Why are policy real interest rates so high in Brazil?
An analysis of the determinants of the Central Bank of Brazil real interest rate

THEREZA BALLIESTER REIS

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Abstract:

This paper discusses the reasons for Brazil's high policy real interest rates by considering two opposing views, the orthodox and heterodox approaches. While orthodox authors defend that bad domestic policies are the cause for the high interest rate, heterodox economists claim that the international financial system and orthodox policies influence the level of policy rate in Brazil. The aim of this study is to assess whether the proposed arguments can be supported when comparing Brazilian real interest rates with other developing countries under the same monetary regime. The conclusion is that, although the orthodox and heterodox arguments are intuitively plausible, when comparing stylized facts and testing the hypotheses econometrically those reasons are not sufficient to elucidate the Brazilian case. The paper concludes by suggesting that there might be political causes of the high real interest rates in Brazil such as a politically influential rentier class.

Keywords: Brazil, Central Bank, interest rate, monetary policy, developing countries

JEL Classification: E43, E58

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1. Introduction

The high central bank interest rate in Brazil has been under discussion for a long time in the academia and society in general. Although some economists defend interest rate setting as a pure technical mechanism, monetary policy is constantly under dispute between workers, firms and rentiers. In order to privilege workers and firms, the former Worker's Party government implemented direct attempts to reduce the central bank real interest rate in 2012/13. However, the policy has failed and the country has again raised real policy rates to a level much higher compared to other similar economies. Therefore, the debate on central bank interest rates and its effects have sparked again in the country, and existing economic theories that seek to explain the phenomenon shall be discussed in this paper.

Brazil's central bank real interest rate (CBRIR) is among the highest in the world[1]. Table 1 shows this comparison. While Brazil has an average of 8.14% over the period 1996-2015, the corresponding time average for a group of selected countries, including Brazil, is only 1.85%. The extraordinarily high real interest rates of Brazil mean that the country is prone to lower investment rates, reduced growth, increasing public indebtedness and rising income inequalities. Therefore, the Central Bank of Brazil (BCB) has been trying to reduce policy rates since the implementation of inflation targeting policies in 1999. Although there has been a clear declining trend of policy rates, Brazil wasn't able to adjust its CBRIRs to the rest of the world. One could argue that, since the country adopts the inflation targeting (IT) framework, the central bank needs to respond to accelerating inflation with raising interest rates. However, Brazil doesn't have inflation rates much higher than other similar economies under inflation target regimes, as we can see in Table 2.

[1] CBRIR is the central bank nominal interest rate minus the inflation rate based on the GDP deflator. The detailed measure of it for each country in the sample is described in Appendix A.

Table 1: Central bank real interest rates of selected countries, 1996-2015

Country	1996-2000	2001-2005	2006-2010	2011-2015	AVR
BRA	16.36%	9.69%	4.27%	2.22%	8.14%
CHL	2.53%	-2.36%	-1.99%	1.60%	-0.05%
COL	5.64%	0.73%	1.70%	0.65%	2.18%
IDN	-6.60%	2.10%	-5.41%	1.36%	-2.14%
PHL	2.20%	2.72%	1.20%	1.05%	1.79%
THA	4.13%	-0.78%	-0.98%	0.31%	0.67%
ZAF	7.36%	1.58%	1.24%	-0.67%	2.38%
AVR	4.52%	1.95%	0.00%	0.93%	1.85%

Source: IMF – International Financial Statistics and national Central Banks (more information in Appendix A)
Note: The abbreviations correspond as following: Chile (CHL), Colombia (COL), Indonesia (IDN), Philippines (PHL), Thailand (THA) and South Africa (ZAF), Brazil (BRA), and the simple average of the selected countries and periods (AVR).

Table 2: Inflation rates of selected countries, 1996-2015 [2]

Country	1996-2000	2001-2005	2006-2010	2011-2015	1996-2015
BRA	8.51%	9.40%	7.55%	7.67%	8.28%
CHL	4.33%	5.79%	6.16%	3.26%	4.88%
COL	18.57%	6.43%	5.13%	3.28%	8.35%
IDN	26.26%	9.71%	13.41%	5.16%	13.64%
PHL	9.71%	4.85%	4.52%	2.12%	5.30%
THA	3.07%	2.88%	3.40%	1.72%	2.77%
ZAF	7.90%	7.52%	7.56%	5.54%	7.13%
AVR	11.19%	6.66%	6.82%	4.11%	7.19%

Source: World Bank – World Development Indicators

Therefore, economists debate other aspects besides inflation that could explain this discrepancy. Mainstream economists find low savings and strong capital controls to be important causes of the phenomenon. Heterodox authors, on the other hand, claim that monetary policy isn't the

[2] Inflation is here defined as GDP deflator as following the World Bank measure for real interest rate.

appropriate tool to control inflation in Brazil since the country has cost-push inflation due to its indexed prices and high exchange rate pass-through, which causes the BCB to keep on raising its policy rate without success in reducing inflation.

The paper provides a systematic review and empirical test of the proposed explanations by mainstream and heterodox authors. I will assess the proposed determinants of CBRIRs through stylized facts and econometric evidence. The main finding of the study is that most of the orthodox and heterodox theories are not sufficient to explain the high CBRIR in Brazil.

The paper is structured as follows: the second section discusses mainstream and heterodox explanations for high Brazilian CBRIRs and provides an empirical comparison between Brazil and other developing countries under the IT framework. Section 4 presents an econometric analysis of the determinants of CBRIRs for seven countries from 1996 to 2015. The last section concludes.

