Foreign Exchange Markets and Macroeconomic Policies in Brazil

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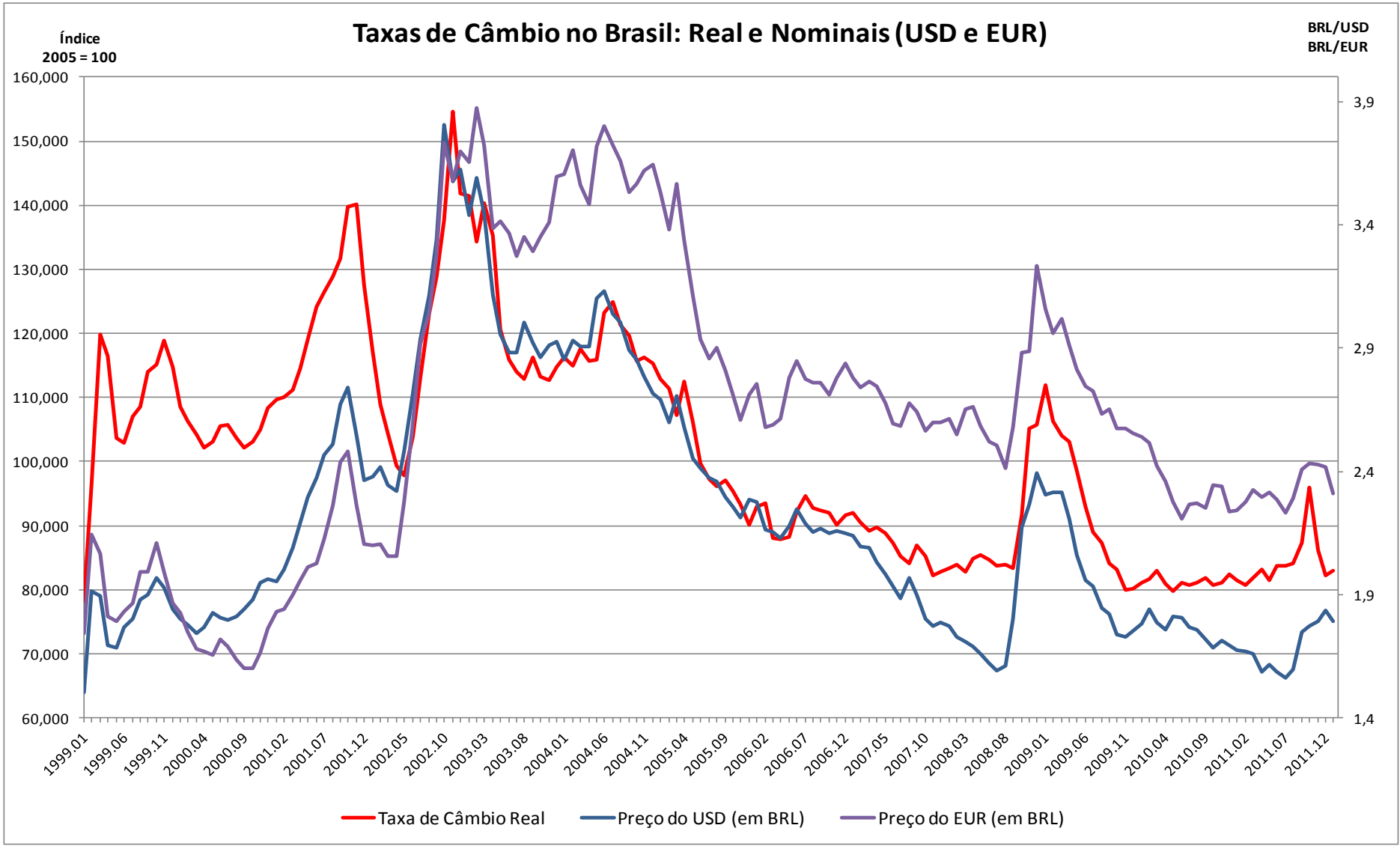
Taxas de Câmbio no Brasil: Real e Nominais (USD e EUR)
Índice
2005 = 100
BRL/USD
BRL/EUR
160,000
150,000
140,000
130,000
120,000
110,000
100,000
90,000
80,000
70,000
60,000
3,9
3,4
2,9
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1999.01
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2006.12
2007.05
2007.10
2008.03
2008.08
2009.01
2009.06
2009.11
2010.04
2010.09
2011.02
2011.07
2011.12
Taxa de Câmbio Real
Preço do USD (em BRL)
Preço do EUR (em BRL)

Plan of the presentation

1) Interest rate differentials, capital flows, exchange rate derivatives and carry-trade
2) Cost-benefit analysis of foreign reserves accumulation
3) Effectiveness of sterilized exchange-rate interventions: empirical tests
4) Interventions repercussions in exchange-rate derivatives markets
5) Concluding remarks

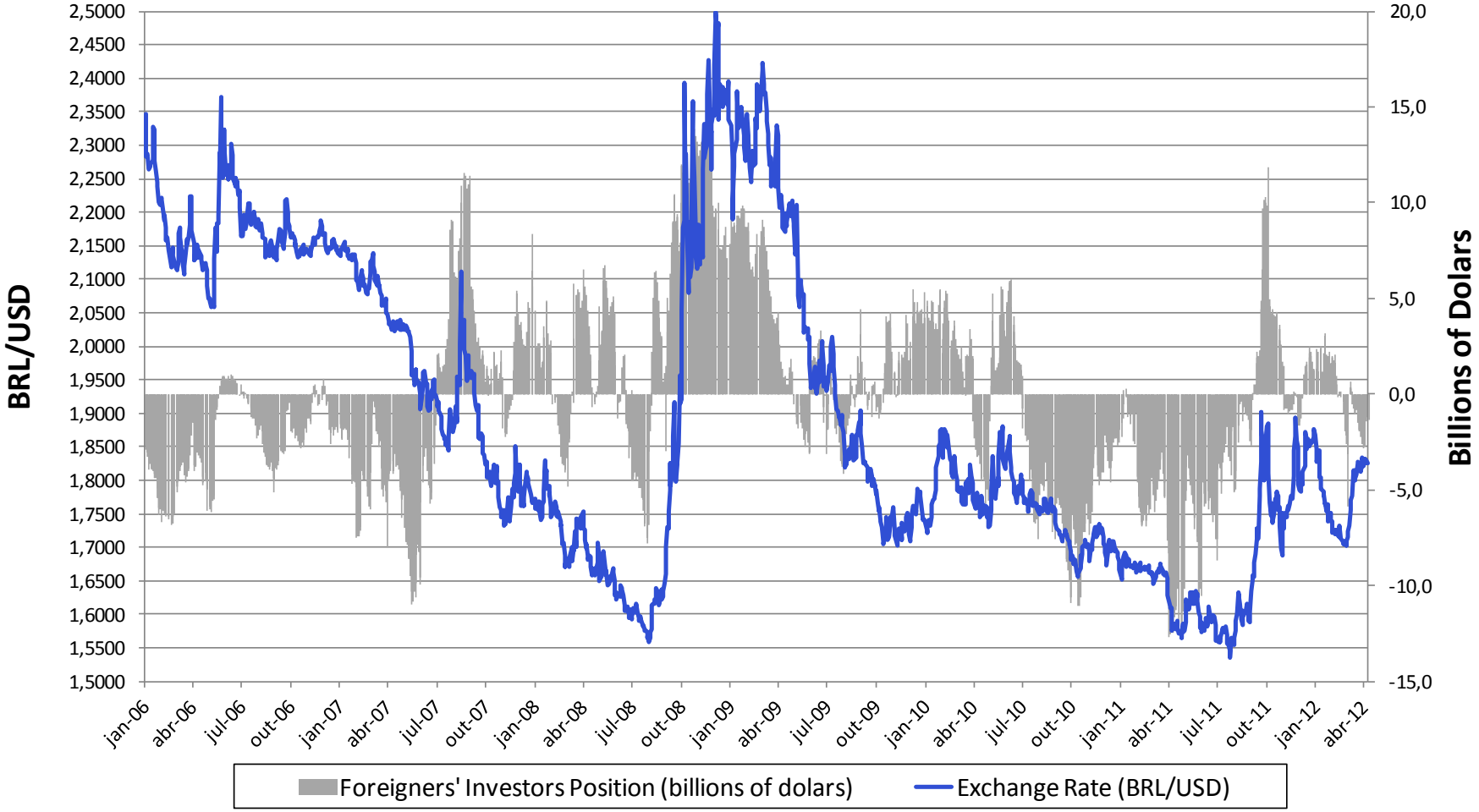
1. Interest Differential, Capital Flows, Exchange Rate Derivatives and Carry-Trade

- The aim of this part is to estimate the importance of the carry-trade in the appreciation of the BRL.
- The high interest rate differential attracts capitals through derivatives (*NDF*s of BRL, sale of exchange rate derivatives—USD futures—at BM&F Bovespa), and this impacts the spot exchange rate.
- Despite the fact that the theory is quite clear, it is very hard to get data on carry-trade, since the majority of those financial strategies are conducted inside large internacional banks.
- A good data source exists in Brazil: the BM&FBovespa.
- Foreigners have tax exemption if they identify themselves (CMN Res. 2689).

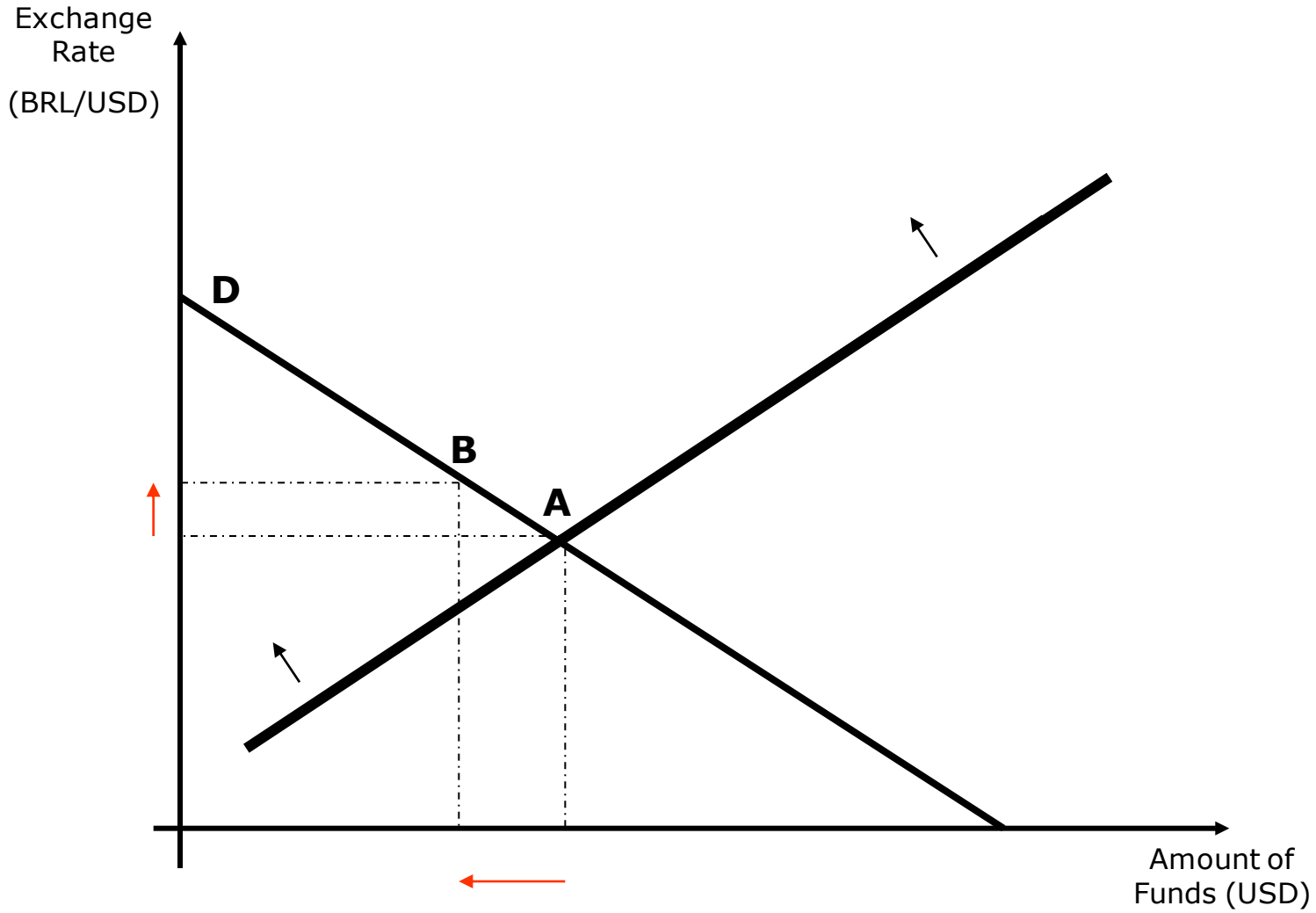
1. Interest Differential, Capital Flows, Exchange Rate Derivatives and Carry-Trade

- Data show that changes in the open interest in USD futures (short position) of the nonresident (foreign) investors present strong correlation with the exchange rate.
- When foreigners' open interest rises, the USD falls (the BRL appreciates), and vice-versa. This is compatible with a shift of the funds "supply" curve over a (very short-term) stable "demand" curve.

