that the military government would be more concerned with the balance of payments *vis-à-vis* inflation. The reason was that a good performance of the balance of payments would benefit a group of well-organized citizens – the tradable sector agents. The underlying assumption in our prior was that an overvalued exchange rate would hurt the tradable sector. However, this is not true if protection is high and the bulk of imports is on intermediate goods for the tradable sector. As it is argued in the historical analysis of Bonomo and Terra (1999b), this was the case in Brazil until late 80's.[4] In such an economic environment, an overvalued exchange rate would have little impact on the balance of payments and it would benefit tradable sector agents. Thus, it is not surprising that we found a higher unconditional probability of the overvalued regime during the dictatorship.[5]

During democracy voters' assessment of the government preferred policies become important. Since voters do not know the policymakers' preferences, incumbents have an incentive to behave as if they had popular preferences. This means that before election incumbents tend to have a more appreciated exchange rate, in order to influence voters. In the subsection above, we found evidence of an exchange rate election cycle during democracy. This empirical pattern fits our asymmetric information framework.

4. Conclusion

This paper studied exchange rate policy in Brazil, from a political economy perspective. An analytical framework was constructed to try and encompass the main forces at work, and a quantitative assessment of the analytical framework was performed, using Brazilian data for the period studied.

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[4] *We would still expect the predictions of our analytical framework to be valid if we had in the past the present protection structure.*

[5] *The Geisel government (1974-79) had a major influence on the results when it did not adjust the exchange rate during the first oil shock (see Bonomo & Terra, 1999b, for an interpretation of this episode).*

The main forces guiding the exchange rate policy choice in Brazil were the result from a tradeoff between inflation and balance of payments (see Bonomo & Terra, 1999b, for historical account). Real exchange rate appreciation helps to reduce inflation, but deteriorates the balance of payments, and the reverse is true for real exchange rate depreciation. Those two effects of exchange rate policy do not have a symmetric effect on the different members of society: inflation reduction benefits a large number of dispersed agents, whereas balance of payments improvement benefits a more concentrated group of exporters and import competing domestic industries.

The analytical framework posited that policymakers' policy choice depends on the relative weight they place on the balance of payments as opposed to inflation reduction. In particular, policymakers in need of popular support would place a relatively higher weight on inflation reduction. Hence, democratic governments should place more weight on inflation reduction, as opposed to dictatorial governments. An elections cycle could also be generated if policymakers differed on the relative weights they place on their policy objectives, and the public could not observe the policymakers' preferences, but only their policy choices.

The analytical framework predictions were tested empirically. A Markov switching model with time-varying transition probabilities was used to characterize the exchange rate regimes, and the influence of the political economy variable on them. The dependent variable chosen was the real exchange rate misalignment with respect to its equilibrium level. We argue that real exchange rate misalignment is a more appropriate measure for the exercise we perform. In trying to identify *political economy* factors that affect exchange rate policy we do not want to capture the effects of other exogenous purely economic variables. The misalignment measure controls for the effects of the economic variables and the political economy variables should explain the remaining variations.

We found that during the dictatorship period the probability of the economy remaining in the undervalued regime was smaller than during the democratic period, and the reverse is true for the probability of remaining in the overvalued regime. This is in contrast with the analytical predictions. We argued that this finding can be reconciled with our analytical framework if we take into account the economic environment during the dictatorship period: high protection for final goods and domestic industry reliance on intermediate

good imports. The elections cycle was identified: the probability of having an appreciated exchange rate is higher in the months preceding elections while the probability of having a depreciated exchange rate is higher in the months succeeding elections. Moreover, the elections cycle showed to be stronger during the democratic period than during the dictatorial period.

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