2. How do mainstream and heterodox economists explain the high policy rate in Brazil?

In this section, I review the mainstream and heterodox arguments for CBRIRs in Brazil, and present some comparative empirical evidence in order to provide a first reality check of the proposed determinants.

2.1 Mainstream explanations

Mainstream economists consider the high real interest rates in Brazil to be a puzzle (Bacha et al. 2009, p.343; Segura-Ubiergo, 2012). Four main arguments have been put forth to explain the phenomenon: lack of savings, high risk premium, convertibility risk and jurisdictional uncertainty[3].

[3] Other factors mentioned by mainstream authors, are the low level of dollarization and low investment grade in Brazil (Bacha et al., 2009), the high level of subsidized credit that pushes equilibrium interest rates up (Hausmann, 2008; Lopes, 2014; Segura-Ubiergo, 2012), lack of central bank independence (Arida et al., 2003; Favero and Giavazzi, 2002; Nahon and Meurer, 2009; Segura-Ubiergo, 2012) and high debt-to-GDP ratio (Arida et al., 2003; Favero and Giavazzi, 2002; Gonçalves et al., 2007; Muinhos and Nakane, 2006; Segura-Ubiergo, 2012). However, because of unavailability of data these mechanisms could not be considered.

Lack of savings

According to mainstream economists, the CBRIR is high because there is a lack of savings in Brazil (Arida et al., 2003; Lara-Resende, 2011; Lopes, 2014; Segura-Ubiergo, 2012). This argument is based on the loanable funds theory in which the equilibrium between the supply of savings and the demand for investment in the market for loanable funds determines the equilibrium interest rate (Mishkin 2014, p.78). Although it is acknowledged that short-term interest rates are set by the central bank, it is argued that the central bank rate cannot deviate from the natural rate of interest given by loanable funds market equilibrium without compromising price stability.

Lopes (2014, p.3) disaggregates aggregate savings into three components: private savings, government savings and external savings. Private savings correspond to domestic firms and household savings, while government savings correspond to budget surplus, and external savings to the commercial deficit, i.e., the surplus in the capital and financial account (Lara-Resende 2011, pp.1-2). It is argued that private savings are low in Brazil because the high marginal tax rate affects mostly firms and households with high propensities to save, whereas most of the transfers are made to households with a low propensity to save, such as pensioners and poor individuals (Hausmann 2008, p.27). At the same time, government savings are also low in Brazil, although public investment is the lowest compared to other developing countries. The explanation given for low public saving is thus the considerable weight of pension transfers, high interest rates on public debt and strong government consumption (*ibid*, p.23). Those factors explain why domestic savings rate are lower in Brazil than in other countries, thus pushing central bank interest rates up according to mainstream authors (Segura-Ubiergo 2012, p.7).

Table 3 depicts gross domestic saving rates as a share of GDP for our sample of seven developing countries that follow an inflation targeting regime. It is possible to see that Brazil has a higher savings-to-GDP ratio in comparison to its peers. For instance, Brazil showed higher rates than Colombia until 2010, South Africa after 2001 and Philippines for the entire sample. Thus, the stylized facts do not support this argument.

Table 3: Gross domestic savings as share of GDP for selected countries

Country	1996-2000	2001-2005	2006-2010	2011-2015	1996-2015
BRA	15.64%	19.17%	20.46%	19.66%	18.73%
CHL	24.31%	25.59%	30.32%	24.73%	26.24%
COL	14.57%	15.51%	20.16%	21.84%	18.02%
IDN	28.06%	29.88%	31.44%	34.24%	30.91%
PHL	15.06%	15.66%	16.90%	16.20%	15.96%
THA	34.14%	29.64%	31.04%	29.56%*	31.09%
ZAF	19.26%	19.12%	20.28%	18.79%	19.36%
AVR	21.58%	22.08%	24.37%	23.58%	22.90%

Source: World Bank – World Development Indicators
Note: Grey areas represent savings rate inferior to the Brazilian one.
**Thailand's average is only from 2011 to 2014.*

High default risk premium

A second mainstream argument is that due to Brazil's history of sovereign defaults the country must pay a high default risk premium (Segura-Ubiergo 2012, p.5). In this view, a "country's risk of default on external debt, together with its inflation history […] provides a good measure of a country's capacity to bear debt without brooking high risk of default" (ibid, p.54). For being a serial defaulter, Brazil is bound to receive less capital inflow from rich countries (Reinhart and Rogoff, 2004), which means that the country must take action to attract capital. Thus, the high government default risk would be captured by a higher central bank interest rate.

The sovereign default of our selected countries is shown in Table 4. In the sample, Brazil had seven sovereign debt problems in the 1980s and five debt problems in the 1990s. However, in the 1980s, Chile and Philippines presented the same number of sovereign default as Brazil and in the 2000s, Indonesia had two years of default, while Brazil had none. Therefore, this explanation also has weak empirical support. This result is consistent with Salles's (2007, p.5) argument that the history of inflation and the default is a common ground for all Latin American countries, thus not justifying the substantially higher Brazilian CBRIR.

Table 4: Sovereign debt problems for selected countries, 1996 – 2010

Country	1970-1979	1980-1989	1990-1999	2000-2015	1970-2015
BRA	0	7	5	0	12
CHL	0	7	1	0	8
COL	0	0	0	0	0
IDN	0	0	1	2	3
PHL	0	7	3	0	10
THA	0	0	0	0	0
ZAF	0	4	1	0	5
AVR	0	4	2	0	5

Source: Database for Sovereign Defaults, Bank of Canada.

Note: The indicator was calculated by using the foreign currency bank loans and transforming them into dummy variables. When there was an event of default on this type of loan, the dummy assumed the value of 1, while 0 means its absence.