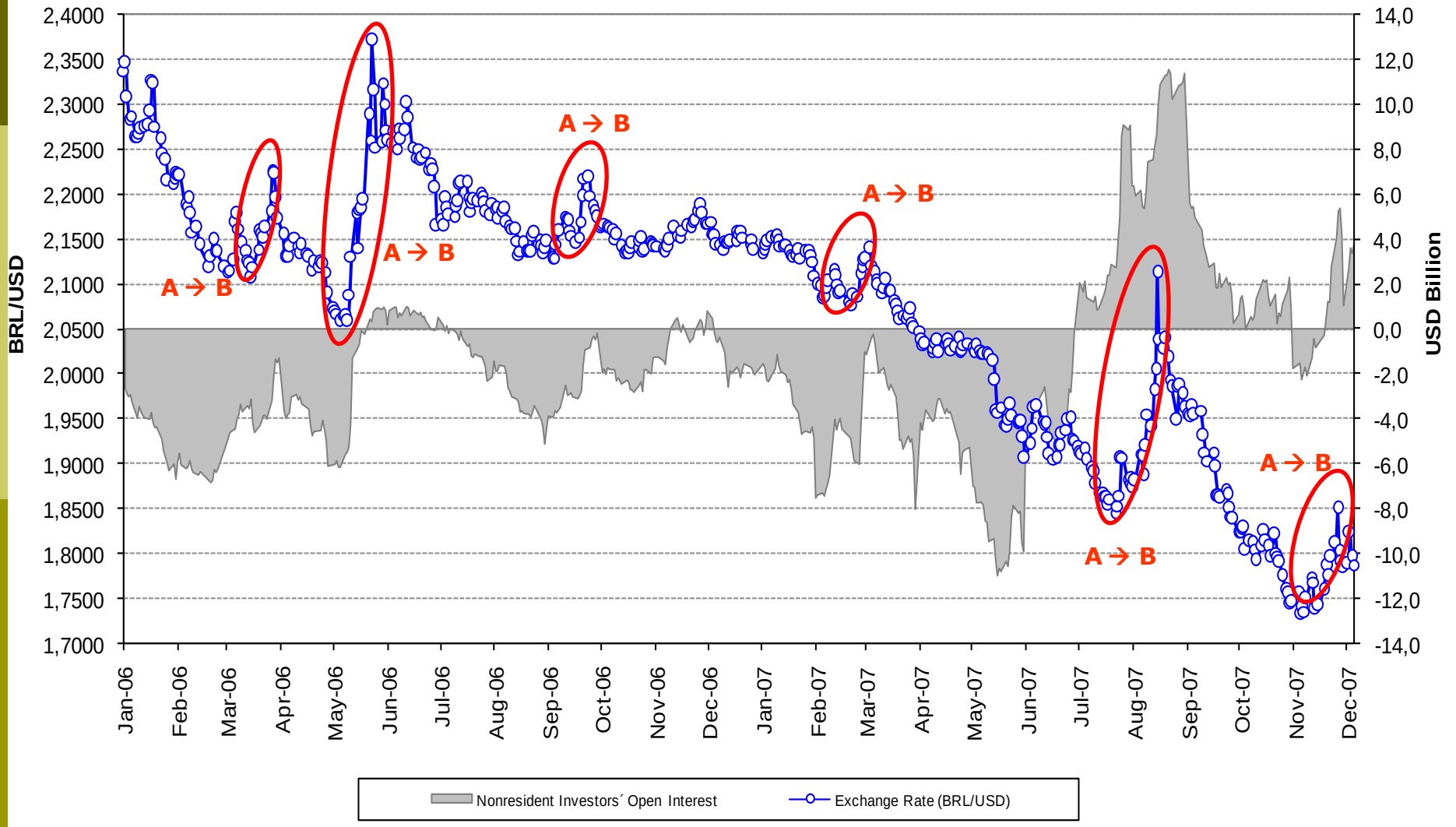
FOREIGNERS' OPEN INTEREST IN THE FUTURE EXCHANGE RATE MARKET



Interaction Between Funds Supply and (very short-term) Stable Demand

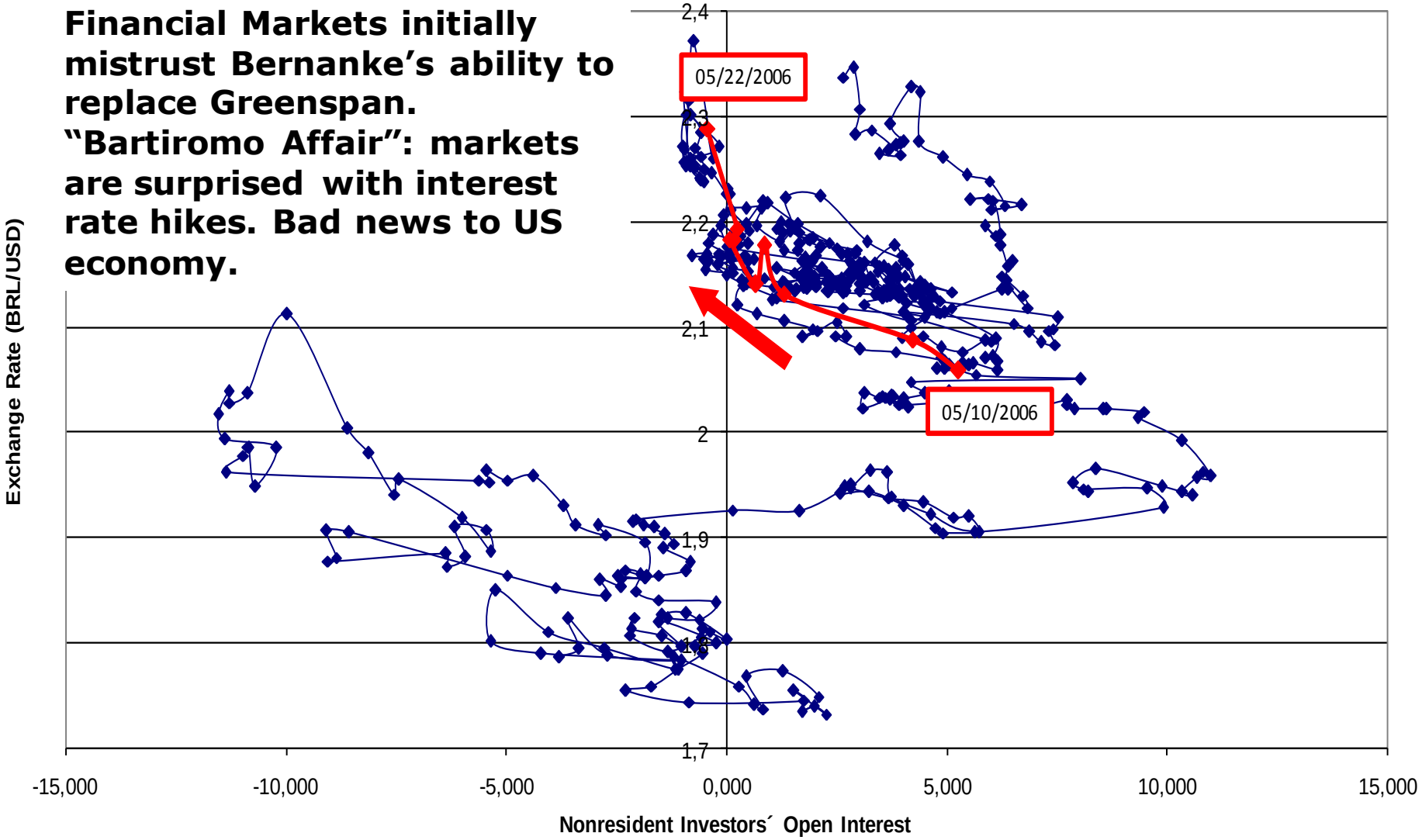


NONRESIDENT INVESTORS´ OPEN INTEREST IN USD FUTURES CONTRACTS X EXCHANGE RATE

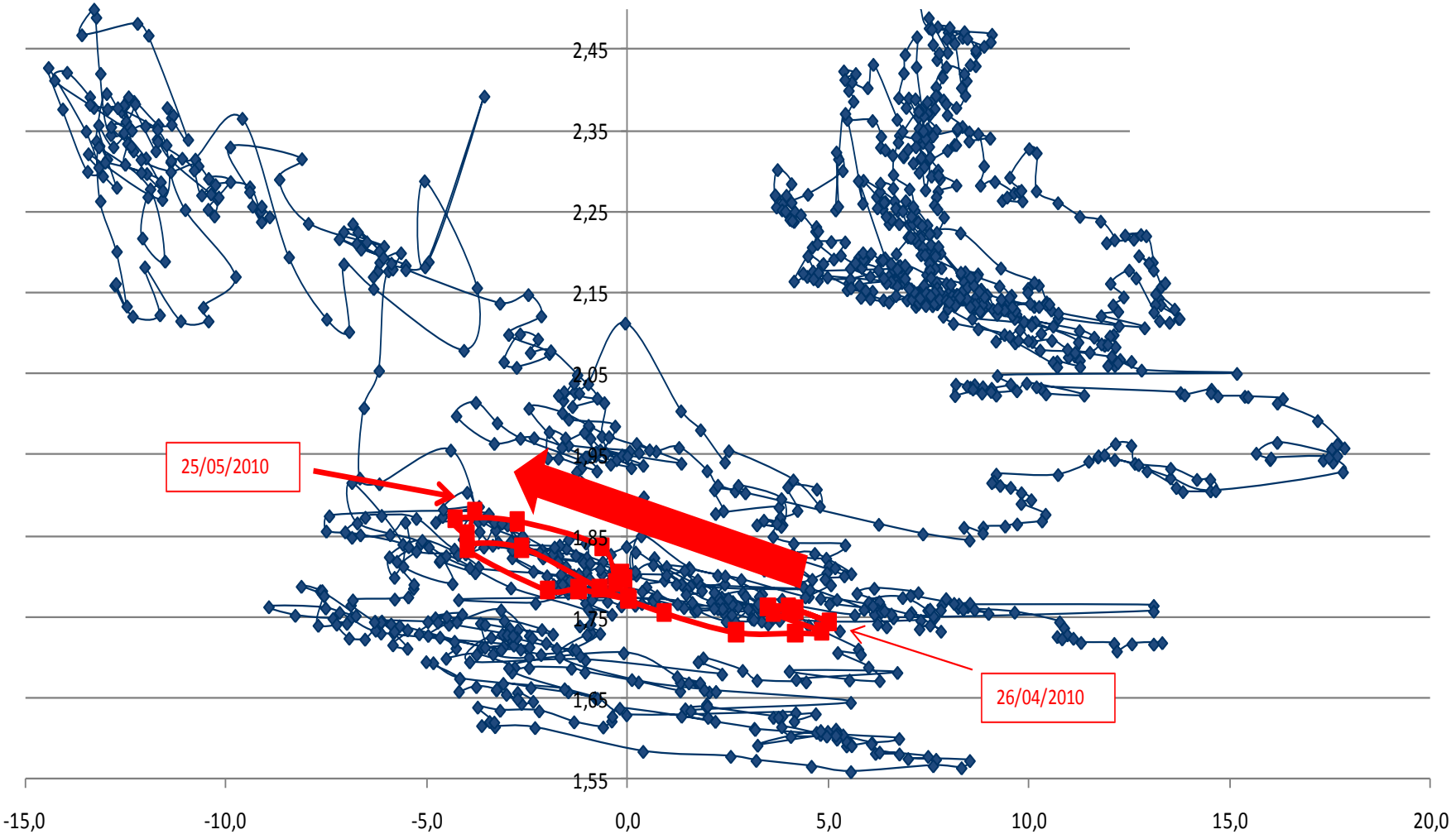


NONRESIDENT INVESTORS´ OPEN INTEREST IN USD FUTURES CONTRACTS X EXCHANGE RATE

Financial Markets initially mistrust Bernanke's ability to replace Greenspan. "Bartiromo Affair": markets are surprised with interest rate hikes. Bad news to US economy.