Note 2: The grey areas show the periods in which countries had a similar as or superior than sovereign debt default events in Brazil.

Convertibility risk

A further argument is that the convertibility of the Brazilian *Real* is considered very restrictive. Although there has been a shift from a pegged to a floating exchange rate regime, Brazil still maintains capital controls (Arida, 2003; Gonçalves et al., 2007). As clarified by Gonçalves et al. (2007, p.62), this argument is not related to pegged exchange rates regimes, but to capital controls, i.e., any restrictions to convert local currency into foreign currency. Some examples of capital controls that impose restrictions on foreign investments by Brazilian residents are: the prohibition of big institutional investors such as pension funds to invest abroad, the high level of bureaucracy that increases the compliance costs and, lastly, a requirement of previous authorization from the BCB to transfer large amounts abroad (Arida et al., 2003, p.12). As a result, mainstream authors argue, foreign lenders would be very cautious in providing funds to Brazilian residents as there would be a high risk that residents wouldn't be able to acquire the necessary national currency to repay the loan at the pre-arranged exchange rate. Thus, lenders would increase their interest rates in foreign currency because of the convertibility risk. The higher interest rates on foreign loans would also push domestic interest rates up (Arida, 2003).

An empirical investigation by Gonçalves et al. (2007) finds only a weak relation between capital controls and interest rates in Brazil. Table 5 displays the level of capital controls for the seven countries under analysis, using a capital control index as a proxy for the convertibility risk argument. The index was constructed by Fernández et al. (2015) based on the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions. As it is noticeable, Brazil had relatively strong capital controls until 2001, but so did other countries. Moreover, Brazil had lower capital controls than the average from 2001 to 2010. Therefore, it is not possible to conclude that this is a strong cause for the Brazilian higher real interest rate, which is also confirmed by the time series in Gonçalves et al. (2007).

Table 5: Convertibility risk measured by capital control indexes of selected countries, 1996-2013

Country	1996-2000	2001-2005	2006-2010	2011-2013	1996-2013
BRA	0.76	0.41	0.49	0.65	0.58
CHL	0.88	0.29	0.18	0.40	0.44
COL	0.74	0.64	0.63	0.58	0.65
IDN	0.54	0.63	0.66	0.66	0.62
PHL	0.77	0.85	0.88	0.88	0.85
THA	0.66	0.77	0.79	0.77	0.75
ZAF	0.63	0.62	0.60	0.63	0.62
AVR	0.71	0.60	0.60	0.65	0.64

Source: Fernández et al. (2015)
Note: The grey areas indicates higher capital control indexes than Brazil.

High jurisdictional uncertainty

Under the institutional aspect, we find the so-called 'jurisdictional uncertainty' hypothesis. According to it, the institutions of a particular country are determinants of interest rate setting (Arida et al., 2003). The theory is based on the fact that there is no domestic market for long-term credit and bonds (Gonçalves et al. 2007, p.55) either in *Real* or foreign currency, but there is a possibility for the Brazilian government, big firms and large banks to receive foreign credit

denominated in foreign currency (Arida et al. 2003, p.4). The lack of a domestic credit market is due to uncertainties related to Brazilian jurisdiction. One example of jurisdictional uncertainty would be the risk created by the government, since it could modify financial contracts at any time, such as through surprise inflation, asset confiscation and direct lending policies – as it has done in the past. Therefore, investors would demand a premium for a possible future loss. The other example relates to the lack of legal rights for creditors and a legal system that systematically benefits debtors (World Bank 2006, p.26). Moreover, in this view, there is an anti-creditor bias reflected in the common Brazilian opinion that the creditor has a negative connotation and opposes itself to the debtor, which in contrast is regarded as the productive capital that is able to generate jobs and output (Arida et al. 2003, p.6). In this respect, the uncertainty related to the Brazilian jurisdiction would then require from the central bank the setting of a higher interest rate to attract foreign capital.

Bacha et al. (2009, p.347) quantify the jurisdictional uncertainty through the rule-of-law index from the World Bank to estimate its impact on interest rates in Brazil, but find no relation between both variables. In the same way, Gonçalves et al. (2007) use the rule-of-law and regulatory quality as proxies for jurisdictional uncertainty, but find no relationship between the variables and interest rates. Table 6 deals with the jurisdictional uncertainty argument. Following the work of Gonçalves et al. (2007), I use the rule-of-law variable as a proxy for jurisdictional uncertainty. Rule-of-law is an estimation of the confidence that agents have in law enforcement and legal stability, especially in the "quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence" (World Bank database definition). It is captured by an index rangingfrom minus 2.5 to 2.5 units in a standard normal distribution. As we can see, many countries such as Colombia, Indonesia and the Philippines have a similar or worse rule-of-law index than Brazil. Thus, the empirical evidence does not support this mechanism.

Table 6: Rule-of-law index of selected countries, 1996-2014

Country	1996-2000*	2001-2005**	2006-2010	2011-2014	Total
BRA	-0.31	-0.40	-0.29	-0.08	-0.27
CHL	1.13	1.28	1.26	1.37	1.26
COL	-0.89	-0.73	-0.44	-0.37	-0.61
IDN	-0.61	-0.86	-0.66	-0.53	-0.67
PHL	-0.15	-0.47	-0.52	-0.46	-0.40
THA	0.53	0.18	-0.13	-0.17	0.10
ZAF	0.08	0.06	0.11	0.12	0.09
AVR	-0.03	-0.13	-0.10	-0.02	-0.07

Source: World Bank – Worldwide Governance Indicators
*Note: *1997 and 1999 are missing. **2001 is missing.*
Note 2: The grey areas show rule-of-law values lower than the respective Brazilian one.