NONRESIDENT INVESTORS' OPEN INTEREST IN USD FUTURES CONTRACTS x EXCHANGE RATE



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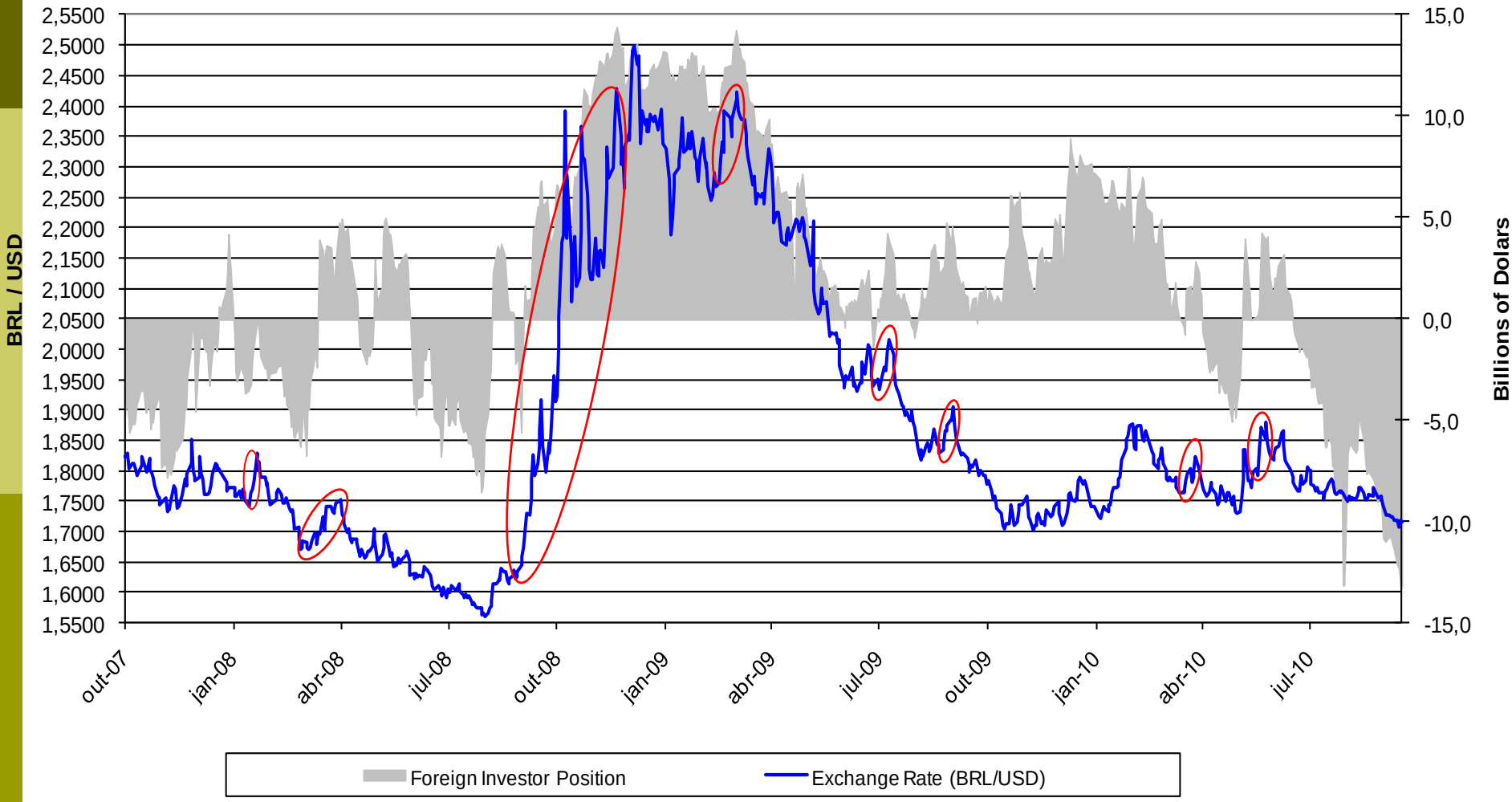
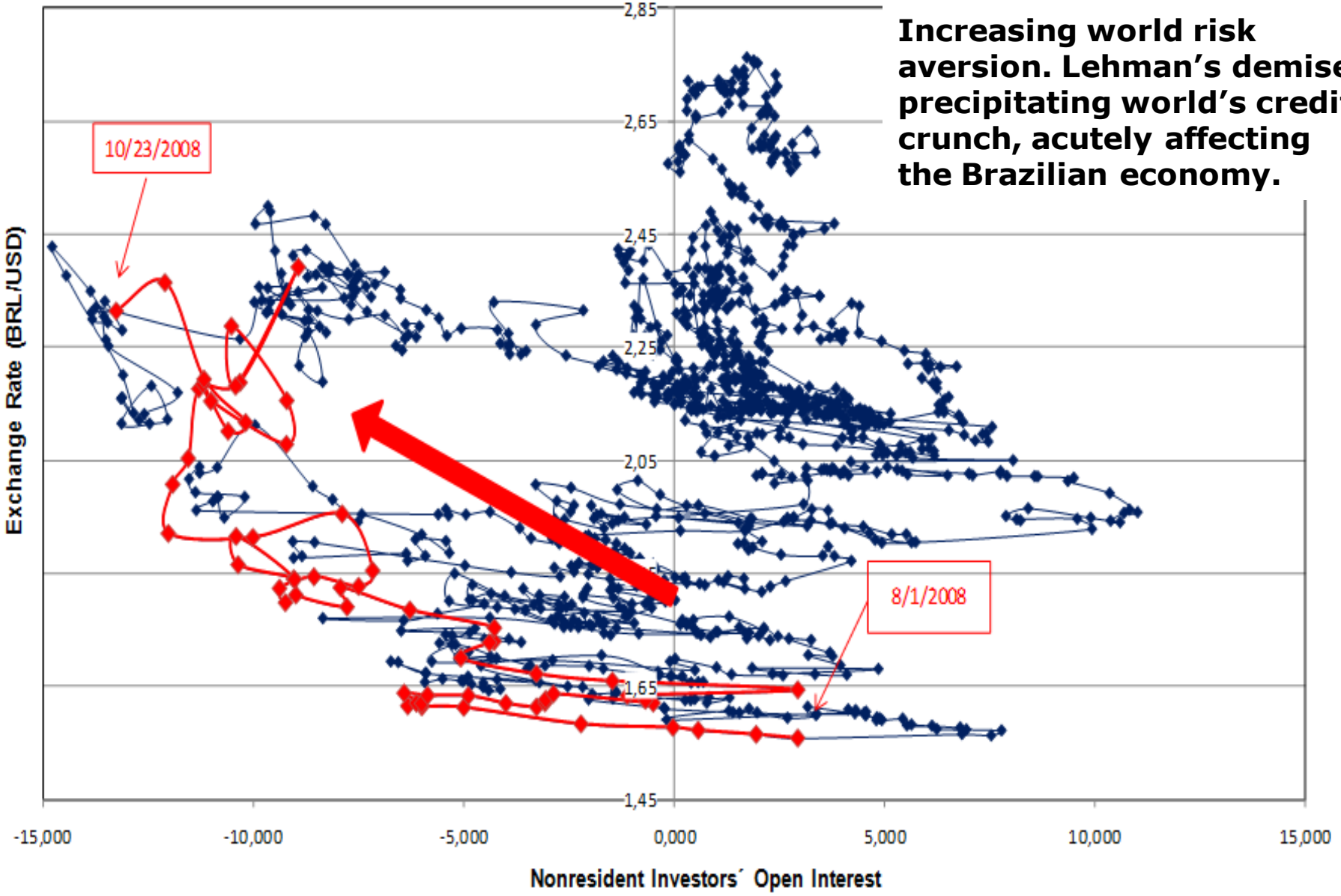
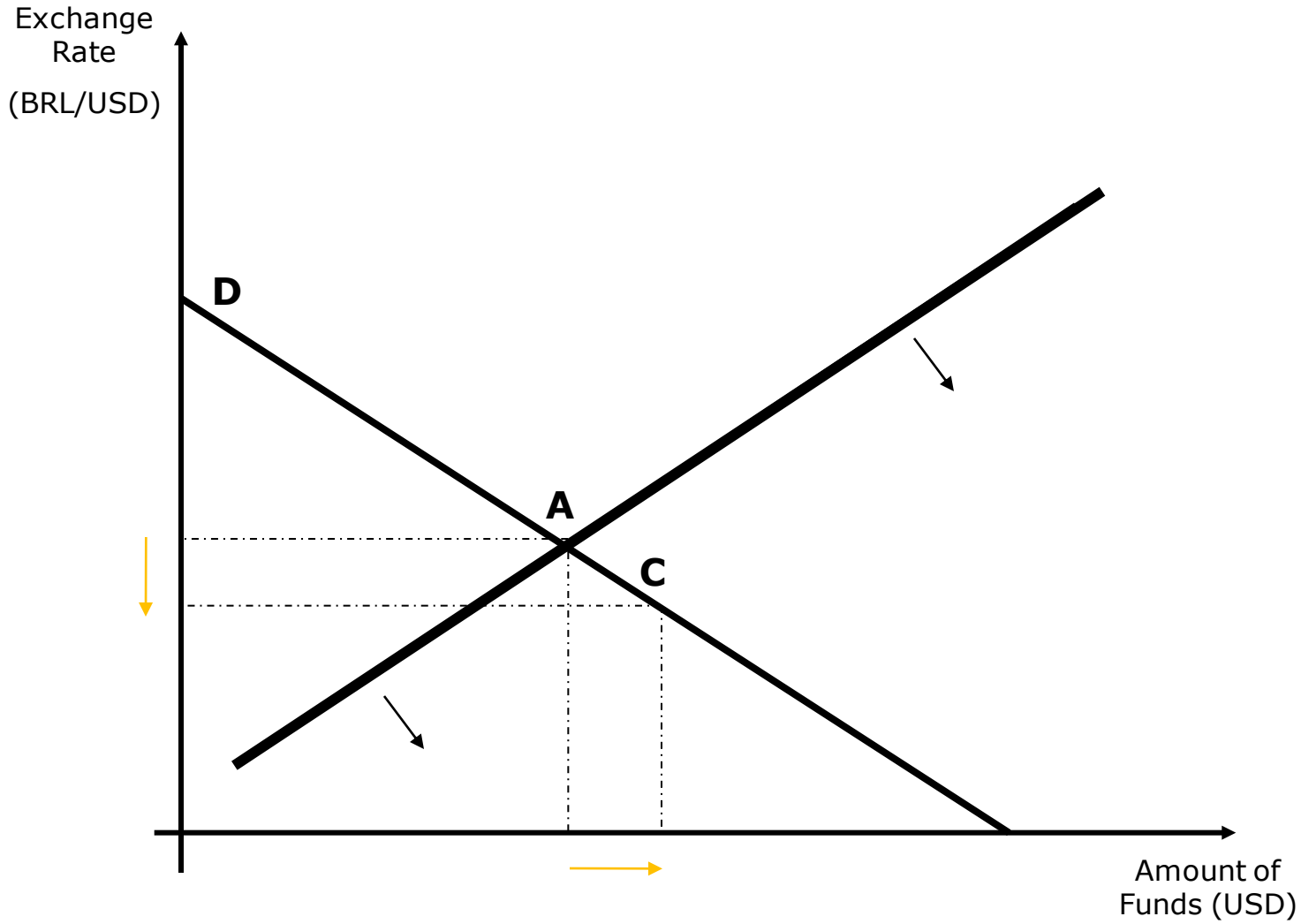


Nonresident Investors' Open Interest in USD Futures Contracts X Exchange Rate



Increasing world risk aversion. Lehman's demise precipitating world's credit crunch, acutely affecting the Brazilian economy.

Interaction Between Funds Supply and (very short-term) Stable Demand



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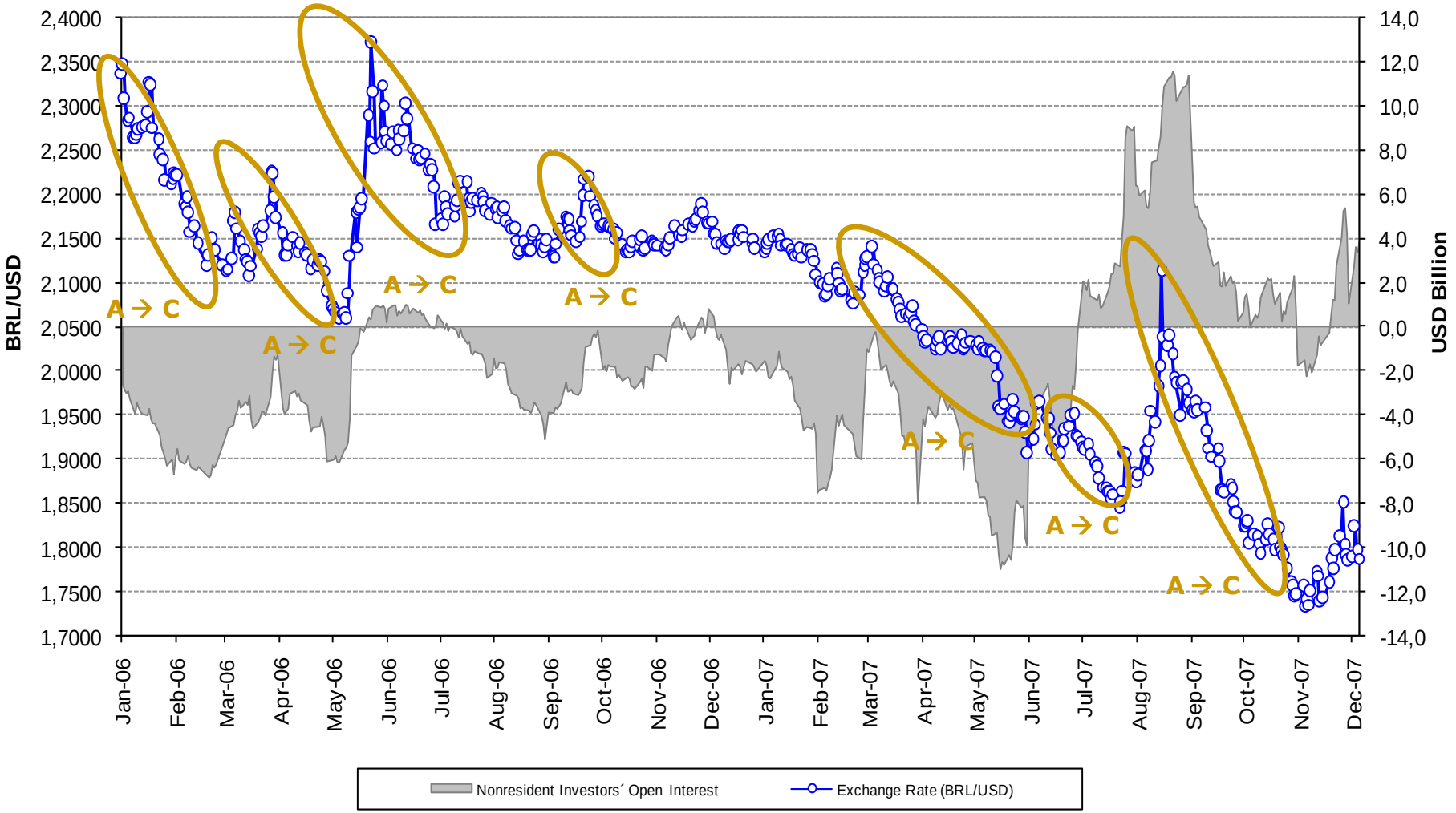

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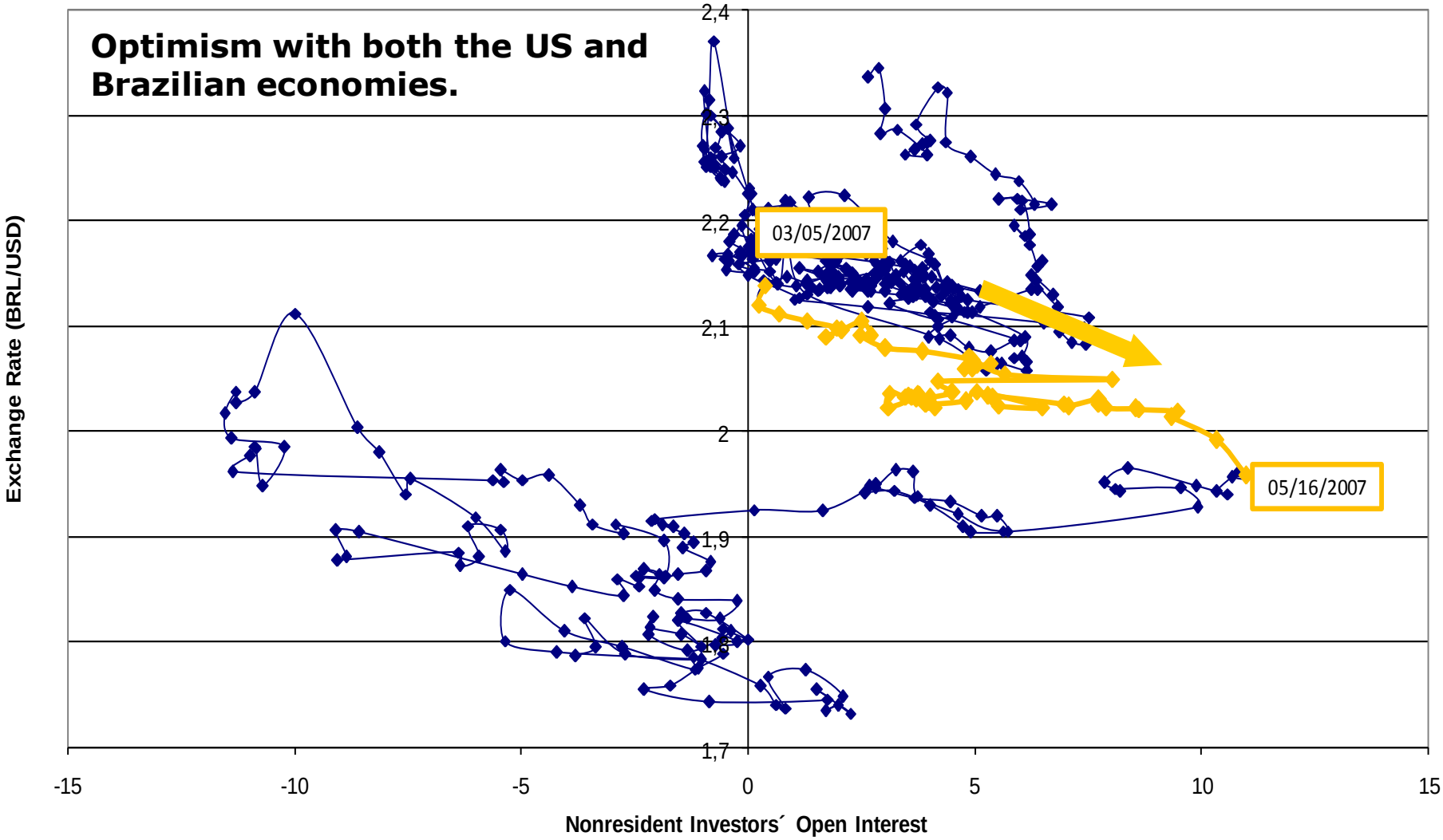
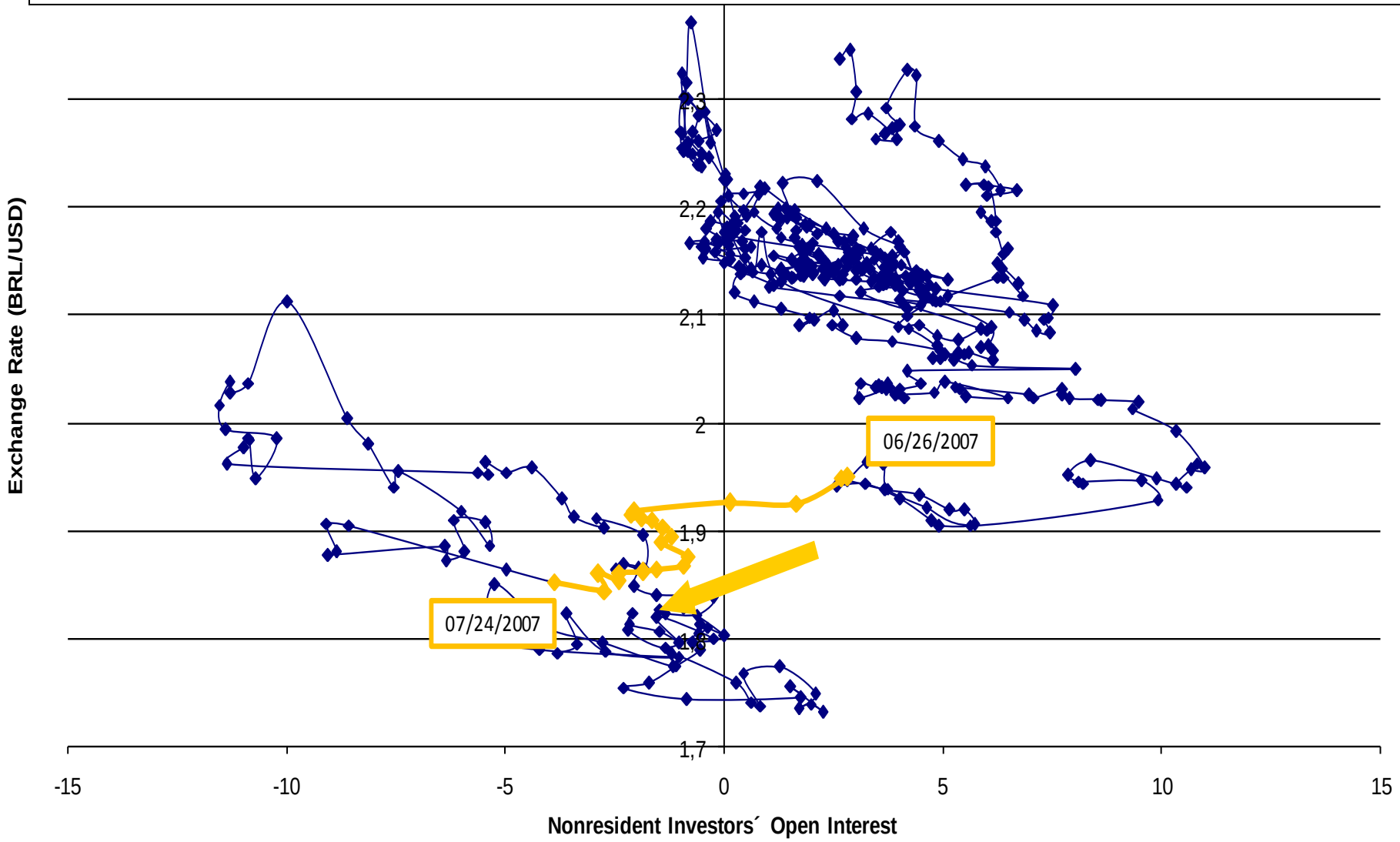


NONRESIDENT INVESTORS´ OPEN INTEREST IN USD FUTURES CONTRACTS X EXCHANGE RATE

This movement of appreciation, which preceded the subprime crises, is the only one that occurs with the shift of the foreigners' open interest from short to long.