To sum up, mainstream economists provide four key explanations for why the policy real interest rate in Brazil is higher than in other countries which are summarized in Table 7. They refer to the lack of savings, the country's history of default on external lenders, the level of capital controls and the intrinsic risk of the national institutions. Yet, our analysis of the stylized facts shows that those arguments are not supported by evidence when comparing the Brazilian results with other developing countries under the IT regime.

Table 7: Resume of mainstream explanations for the high real interest rate in Brazil

Argument	Proponents	Cross-country comparison	Empirical support?
Low level of savings	Arida et al., 2003; Hausmann, 2008; Lara-Resende, 2011; Segura-Ubiergo, 2012	Colombia, the Philippines and South Africa have lower saving rates	✗
Default history	Reinhart and Rogoff, 2004; Salles, 2007; Segura-Ubiergo, 2012	Brazil only has more default issues in the 1990s	✗
Convertibility risk	Arida, 2003; Arida et al., 2003	The Philippines show higher capital control measures for the entire sample	✗
Jurisdictional uncertainty	Arida et al., 2003; Bacha et al., 2009; Gonçalves et al., 2007; World Bank, 2006	Colombia, Indonesia and the Philippines exhibit worse rule-of-law indicator	✗

2.2 Heterodox explanations

Heterodox economists also provide several explanations for the high interest rates in Brazil. Two key arguments are related to the effect of the exchange rate on inflation. Moreover, heterodox economists believe that the application of wrong monetary policies and the conservative approach of the BCB are also strong factors for the high CBRIR in Brazil[4].

Exchange rate volatility

The first argument of the heterodox approach is that the high volatility of the exchange rate has a strong connection with the high interest rates (Sicsú 2002, p.132; Oreiro et al. 2012, p.576). According to Carneiro and Rossi (2013, p.6), "international investors demand a premium which takes the form of an increase in the nominal interest rate to compensate for the risk of moving to an unstable currency". This argument stems from the Keynesian assumption that every asset has a liquidity premium, that is, a value for its convenience and security, which is included in the final rate of return on this asset (Keynes 1936, p.143). Considering national currencies as assets, the more convenient and secure the currency, the lower will be its interest rate. Herr (2008, p.129) calls this phenomenon currency premium: 'each currency in the world earns a specific non-pecuniary rate of return' that represents its respective qualities. This concept is also present in Conti et al. (2014, pp.355-356), who elaborate the determinants of the domestic interest rate under this aspect.

In Table 8, the volatility of the nominal exchange rate for selected countries can be compared[5]. Although Brazil does show a strong volatility, other countries' exchange rates are also unstable, such as the Indonesian and the South African ones. Therefore, this argument seems not to be a sufficient explanation for the high CBRIRs in Brazil.

[4] Moreover, the indexation of government bond interest rates to central bank interest rate is mentioned by Baltar (2015), Modenesi and Modenesi (2012) and Oreiro et al. (2012) as a factor for the high Brazilian real policy rate. However, other developing countries under IT also have bond interest rates indexed to inflation (Deacon et al. 2004), so it seems this is not a particularity of the Brazilian economy. Because of the inability of measuring the level of indexation between those variables, I leave this argument out of this analysis.

[5] For details of the volatility measure, please refer to the Appendix A.

Table 8: Nominal exchange rate volatility of selected countries, 1996 – 2015

Country	1996-2000	2001-2005	2006-2010	2011-2015	1996-2015
BRA	0.035	0.099	0.077	0.075	0.072
CHL	0.028	0.054	0.060	0.040	0.046
COL	0.065	0.035	0.067	0.050	0.054
IDN	0.135	0.048	0.045	0.040	0.067
PHL	0.058	0.018	0.035	0.020	0.033
THA	0.084	0.025	0.030	0.022	0.040
ZAF	0.058	0.078	0.082	0.058	0.069
AVR	0.066	0.051	0.057	0.044	0.054

Source: World Bank – World Development Indicators

Note: Following Clark et al. (2004), volatility is measured as the yearly standard deviation of the growth rate of monthly exchange rates.

Note 2: The grey shadows show periods in which volatility in other countries was superior to the one in Brazil.

Exchange rate pass-through

Furthermore, heterodox authors highlight the effects of strong exchange rate pass-through in Brazil. The high exchange rate pass-through means that in the case of a currency devaluation there is a strong effect in the domestic price level. Consequently, the BCB is forced to increase the nominal interest rate to contain the increase in general prices (Ono et al. 2005, p.241). A high exchange rate pass-through is a second channel through which exchange rate volatility may affect the CBRIR, according to heterodox authors. Since exchange rate volatility changes the expected inflation rate, the monetary authority might be unable to meet the previously established target (Arestis et al. 2008, p.26). According to Barbosa-Filho (2015, p.414), by adopting an interval of tolerance of 2 percentage points, the BCB can adjust the target according to the exchange rate variations. In this case, exchange rate volatility is able to explain most of the changes in inflation in Brazil since the IT implementation. This is supported by an empirical study by Oreiro et al. (2012) that shows that the variation in the exchange rates is the main determinant of the Consumer Price Index (CPI) and central bank interest rate in the country.

The measurement of exchange rate pass-through for each country in the sample is out of the scope of this paper. However, empirical evidence show that Brazil doesn't have a higher pass-through

than Baqueiro et al. (2003, p.349) found that, for Colombia, they find that during periods of high inflation, the country has an exchange rate pass-through coefficient of 2.56, while for low inflation periods the coefficient is 0.77. Extending the model to Brazil, Silva and Vernengo (2008, pp.69-70) find the exchange rate pass-through coefficient in Brazil to be 0.91 during high inflation periods and only 0.02 for low inflation periods. Thus, although it is possible to affirm that the effect of exchange rate variation has a positive effect on inflation in Brazil, this can't be the only explanation for the high real interest rates.

Cost-push inflation

Heterodox economists don't assume that inflation is a matter of pressures from aggregate demand. The increase in prices can also occur on the supply-side, due to so-called *cost-push inflation*. This phenomenon can derive from an increase in rents (Wray, 1997), indexation of administrated prices (Summa and Serrano, 2011), devaluation of the national currency (Serrano, 2010), but mostly from aspirations from workers or capitalists (Rochon and Rossi 2006, p.9; Smithin 1994, p.99). Also known as *conflict inflation*, this latter type of increase in prices takes place because, by demanding higher wages or establishing higher profits, there is an increase in costs of production. Therefore, the distributional conflict between workers and capitalists can push prices up (Lavoie, 2014; Rochon and Rossi, 2006). Correspondingly, heterodox authors believe that the orthodox policy of controlling inflation through monetary policy isn't appropriate. This is particularly important in Brazil, where indexed prices in the economy cause cost-push inflation, which can't be prevented by setting a higher interest rate (Summa and Serrano 2011, p.4; Oreiro et al. 2012, p.563). Due to high inflation in the 1980s, many services and goods, including administered prices, were indexed to inflation in order to maintain their real values. Although there was a reduction of indexation after the *Real Plan* in 1994, a significant share of goods and services still have formally indexed prices, such as rents, energy and telecommunication (Modenesi and Modenesi 2012, p.403). In addition to the indexation, administered prices exhibit other peculiarities. Those prices show insensitivity towards interest rate changes, represent around 30% of the CPI, and have growth beyond the free-price goods and services (*ibid*, p.396), which pushes inflation further. A study by Summa and Serrano (2011, p.8) shows that average administrated price inflation has been higher than total average price growth during the 2000s. This study corroborates the hypothesis that the

indexation of administered prices has a strong effect on inflation in Brazil. Moreover, there is an 'amplifying effect' of monitored prices. For instance, exchange rate fluctuation has a greater effect on those prices than free-price good or services (Oreiro et al. 2012, p.566). Serrano (2010, p.68) affirms that these fluctuations first impact monitored prices, which are later passed onto free-price goods.

Empirically, the indexation of prices as a factor of increasing central bank interest rates up is difficult to compare due to lack of data. Although Brazil has a high indexation level, as discussed above, other countries also exhibit the same issue. In Colombia, for instance, regulated prices of electricity, gas, water and sewage are indexed to previous inflation, while fuel and transport services adjust prices according to costs (Vargas et al. 2009, p.137). Moreover, López (2008, p.24) affirms that, although showing a declining trend in relative prices with respect to free-priced goods, administered prices in Colombia have a higher annual variation than the latter, and present a high impact on total inflation, when considering its relative size in the basket of goods. Therefore, administered prices indexation is not only a feature of the Brazilian economy. Since Colombia exhibits a much lower CBRIR than Brazil, this explanation can also be regarded as insufficient.

Orthodox monetary policy

Considering the political aspect of the IT framework, Oreiro et al. (2012, p.563) claim that the BCB has an excessive concern about the inflation rate. To confirm this argument, Modenesi (2011, p.427-428) shows that the BCB has an extremely conservative reaction function: it sets the interest rate higher than necessary to fight inflation and it reduces the rate only very slowly when actual inflation is below the target. This "slow to ease, quick to hike" philosophy has been adopted by other inflation targeting central banks as well (Bibow 2013, p.623). In fact, under disinflation or economic deceleration is it likely that BCB interest rate will remain unchanged (Modenesi 2011, p.428).

Schmidt-Hebbel and Werner (2002, p.9) econometrically test the causality between CPI inflation and inflation targeting. For Brazil, they don't find any causality, probably due to the small sample period or the fact that the country already had low inflation rates when adopting the IT framework. For Chile, however, they conclude that CPI inflation caused the setting of the inflation target and

consider this finding to be consistent with the argument that the Central Bank of Chile was conservative during the setting of its targets during the 1990s. In that way, Brazil seems not to be the only country in which the Central Bank set conservative targets to reduce inflation.

To conclude, heterodox economists believe that the BCB's interest rate policy has another purposes beyond controlling inflation directly: to control exchange rate volatility due to high exchange pass-through. Moreover, due to a wrong approach to the causes of inflation, the BCB is unable to reduce inflation effectively. Therefore, the interest rate ends up being set at a much higher level than it should be. A resume of heterodox arguments can be found in Table 9.

Table 9: Resume of heterodox arguments for the high real interest rate in Brazil

Argument	Proponents	Cross-country comparison	Empirical support?
Exchange rate volatility	Arestis et al., 2008; Sicsú 2002	South Africa has strong volatility as well	✗
High exchange rate pass-through	Baltar, 2015; Ono et al., 2005; Oreiro et al., 2012	Brazil shows a lower coefficient than Colombia	✗
Cost-push inflation	Modenesi and Modenesi, 2012; Oreiro et al., 2012; Serrano, 2010; Summa and Serrano, 2011	Colombia exhibits indexation of administered prices too	✗
BCB conservatism	Modenesi, 2011; Oreiro et al., 2012	Chile also implemented conservative targets in the 1990s	✗

As we could see, the stylized facts show us the fragility of the current analyses for the case of Brazil. However, in order to test for the general explanatory power of each argument, I will use an econometric analysis to investigate whether those could be relevant in a context of developing countries under the IT regime. Moreover, the econometric analysis will provide evidence on country-specific characteristics that are not captured by the existing explanations.