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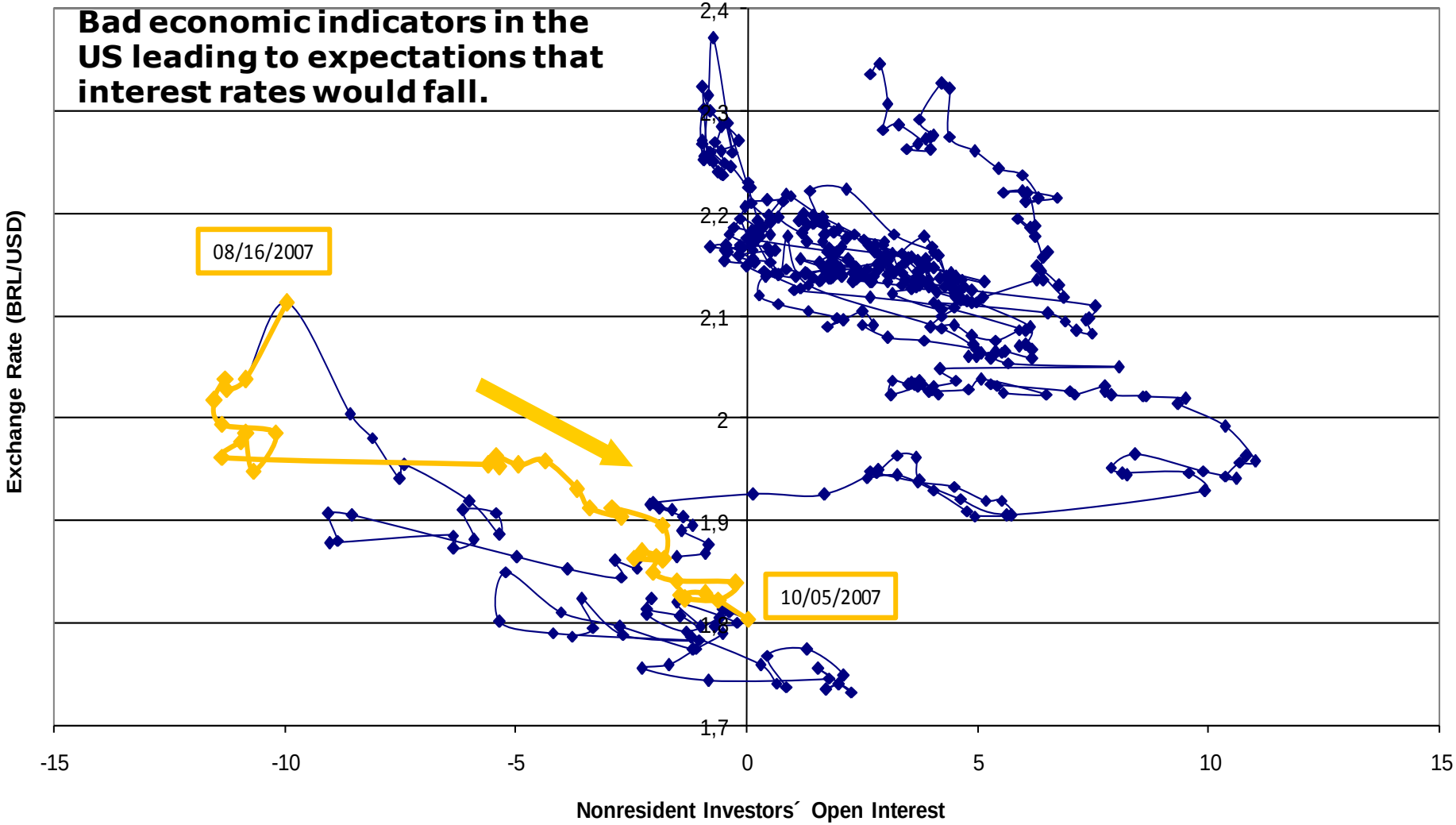
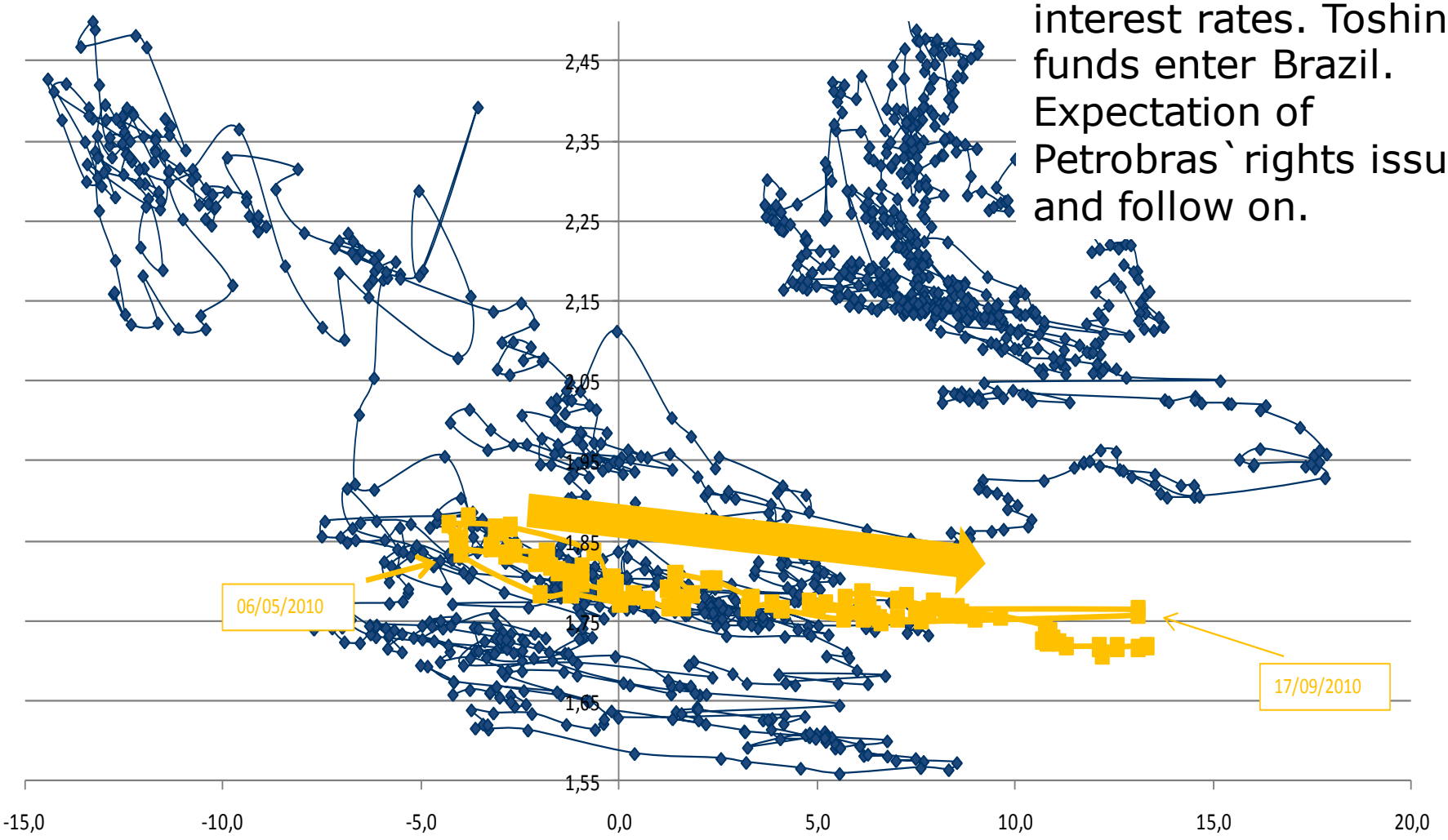
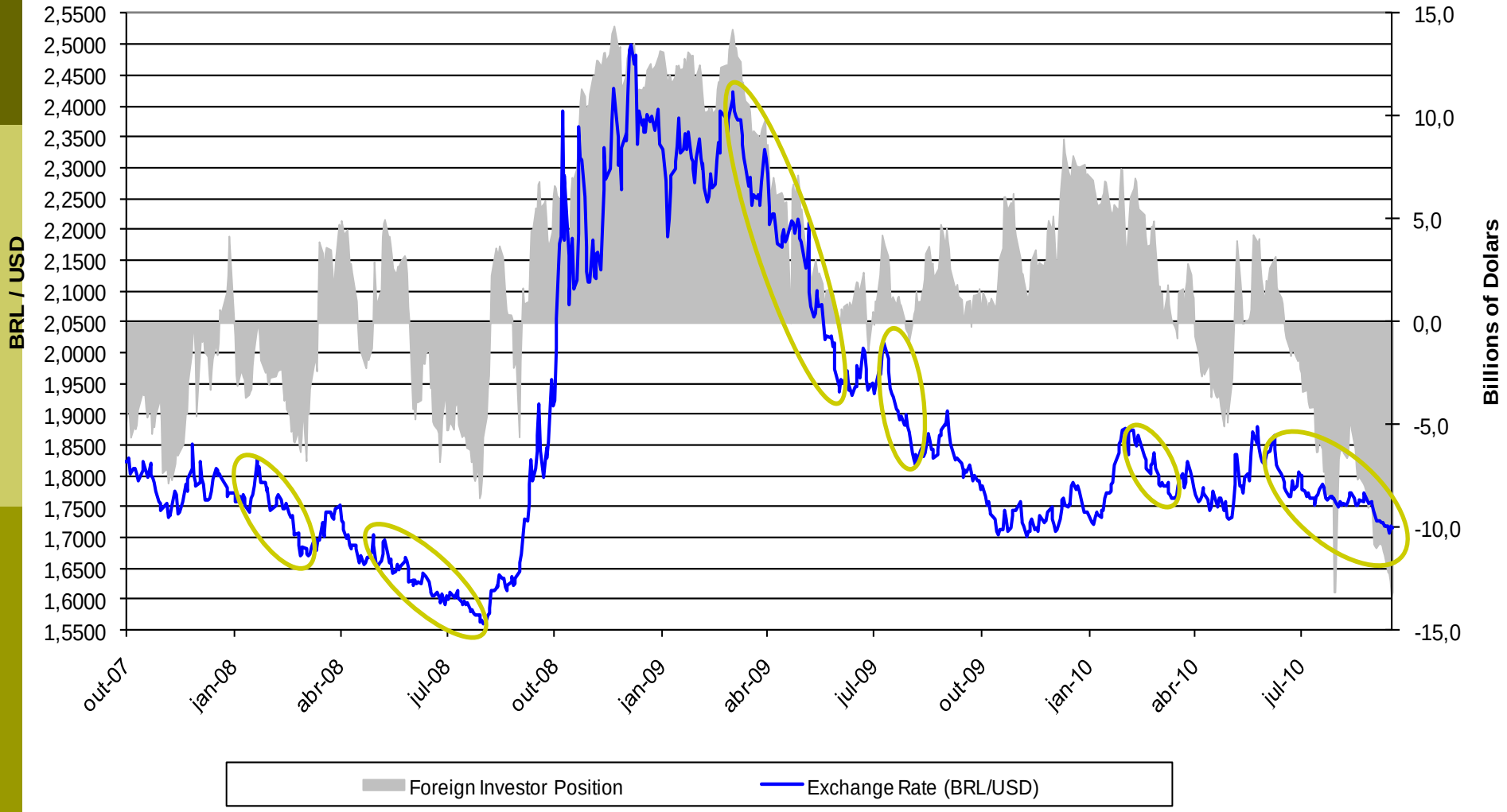


NONRESIDENT INVESTORS' OPEN INTEREST IN USD FUTURES CONTRACTS x EXCHANGE RATE

Low US long term interest rates. Toshin funds enter Brazil. Expectation of Petrobras` rights issue and follow on.



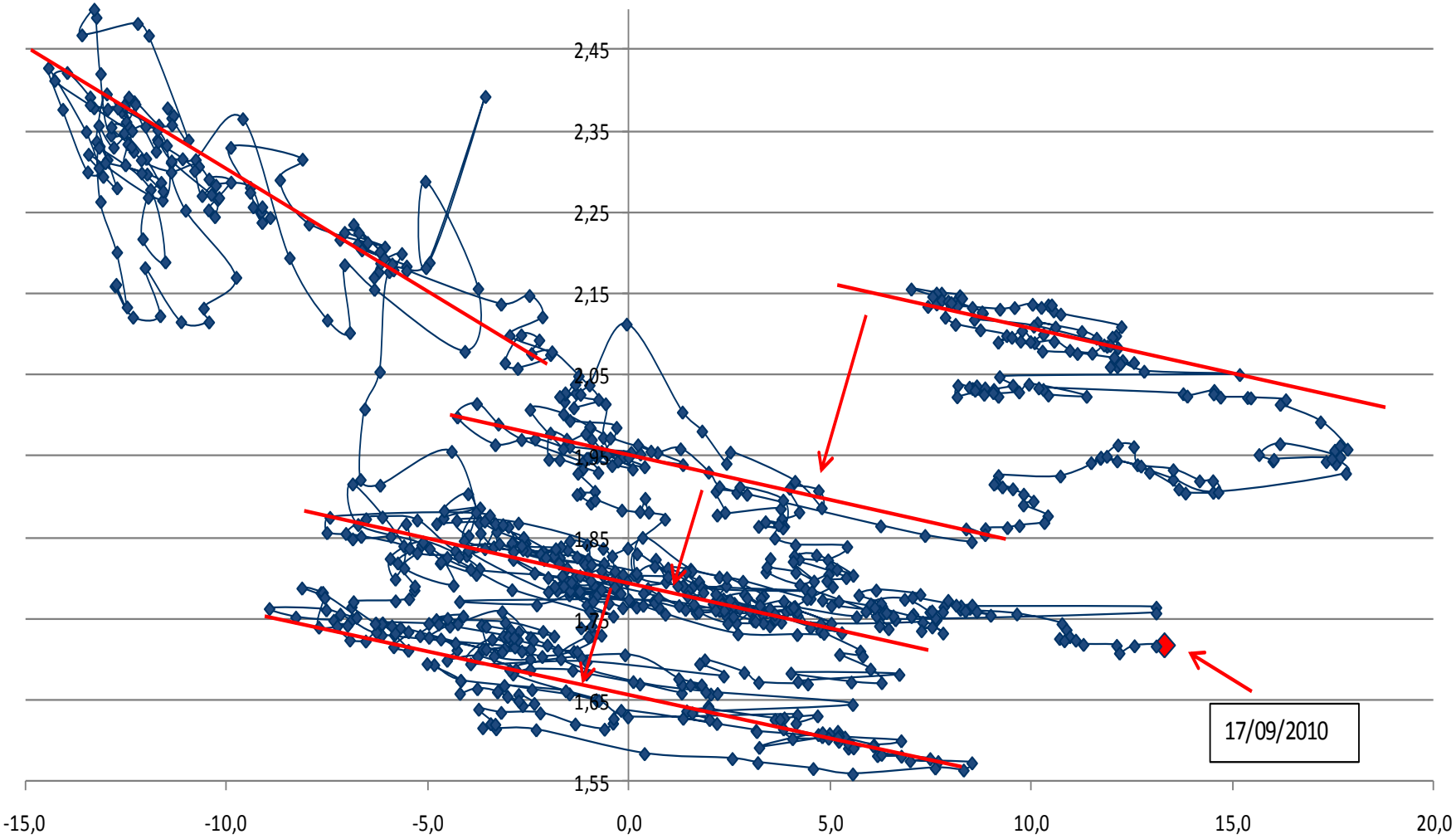
NONRESIDENT INVESTORS' OPEN INTEREST IN USD FUTURES CONTRACTS X EXCHANGE RATE



1. Interest Differential, Capital Flows, Exchange Rate Derivatives and Carry-Trade

- Throughout the sample period, what I called demand curve seems to be shifting downwards.

NONRESIDENT INVESTORS' OPEN INTEREST IN USD FUTURES CONTRACTS x EXCHANGE RATE



1. Interest Differential, Capital Flows, Exchange Rate Derivatives and Carry-Trade

- Throughout the sample period, what I called demand curve seems to be shifting downwards.
- Such movements are, probably, associated to larger capital inflows not related to the interest arbitrage.
- Those inflows (larger exports payments or financing, FDI, portfolio inflows with longer horizon) are of lower frequency than the carry-trade, thus affecting the "demand" curve.
- That is, although the interest arbitrage is one of factors causing the appreciation of the BRL, it does not seem to have had such a great influence.

1. Interest Differential, Capital Flows, Exchange Rate Derivatives and Carry-Trade

- It remains to be done the full modeling of both "demand" and "supply" curves to explain the exchange-rate, and the role of the carry-trade.