3. Econometric analysis of the determinants of central bank real interest rates

This section develops a panel analysis of the determinants of central bank real interest rates based on the orthodox and heterodox explanations presented above. The sample consists of Brazil (BRA), Chile (CHI), Colombia (COL), Indonesia (IDN), Mexico (MEX), Peru (PER), Philippines (PHL), Poland (POL), Thailand (THA), Turkey (TUR) and South Africa (ZAF). The time period is 1996 – 2015. I start from the following general regression equation:

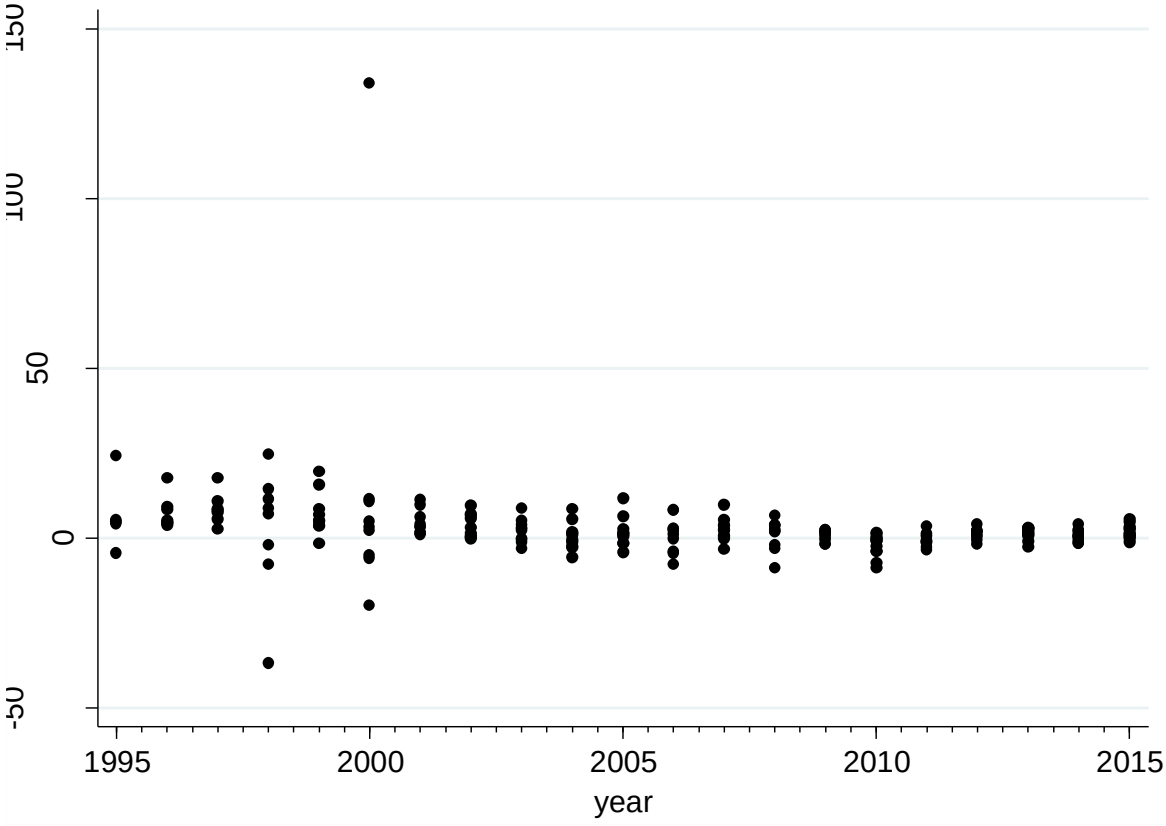
$$(1) \qquad CBREAL_{it} = \alpha_i + \beta_1 SAV_{it} + \beta_2 RULE_{it} + \beta_3 KCONTR_{it} + \beta_4 XRVOL_{it} + \beta_5 IT_{it} + \beta_6 FED_t + \beta_7 GDP_{it} + \varepsilon_{it}$$

Where *CBREAL* is the central bank real interest rate, α_i is the fixed effect of each country, *SAV* is gross domestic savings as share of GDP, *RULE* is the rule-of-law index, *KCONTR* is an index for overall restrictions to inflow and outflow of assets and *XVOL* is the volatility of nominal bilateral exchange rates with respect to the U.S. dollar. Three other control variables are added: *IT* is a dummy variable for the years in which the country was under the inflation-targeting framework (0 is not under IT and 1 is under IT), *FED* is the effective federal funds rate of the United States and *GDP* is the GDP growth[6].

Figure 1 shows a scatter plot of the dependent variable. We can see that Turkey's value of 133.97 in the year 2000 constitutes an extreme outlier. It has thus been removed from the sample.

[6]Appendix A displays detailed information on these variables.

Figure 1: Scatter plot for the CBREAL variable for all the countries in the sample



I estimate the model using a simple within estimator and run different tests to control for certain effects that could bias the estimations. First, I check for unit roots in the time series. I conduct Fisher type panel unit root tests for all time series variables using the augmented Dickey-Fuller test with time lag one. The mean of the series across the panel for each period has been subtracted in order to correct for cross-sectional dependence and the *drift* option is used since the mean of each variable is nonzero for all the countries in the sample. Second, I conduct a Hausman test to decide between random and fixed effects. The result indicates the use of fixed effects. Then, I perform a Wald test which suggests no time fixed effects. Fourth, a modified Wald test showed the presence of heteroskedasticity in the model. Lastly, in order to test for autocorrelation, I run the Wooldridge test for autocorrelation in panel data and the result indicates first-order autocorrelation (AR1) in the model.