2. Costs and Benefits of the Foreign Reserves Accumulation

- **Benefits**
  - The reserves are invested in US Treasuries, yielding very low rates.
  - Fall in the risk premiums, reducing the interest rates and stimulating capital inflows, thus reducing the cost of capital for Brazilian firms. This channel, however, is almost exhausted.
  - Fall of the exchange rate volatility, which reduces the volatility of real interest rate and economic activity. This channel, too, is almost fully exploited.
  - Insurance against trade or, most importantly, capital flows shocks (reduced external vulnerability). Current level of foreign reserves, almost USD 270bi, is more than enough.

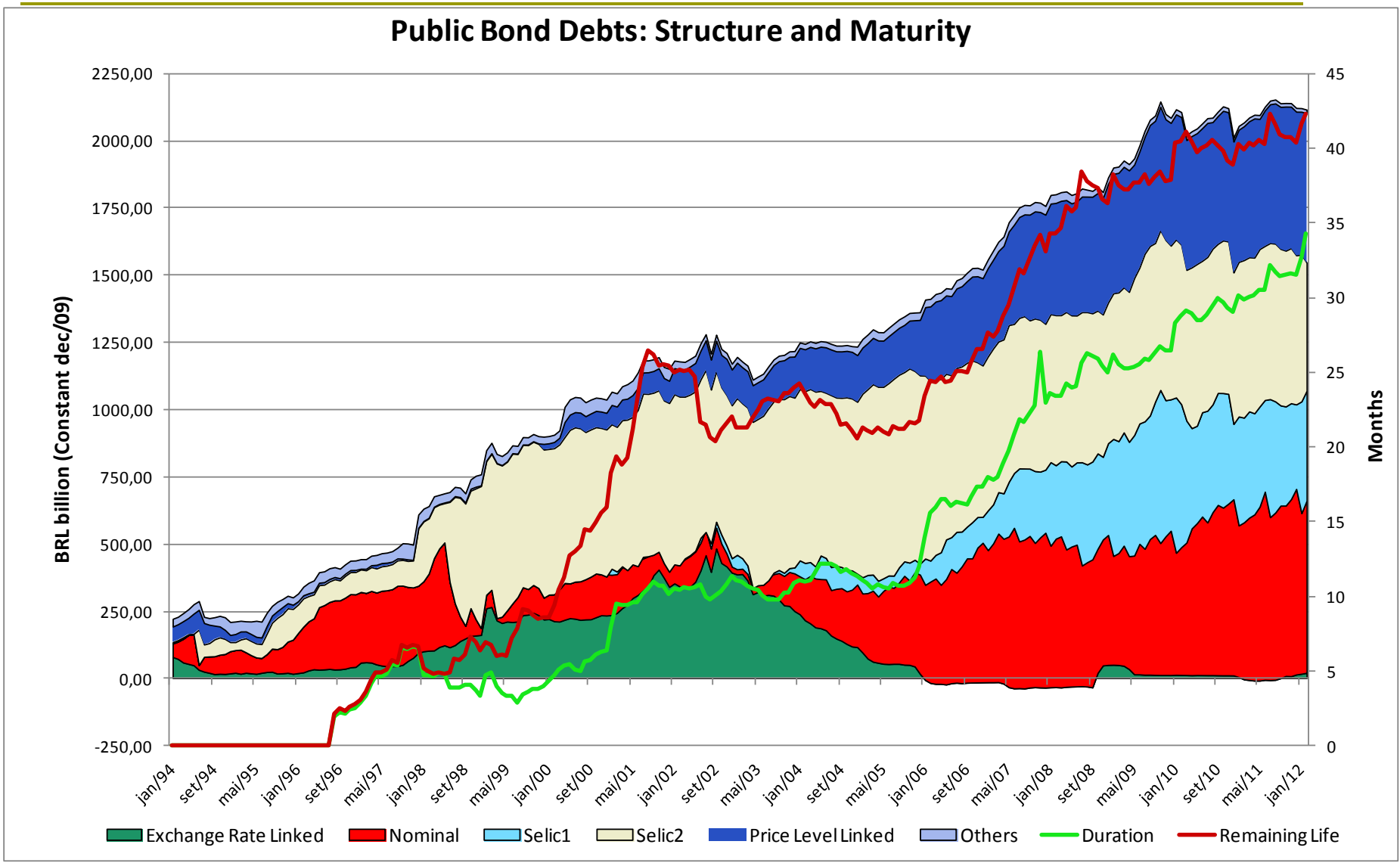
2. Costs and Benefits of the Foreign Reserves Accumulation

- **Costs**
  - The gross fiscal cost of the sterilization is the real rate of interest (now around 6% for the public domestic debt), plus the real appreciation of the BRL.
  - Therefore, if the real exchange rate remains constant (requiring a depreciation of the BRL around 2% a year), there is a financial cost of around 6% per year. The actual numbers for previous years have been much higher, because the domestic real interest rate was higher and the BRL appreciated.

2. Costs and Benefits of the Foreign Reserves Accumulation

- Reserves reaching USD 270 billions exceed, by far, the great majority of indexes proposed as desirable amounts of reserves. (Guidotti-Greenspan rule, *n* months of imports and others);
- Studies using cost-benefit analysis for Brazil (Salomão, 2007) indicate that this was already the case before the sub-prime crisis;
- However, above anything, the crisis taught policy-makers that countries needed more reserves than our models predicted.
- But how much?
- Jeanne and Rancière (2009) built a model and estimate around 9% the optimal level of reserves for insurance purposes. At the time of their writing, only Asia had gone beyond the full-insurance level of 16.5%. Brazil current foreign reserves are growing to such level, and will soon also constitute a puzzle in their terminology. Their conclusion is that Asian countries accumulated so many reserves because they were manipulating their currencies.
- Is Brazil doing the same?

2.2. Costs of the Exchange Reserves Accumulation: Worsening of Debt Structure



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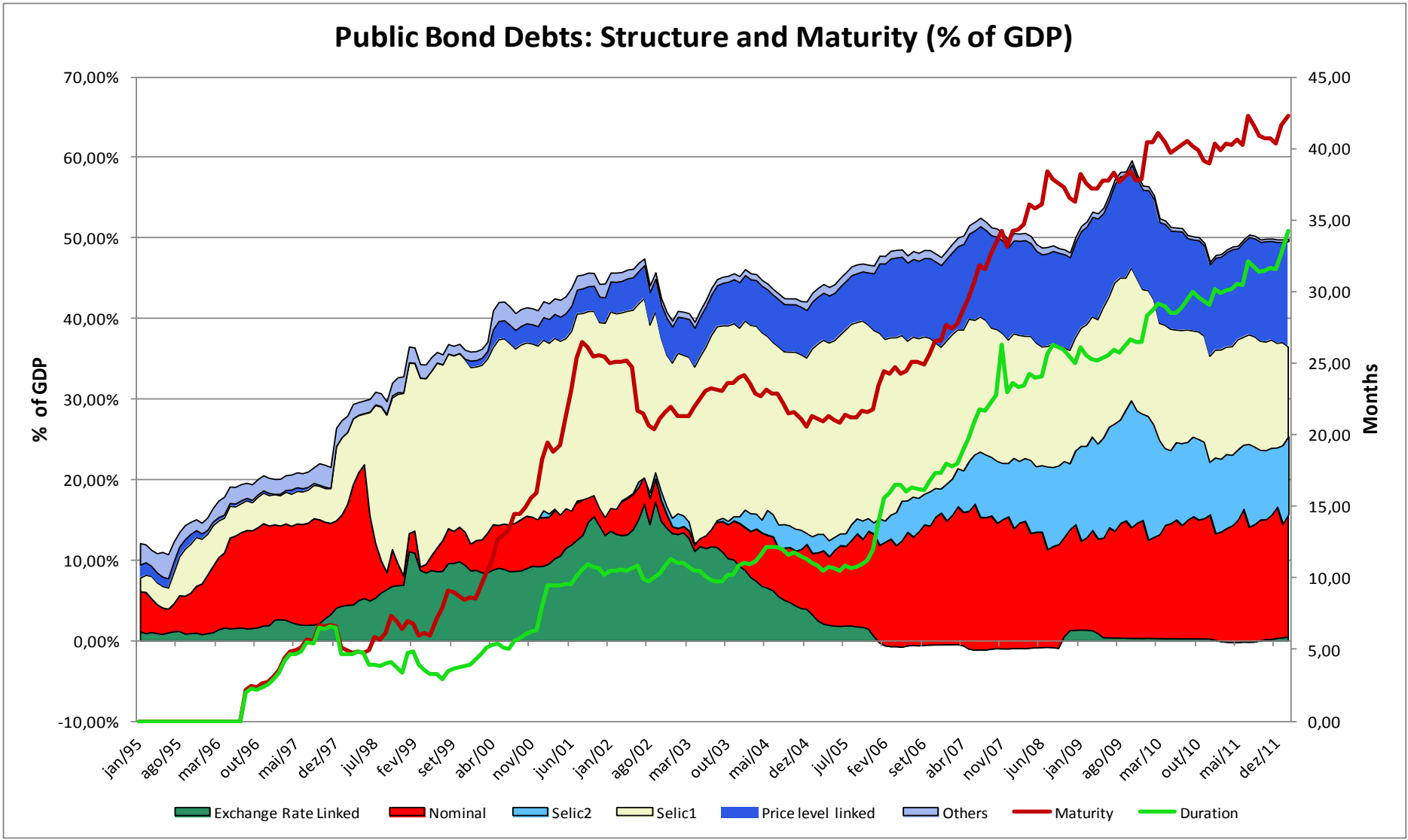
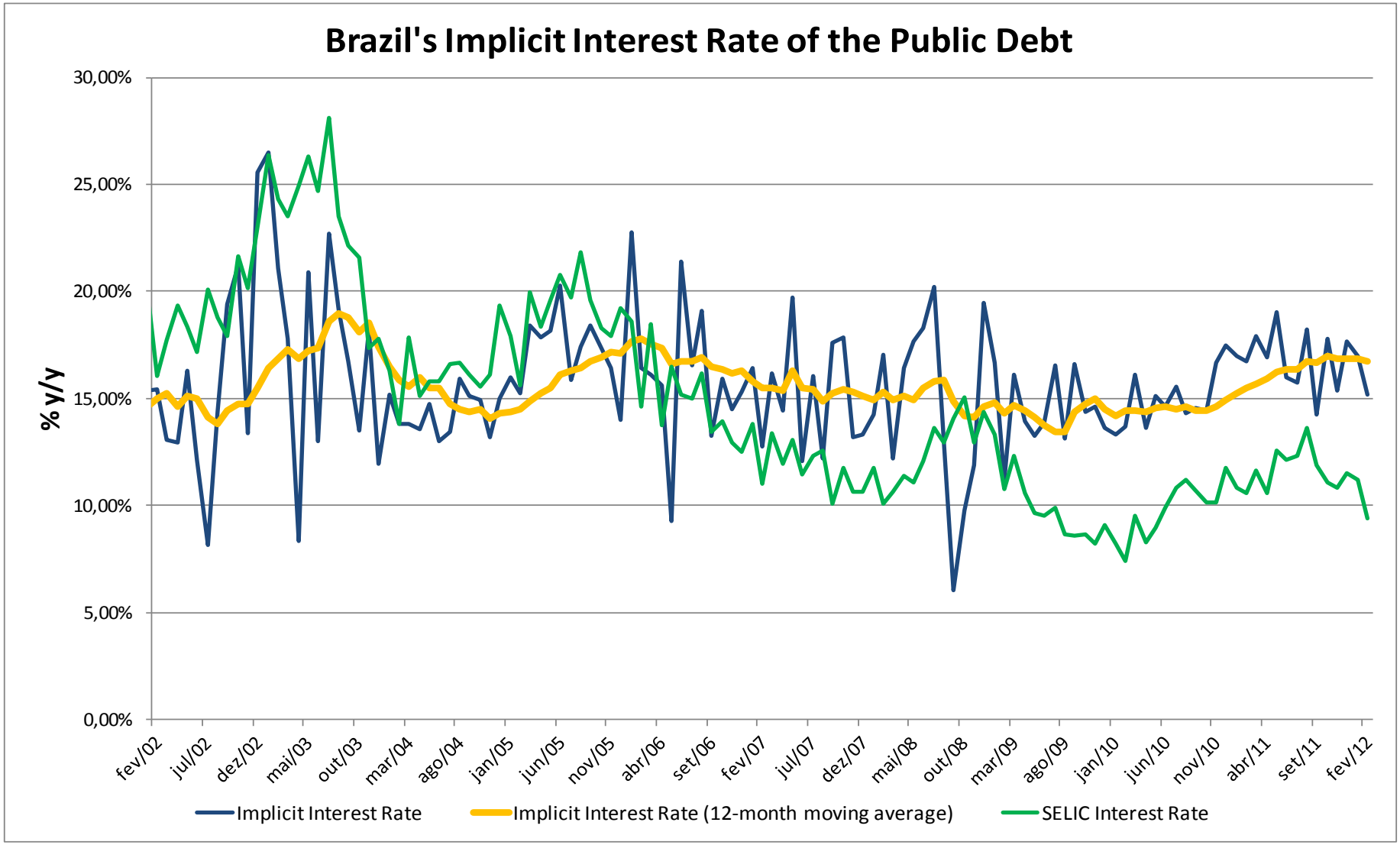


2.2. Costs of the Exchange Reserves Accumulation: Higher Implicit Interest Rates on the Public Debt



2. Costs and Benefits of the Exchange Reserves Accumulation

- The cost of each additional 1 USD of reserves is the interest differential, which is not small and is expected to rise, since the Brazilian CB has paused, but is still believed to be in the middle of a tightening cycle, while the benefit of each 1 additional USD has been significantly falling.
- Reserves reduce the risk of external shocks (sudden stops) but their cost increases the fiscal risk. There will certainly be a (finite) level, from which the net benefit of additional reserves accumulation will be negative.
- Brazil did very well during the crisis with less reserves than it has now.
- If less than today's reserves was enough to weather the perfect storm of September 2008, does it now need more reserves than before?