In order to account for the problems of autocorrelation and endogeneity, I chose the autoregressive distributed lag (ADL) approach to find the right lag structure for the model. I start from a general model with contemporaneous explanatory variables and two time lags each, including the

dependent variable. The Pesaran test for cross-sectional independence was not rejected, which suggests the presence of cross-sectional independence. Therefore, I apply robust standard errors to correct heteroskedasticity. Then I successively withdraw the explanatory variables with the lowest *t-value* until I reach a model with one explanatory variable each. The resulting model is the following:

$$(2) \quad CBREAL_{it} = \alpha_i + \beta_1 CBREAL_{it-1} + \beta_2 SAV_{it-1} + \beta_3 RULE_{it-1} + \beta_4 KCONTR_{it-1} + \beta_5 XRVOL_{it} + \beta_6 IT_{it-2} + \beta_7 FED_{t-2} + \beta_8 GDP_{it-1} + \varepsilon_{it}$$

Where the description of variables are the same as in equation (1), but with different time lags. I employ four different methods to estimate equation (2). The first one is the fixed-effects estimation with robust standard errors of the ADL model given by equation (2) (RB), which corrects for heteroskedasticity and first order autocorrelation. The Peasaran test indicates that the model (2) suffers from cross-sectional dependence. I thus use the fixed-effect method with Driscoll-Kraay standard errors (DK) correcting for heteroskedasticity and cross-sectional dependence as a second estimation method. Then I use the Pesaran & Smith (1995) Mean Group Estimator (MGE) that allows for heterogeneous slope coefficients across group members and corrects for cross-sectional dependence with robust standard errors. Lastly, I apply a regression using the first difference of both dependent and explanatory variables as to account for autocorrelation and heteroskedasticity.

The specifications are described in table 10, while the results are shown in table 11.

Table 10: Methodology of each ADL estimation

Specifica-tion	Estimation method	Unobserved country fixed effect	Standard Errors	Correct for heteroske-dasticity	Correct for Autocorrela-tion AR1	Correct for Cross-sectional dependence
(1) RB	Within	Fixed	Robust	✓	✓	×
(2) DK	Within	Fixed	Driscoll-Kraay	✓	×	✓
(3) MG	Mean group		Robust	✓	×	✓
(4) FD	Within	Fixed	Robust	✓	✓	×

Table 11: Estimations of equation (2)

Dependent variable: central bank real interest rate (*CBREAL*)				
	(1) RB	**(2) DK**	**(3) MG**	**(4) FD**
$CBREAL_{it-1}$	0.18**	0.18**	0.26***	-0.15
	(0.08)	(0.07)	(0.07)	(0.10)
SAV_{it-1}	0.22	0.22**	0.21	-0.07
	(0.13)	(0.08)	(0.36)	(0.25)
$RULE_{it-1}$	-2.27	-2.27*	5.49	4.37
	(1.73)	(1.08)	(6.42)	(3.38)
$KCONTR_{it-1}$	1.62	1.62	0.01	-9.91**
	(2.26)	(2.76)	(9.19)	(4.75)
$XRVOL_{it}$	0.54	0.54**	0.55	-0.18
	(0.33)	(0.23)	(1.01)	(0.55)
IT_{it-2}	-5.24***	-5.24***	-2.98***	-2.02
	(0.90)	(0.23)	(1.14)	(1.88)
FED_{t-2}	0.11	0.11	0.14	0.42**
	(0.12)	(0.19)	(0.17)	(0.21)
GDP_{it-1}	0.09	0.09	0.18	-0.16*
	(0.10)	(0.10)	(0.18)	(0.07)
Observations	149	149	143	115
Groups	11	11	10	11
Time period	**1996 – 2015**	**1996 – 2015**	**1996 – 2015**	**1996 – 2015**
F-test	0.0000***	0.0002***	0.0035**	0.0000***

Note: * statistically significant at the 10% level, ** statistically significant at the 5% level, *** statistically significant at the 1% level

Note 2: Values in the brackets correspond to standard errors

As a final robustness check, I redo the ADL method with fixed-effects and robust standard errors, and successively remove the variables with the lowest t-value until only statistically significant variables remain, which turn out to be $CBREAL_{it-1}$ and IT_{it-2}.

As it is possible to notice, no explanatory variable is statistically significant across all specifications. Except for the estimations using first differences, the IT regime dummy variable is statistically significant in most specifications and has a negative effect on CBRIR. In the first specification, for instance, implementing the IT framework reduces *CBREALs* by about 5.2 percentage points on average two years later. Thus, there is some evidence that the IT framework reduced the CBRIR in the sample. This result is at odds with the argument that the IT framework is beneficial for the rentier class as a whole as made by Epstein (1992, 2002) and Papadatos (2009). This is a puzzling finding that may warrant further research. Apart from IT no other variable is statistically significant in more than one specification. Therefore, none of the other explanatory variables can be considered robust.

In conclusion, the results show that the proposed explanations for CBRIR determination in developing countries under IT cannot obtain strong econometric support. The weak performance of the explanatory variables points to the relevance of omitted variables that are partly captured by the country specific constants. A closer look at the country specific constant also shows whether Brazil still exhibits a significantly higher CBRIR after controlling for other factors. Table 12 displays the country specific constants of the sample obtained from specification (1).

Table 12: Unobserved country fixed effects of sample countries

Country	Fixed effect
BRA	5.22
CHL	-0.76
COL	0.15
IDN	-3.04
MEX	-0.27
PER	-0.45
PHL	-0.47
POL	0.67
THA	-1.10
TUR	-0.41
ZAF	0.34

Here it is possible to see that Brazil has a very high fixed effect 5.22, while other countries had smaller and even negative country specific constants. What could explain this strong variance in country specific factors that are not captured by the model?