2. Costs and Benefits of the Exchange Reserves Accumulation

- Regardless of the reasons the CB may have to intervene in the exchange rate markets, let's see what effects, if any, sterilized interventions have on the exchange rate.

3. Effectiveness of the Sterilized Interventions: Empirical Tests

- Controlling for the determinants of the exchange rate flow, and for the changes in the foreign debt, interventions have a small effect, although statistically significant, on the nominal exchange rate.
- The sterilized purchase of USD 1 billion depreciates the exchange rate between 0,113% and 0,400%, that is, to go from 1,7300 BRL/USD to between 1,732 BRL/USD and 1,737 BRL$/USD.

ΔS_t	MQO(1)	MQO(2)	MQ2e(3)	MQ2e(4)
C	-0,036* (-1,763)	-0,044** (-2,151)	-0,086*** (-3,523)	-0,064*** (-2,011)
$\Delta(i - i^*)_t$	0,156 (0,515)	0,131 (0,430)	0,296 (0,518)	0,305 (0,971)
$\Delta Ibov_t$	-0,124*** (-10,260)	-0,124*** (-10,256)	-0,129*** (-10,404)	-0,129*** (-10,332)
ΔCRB_t	-0,184** (-10,261)	-0,183*** (-10,100)	-0,190*** (-10,248)	-0,192*** (-10,295)
$\Delta\ EmbiBR$	0,092*** (12,101)	0,093*** (12,164)	0,090*** (11,715)	0,089*** (11,525)
(Open Interest)t	0,0724*** (3,328)	0,015*** (3,104)	0,0315*** (3,817)	0,032*** (5,042)
(***Inflation Surprises***)t	0,0724 (1,536)	- -	0,422*** (3,813)	- -
Int_t^{compra}	- -	0,113** (2,02)	- -	0,333** (2,336)
Int_t^{venda}	- -	-0,0242 (-0,287)	- -	0,591*** (4,096)
AR(1)	-0,187*** (-7,515)	-0,187*** (-7,976)	-0,188*** (-7,443)	-0,185** (-7,268)
Estatística F	118,681***	104,13***	116,45***	102,00***
Adj. R2	0,34	0,344	0,32	0,316
Q Stat. (6 lags)	5,36	8,17	6,49	10,68

ΔS_t	MQO(1)	MQO2e(2)	MQO2e(3)
C	-0,020 (-0,891)	-0,086** (-2,158)	-0,082*** (-3,023)
$\Delta(i_t - i_t^*)$	0,204 (0,290)	0,691 (0,875)	0,198 (0,281)
$\Delta Ibov_t$	-0,115*** (-3,726)	-0,115*** (-3,574)	-0,119*** (-3,791)
ΔCRB_t	-0,174*** (-6,323)	-0,188*** (-5,643)	-0,177*** (-6,382)
ΔR_t	0,092*** (3,874)	0,089*** (3,754)	0,091*** (3,880)
ΔOI_t	0,012* (1,689)	0,044*** (3,996)	0,024*** (2,976)
Int_t^{AV}	-0,160 (-1,534)	0,026 (0,113)	0,400** (2,500)
$\text{swap}_t^{\text{compra}}$	0,239*** (3,883)	1,408*** (2,594)	0,198*** (3,233)
$swap_t^{venda}$	-0,093 (-0,232)	-1,478* (-1,673)	-0,087 (-0,213)
AR(1)	-0,182** (-2,156)	-0,176*** (-2,524)	-0,180** (-2,138)
Estatística F	72,668***	60,871***	71,625***
Adj. R2	0,335	0,170	0,323
Q Stat. (6 lags)	4,84	6,7	6,6

3. Effectiveness of the Sterilized Interventions: Empirical Tests

- Dynamic econometric models show that the effect is temporary, between five and 10 days.
- This result means that the CB has to keep intervening to keep the exchange rate from appreciating.

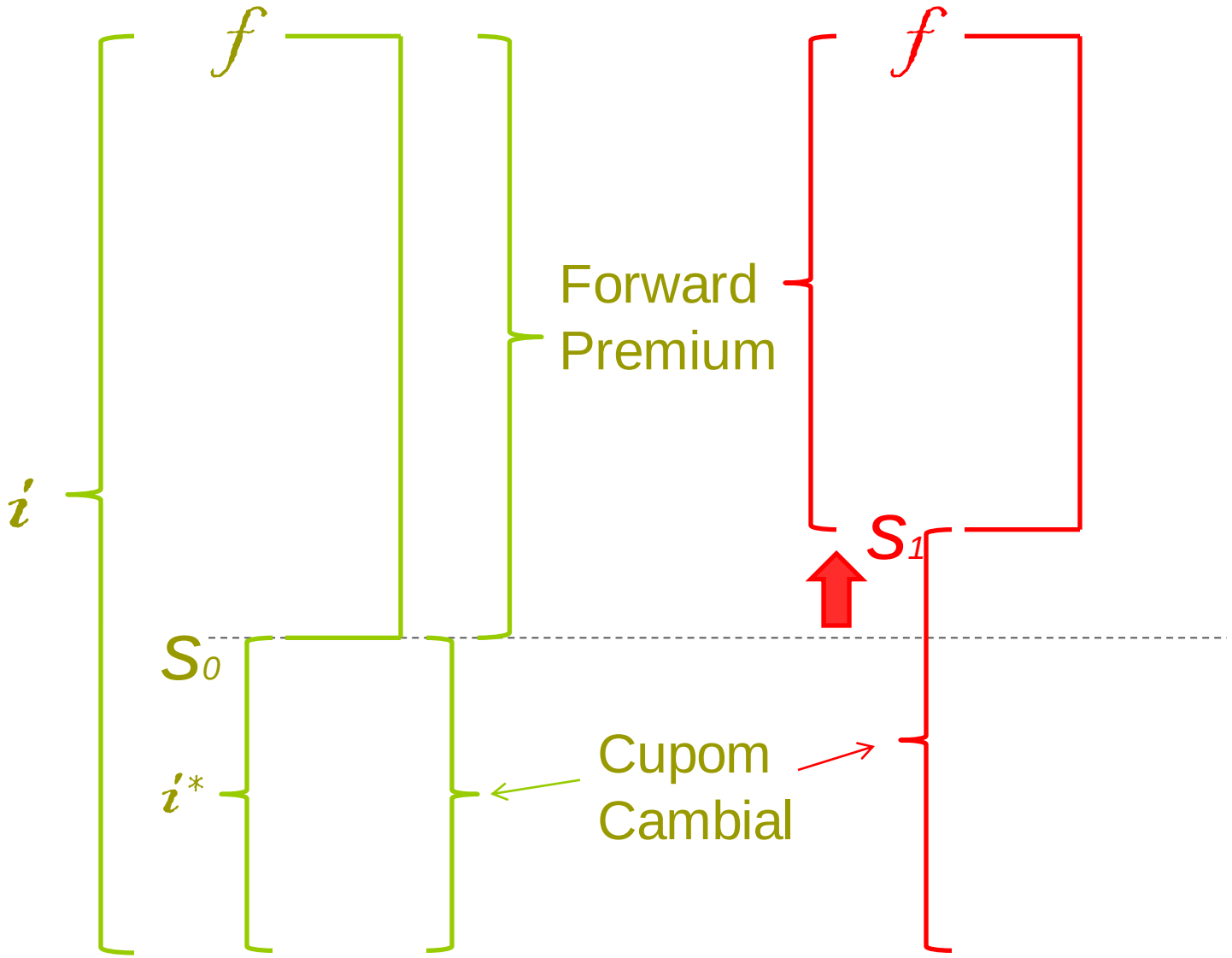
4. Repercussions of the Sterilized Interventions in Exchange-Rate Markets

Let us examine the mechanics of a sterilized spot dollar purchase by the Central Bank:

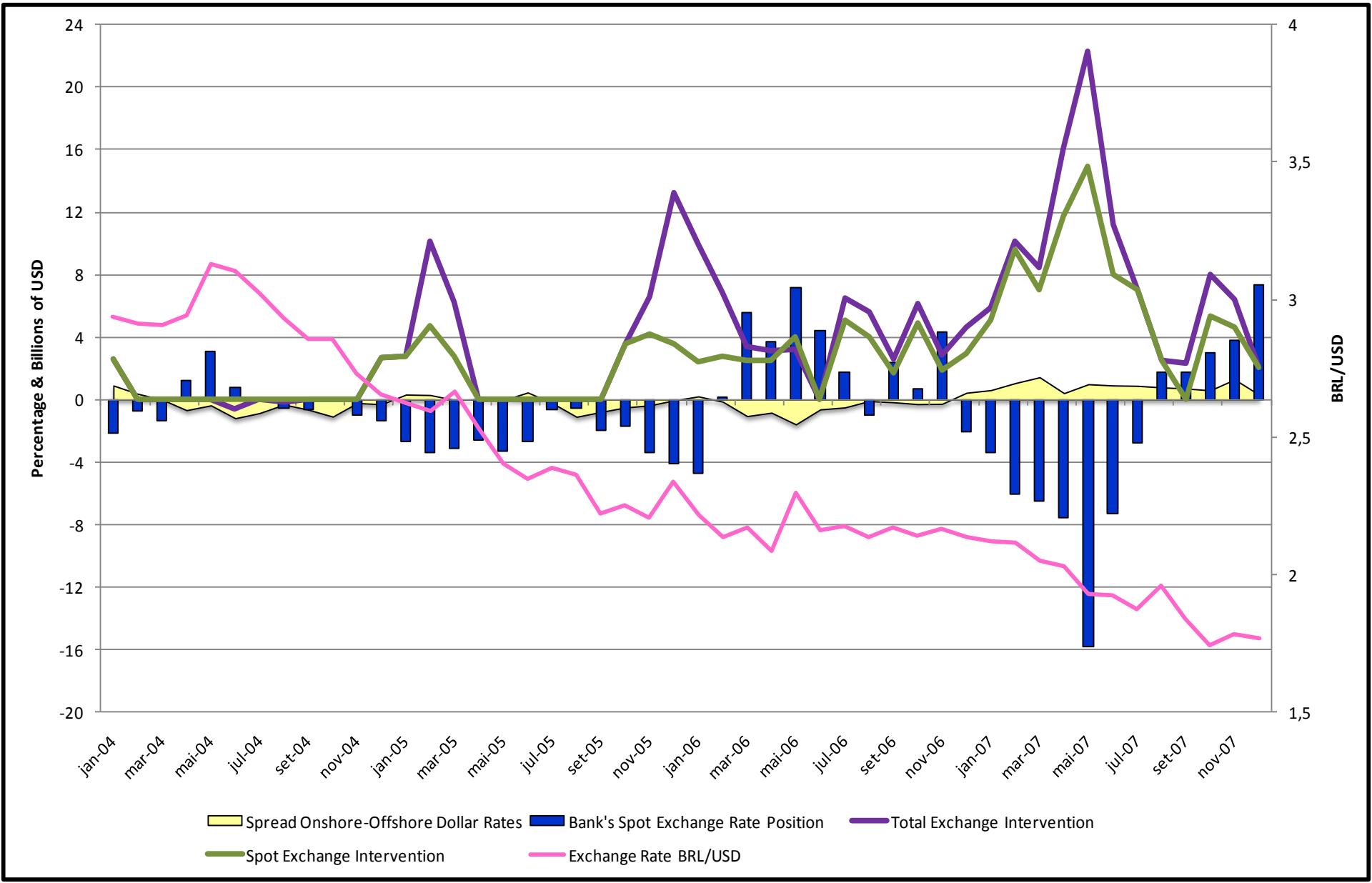
1) When the Brazilian Central Bank (BCB) buys USDs, it injects BRLs which are sterilized through the sale of treasury bonds previously held by the BCB;
2) This purchase of dollars increases the spot dollar, decreasing the *forward premium*;
3) As the domestic short-term interest rate did not change, the onshore dollar rate (cupom cambial) increases;
4) With the onshore dollar rate increase, banks borrow more dollars abroad to invest them in Brazil at the higher onshore dollar rate. To do so, they sell the borrowed USD in the spot market, invest the acquired BRL in treasury bonds, and purchase USD futures to guarantee a USD return equal to the onshore dollar rate;
5) The final result of the BCB's intervention is the attraction of more USD, which weakens the effect of the intervention over the exchange rate.

Covered Interest Parity (CIP)

$$f - s = i - i^*$$



Spread between the onshore and offshore dollar rates and banks' short term arbitrage (3 months)



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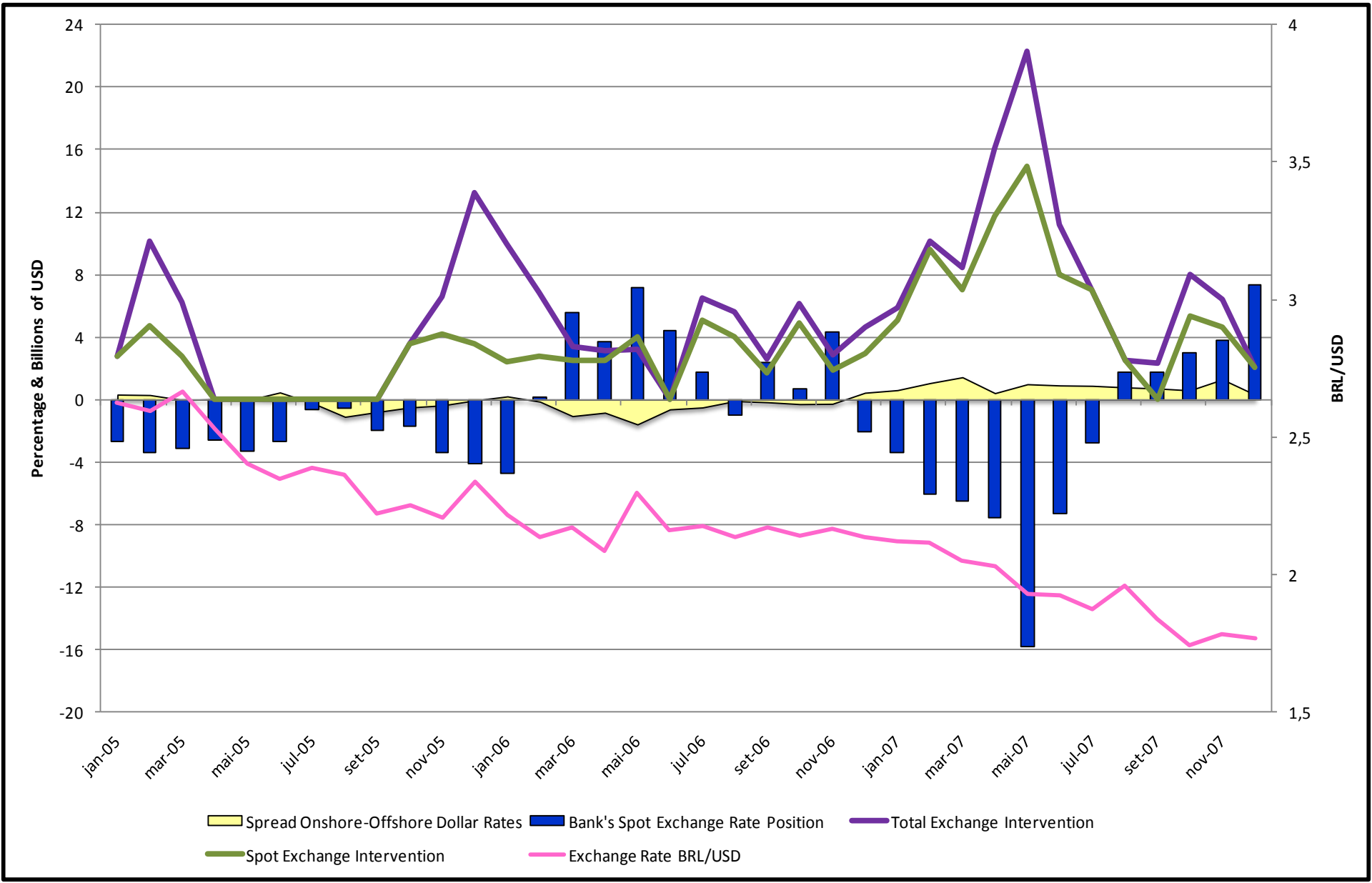

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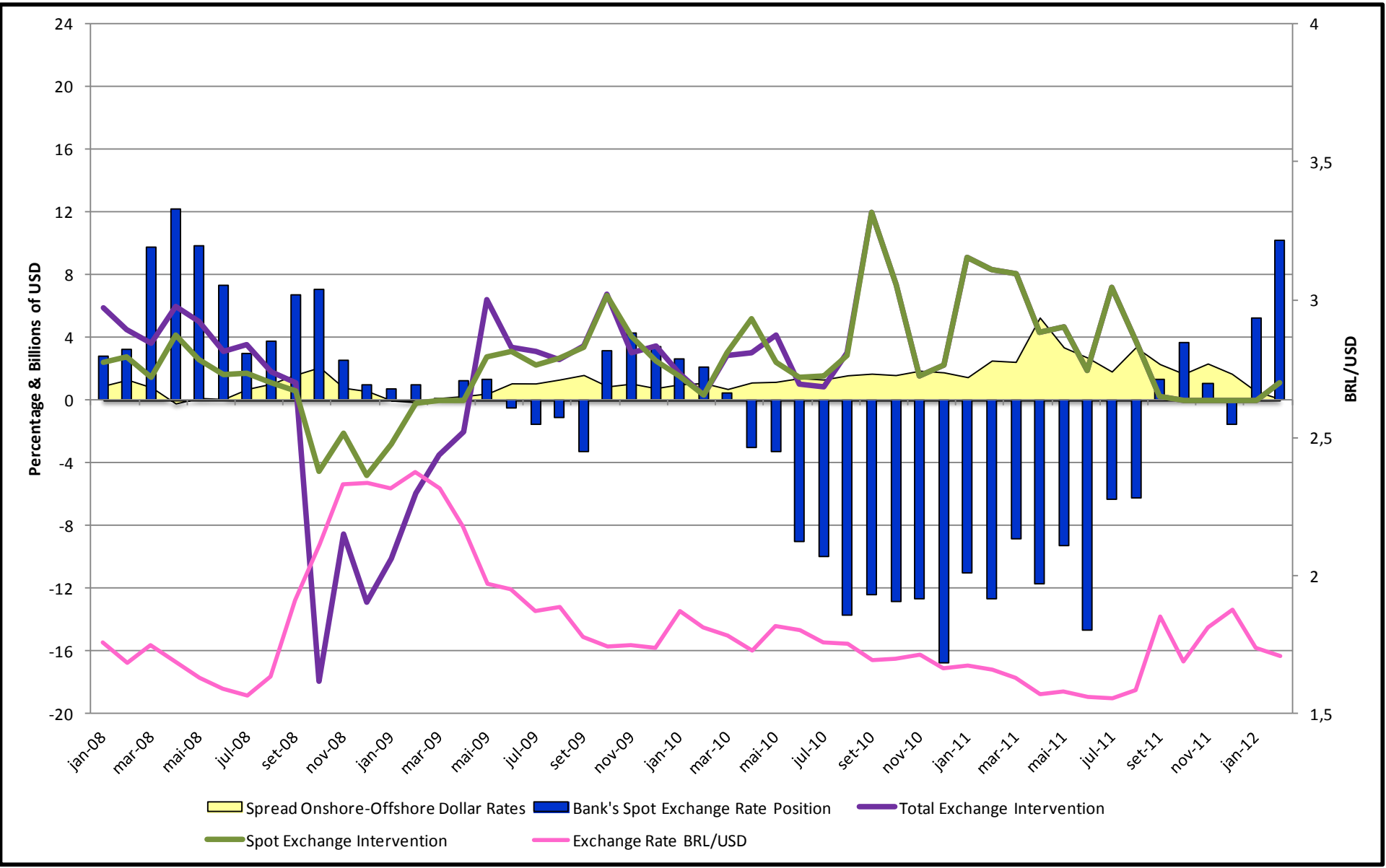

4.1. Sterilized Interventions Effect on the Onshore-Offshore Spread

DCC1Mt	OLS
c	0,021 (1,153)
(Spot +)^{t}	0,214*** (3,158)
(Spot –)^{t}	0,873** (2,266)
(Fut. +)^{t}	0,050 (1,159)
(Fut. -)^{t}	0,159 (1,379)
DCC1M^{t-1}	0,826*** (43,578)
F - Stat.	603,17***
Adj. R2	0,701
Q Stat. (7 lags)	73,78***

DCC3Mt	OLS
c	0,002 (0,38)
(Spot +)^{t}	0,058* (1,734)
(Spot –)^{t}	-0,265 (-0,935)
(Fut. +)^{t}	0,001 (0,069)
(Fut. -)^{t}	(0,073) (1,031)
DCC3M^{t-1}	0,939*** (66,65)
F - Stat.	2250***
Adj. R2	0,89
Q Stat. (7 lags)	13,68*

4.2. Spread Onshore-Offshore and Banks' Short Term Arbitrage

BP^t	OLS
c	4102,5*** (4,03)
$(Spot +)^t$	-1149,4*** (-4,35)
$(Spot –)^t$	1162,7*** (2,44)
$(Fut. +)^t$	0,307 (0,90)
$(Fut. -)^t$	-0,047 (-0,167)
$DCC1M^t$	-1375,5*** (-3,09)
Dummy	-4619,4*** (-3,87)
F - Stat.	12,32***
Adj. R2	0,32

BP^t	OLS
c	3880,3*** (3,71)
$(Spot +)^t$	-1179,1*** (-4,18)
$(Spot –)^t$	914,7 (1,43)
$(Fut. +)^t$	-0,165 (-0,56)
$(Fut. -)^t$	0,575 (1,306)
$DCC3M^t$	-1342,19* (-1,69)
Dummy	-4270,3*** (-3,34)
F - Stat.	9,84***
Adj. R2	0,26

4.3. Repercussions of the Sterilized Interventions in Exchange-Rate Markets

- Theoretically, there are two channels through which sterilized interventions could be effective: **signaling** and **portfolio balance** channel.
- **Signaling** is not relevant under Inflation Targeting.
- The **portfolio balance** channel depends upon domestic and foreign bonds being imperfect substitutes.
- With the onshore-offshore-dollar-rate arbitrage, it is likely that domestic and foreign bonds become perfect substitutes. Therefore, sterilized interventions should have little, if any, effect on the nominal exchange rate.

4.4. Does it matter the market in which the CB intervenes: spot or futures?

- According to the typical models used in modern finance, sterilized interventions should not affect the nominal exchange rate, unless those affected fundamentals.
- Those models help even less to answer the question of where to intervene, since futures and spot prices are always perfectly arbitraged.
- Size and liquidity considerations have not yet been successfully incorporated in finance, to the point of building new "workhorses" models.
- With these caveats in mind, let me speculate about possible distinctions between the spot and futures (sterilized) interventions by the CB.
- Spot sterilized purchases increase the onshore dollar rate (cupom cambial), thereby enticing banks to borrow abroad and invest (in USD) onshore. What happens when the CB purchases USD futures (or swaps)?

4.4. Does it matter the market in which the CB intervenes: spot or futures?

Let's analyze the purchase of USD futures (*swap reverso*) by the CB:

1) When the CB buys USD futures, the futures exchange rate increases incipiently, and so does the forward premium;
2) Given that the domestic interest rate does not change, the onshore dollar rate (*cupom cambial*) is reduced;
3) Banks arbitrage the difference between the onshore and offshore dollar rates by borrowing onshore (in USD) and lending offshore. For that they borrow in BRL onshore, buy the USD in the spot market, lend abroad (at the Libor) and purchase USD futures to cover the exchange-rate risk and lock in the differential between the Libor and the *cupom cambial*.
4) Thererefore, when the CB intervenes through purchases of USD futures (*swap reversos*), it initiates a process that make private banks buy USD in the spot market (instead of selling, as in the case of spot market sterilized interventions).
5) Does this matter? The previous empirical result hints that it might.
6) However, other factors may be playing a role, as liquidity (the Brazilian USD futures market is much larger and more liquid than the spot market; a *jabuticaba*).
7) The CB may face a problem to intervene through the swap market, since financial losses in derivatives markets may be more difficult to explain than mark-to-market losses of the stock of "greenbacks".
8) If this is indeed a problem, the swap contracts could be adapted to deliver the spot USD when the contracts mature (deliverable swaps).

5. Conclusion (1/2)

- If the world keeps recovering from the crisis, Brazil will continue to do well and be one of the favorite destinations to foreign capital.
- These capital inflows will put pressure to further appreciate the BRL. The exchange rate appreciation will, in turn, press policy makers to do "something", as the 2% tax, especially now that a large part of the media complimented Brazil for its initiative (FT, The Economist, and even the father of Washington consensus).
- Opening up the still closed Brazilian exchange rate markets is very good for Brazil in the long run, but it is not clear that it will help to depreciate the BRL.

5. Conclusion (2/2)

- Sterilized interventions will continue, albeit their high fiscal costs and small effects on the exchange rate, and reserve accumulation will proceed.
- Recently, the CB has increased the amount purchased, and the Brazilian Sovereign Fund is about to its operation, also conducting purchases of USD.
- Policy slippages, as the *de facto* abandonment of Inflation Targeting for the sake of exchange rate control, is a risk, under the new administration.
- Fiscal policy measures, which could help to depreciate the *real real* exchange rate are out until a new government arrives in 2011.

Obrigado

Determinantes do Cupom Cambial: Controles de Capitais