A possible explanation is that central bank policy is affected by political determinants that have not been properly considered by the economic literature on interest rates in Brazil. Different authors have pointed to the strong political power of rentiers in the country, although not providing empirical evidence to the maintenance of high CBRIR in Brazil. Boito Jr. (2008, p.79-80) mentions the approximation of industrialists with workers movements in 1996 to protest against neoliberal reforms and the increase of interest rates, which were considered to be a pro-rentier policy. Singer (2015) writes about the attempt of the active reduction of CBRIR in 2012 and 2013 by the former president Dilma Rousseff. He shows how expansionary monetary policies caused a strong reaction from the rentier class and later, even industrialist organizations, as a result of an elite coalition. Another aspect of the opposition of industrialists to decreasing CBRIR is also investigated by Bruno (2011) that points out the increasing financialization of firms in Brazil, thus aligning the

interest of industrialists to the one of rentiers. Finally, Vernengo (2008) explains how the rentier class and financial capital benefit from the current monetary regime with high real policy rates, while workers and firms bear the costs of such restrictive monetary policies. Even if the discussion on the political power of rentiers is conceivable, empirical investigation on this matter is still lacking and should be dealt with in future research.

The question could be addressed by analyzing the composition of high level administration of each country in order to assess the policy making power of the financial sector, as it has been done already for the United States' case (Bellamy Foster and Holleman 2010). Another method would be to estimate the capital flows as a proxy for the pressure of the rentiers with respect to changes in the CBRIR in each country and compare the results. In this case, if a decrease in CBRIR would have a stronger effect on capital outflows from Brazil than other countries, *ceteris paribus*, it could be concluded that the rentier class is able to easily transfer its capital, thus leading to a stronger bargaining power.

4. Conclusion

This paper presented orthodox and heterodox views in order to explain the high CBRIR in Brazil. After a comparison of stylized facts between Brazil and other developing countries under the IT framework, it was concluded that the existing arguments are not sufficient to explain why the CBRIR is much higher in Brazil than in other countries. After analyzing stylized facts, I developed an econometric model that included the most important variables proposed by the two opposing views and tested it empirically using a panel data. The result corroborated the comparative analysis and showed that all proposed variables perform weakly as predictors of CBRIR in developing countries under inflation targeting. There is some weak evidence that the introduction of the IT regime in the selected countries reduces CBRIR, in contrast to what some heterodox authors have argued. Another conclusion of the econometric analysis regards the unobserved country fixed effects of the sample countries. In comparison to other countries, Brazil had a very high coefficient, which means that there are some specificities of the country that are not captured by the model. Based on the political economy literature, my suggestion is that the rentier class in Brazil has a strong influence over the establishment of central bank policy rates that may help explain the

phenomenon of extraordinarily high real interest rates. This presumption has to be addressed in further research.

Currently facing a severe recession together with accelerating inflation, Brazil needs to reconsider its policies of high interest rates, which seem not to effective in bringing down inflation. Thus, the country needs to adopt alternative measures to deal with inflation, while at the same time considering the distributive policies that must take place as to stimulate growth and provide social justice.

Appendix A: Description of variables used in model (1)

Table A1: Dependent variable's measures, period and sources

Country	Variable	Measure	Period	Source
BRA	SELIC/TCB	Simple average	1996 – 2015	Central Bank of Brazil
CHI	Tasas de interés de referencia de la política monetaria	Simple average	1995 – 2015	Central Bank of Chile
COL	Tasa de intervención Banco de la República	Simple average	1995 – 2015	Banco de la Republica
IDN	Central bank policy rate	Percentage per annum	1995 – 2015	International Financial Statistics, IMF
MEX	Tasa de fondeo bancario	Weighted average	2008 – 2015	Bank of Mexico
PER	Tasa Referencia de Politica Monetaria	Simple average	2003 – 2015	Central Reserve Bank of Peru
PHL	RRP Rate (term)	Simple average	1995 – 2015	Central Bank of the Philippines
POL	Reference rate	Simple average	1998 – 2015	Narodowy Bank Polski
THA	Max. interest rates of fixed deposits (1 year)	Simple average	1995 – 2015	Bank of Thailand
TUR	Central bank policy rate	Percentage per annum	1999 – 2015	International Financial Statistics, IMF
ZAF	Central bank policy rate	Percentage per annum	1995 – 2015	International Financial Statistics, IMF

Table A2: Explanatory variables

Variable	Abbr.	Measure	Period	Source
Gross domestic savings (% of GDP)	*SAV*	Gross domestic savings are calculated as GDP less final consumption expenditure (total consumption).	1996 – 2015	World Development Indicators, World Bank
Rule-of-law	*RULE*	Index of an estimation of the confidence that agents have in the rules of society	1996 – 2014	Worldwide Governance Indicators, World Bank
Capital control	*KCONTR*	Overall restrictions index (all assets categories)	1996 – 2013	Fernández et al., 2015
Exchange rate volatility	*XRVOL*	Yearly standard deviation of the first difference of monthly nominal values (local currency per USD) in log, as defined by the IMF (2004)	1996 – 2015	USDA, Economic Research Service
Inflation-targeting	*IT*	Dummy variable for the years under the inflation-targeting framework	1996 – 2015	Hammond, 2012
Effective federal funds rate	*FED*	Volume-weighted median of overnight federal funds transactions	1996 – 2015	Federal Reserve Economic Data
GDP growth	*GDP*	Annual percentage growth rate of GDP at market prices based on constant local currency.	1996 – 2015	World Development Indicators, World Bank

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