Banks Make FX Sterilized Purchases Expansionary

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1. Introduction (1/4)

- Given the abundant liquidity prevailing in international financial markets, together with the good prospects of many emerging markets, capital has flown very intensely to these economies from 2003 to 2011.
- Several emerging markets have adopted inflation targeting (IT) as their monetary regime.
- Although the IT framework prescribes a free floating exchange rate, the real exchange rate appreciation associated with capital inflows is considered very detrimental to long term growth, with the specter of Dutch disease being often brandished.
- Another concern is that capital flows may fuel credit bubbles, jeopardizing not only inflation control, but also financial stability.
- According to the Central Bank of Brazil: "… *the fragility in some mature economies, combined with favorable perspectives for the Brazilian economy, has determined an inflow of foreign resources, part of which has been going to the credit market. In this sense, the excess of external inflows may weak* (sic) *the credit channel, smooth its contribution to the aggregate demand moderation, as well as cause distortions in the price of domestic assets*" (Central Bank of Brazil, 2011).

1. Introduction (2/4)

- The Central Bank of Chile warned: "*… the main risks for financial stability associated with larger gross capital inflows include the generation of currency and maturity mismatches, credit booms that lead to a deterioration in loan quality, and local asset price misalignment*" (Central Bank of Chile, 2011).
- The Central Bank of Turkey admonished: "… *in emerging economies, short-term capital flows and rapid credit growth feed macro financial risks.* … . *The major risk factor for emerging economies is the macroeconomic imbalances driven by rapid capital inflows. Central banks of emerging economies continued to implement macroprudential measures to contain the potential adverse effects of capital flows*" (Central Bank of Turkey, 2011).
- Several forms of intervention in the exchange rate markets have been tried as extra tools to bypass the open economy trilemma and mitigate real exchange rate appreciation.
- The most frequently used forms of intervention are sterilized foreign exchange (FX) purchases and controls on capital inflows.

1. Introduction (3/4)

- The literature on sterilized interventions is focused on its effectiveness in affecting the exchange rate, mainly via two effects:
  - Portfolio balance effect;
  - Signaling effect.
- There is a very large empirical literature on FX Intervention, e.g., Dominguez and Frankel (1993).
- Sarno and Taylor (2001) survey early literature (mainly advanced economies); evidence not supportive (intervention is small when compared to size of bond markets).
- Menkhoff (2013) provides a more recent survey covering Emerging Markets, where evidence is more supportive (intervention can be sizable relative to domestic bond markets).
- The support for the effectiveness of sterilized FX interventions to affect the exchange rate is not strong.

1. Introduction (3/4)

- Recently, general equilibrium models have been developed, mostly in the DSGE tradition: Kumhof (2010), Benes et al. (2015), Devereux and Yetman (2014) and Cavallino (2016).
- Apart from its possible effect on the real exchange rate, sterilized FX purchases are commonly taken as neutral from the point of view of its effects over aggregate demand.
- A recent exception is Blanchard et al. (2015), to be presented this afternoon.
- To illustrate this point, imagine an open economy with unemployment at NAIRU, GDP growth at the normal rate, real interest rate at the neutral rate and inflation rate at the inflation rate target.
- Submit such economy to a shock of massive and continued capital inflow.

1. Introduction (4/4)

- The inflation-targeting-monetary-policy maker decides to fully sterilize the capital inflows. Under the inflation targeting framework, this means purchasing all the FX inflow with domestic currency, thereby lowering the nominal interest rate and expanding the quantity of money.
- Simultaneously, the CB conducts contractionary open market operations to soak up the liquidity which it had created with the FX purchase, which means it sterilizes the monetary effect of the FX purchase.
- Under IT, such contractionary open market operations will only cease when the previous nominal interest rate is restored.
- **Are such sterilized interventions under inflation targeting expansionary? Do they affect the output gap?**

Agenda

1) Introduction;
2) Effects of sterilized interventions in a static model with a banking sector and two financial assets, bonds and loans;
3) Brazil: Empirical evidence of the effects of sterilized interventions;
4) Conclusion.

2. Effects of sterilized interventions in a static model with a banking sector and 2 financial assets, bonds and loans (1/6)

- In the standard definition, the sterilized FX purchase does not affect the monetary base; it merely exchanges foreign assets for domestic assets (government bonds).
- However, in a inflation-targeting (IT) framework, this is not quite the way in which sterilization takes place. In the second stage, when the CB exchanges for bonds the money it had issued to buy the dollars, it will keep selling bonds until the point in which the interest rate set by the MPC is restored, which not necessarily asserts the repurchase of all the money that had been issued.
- If aggregate demand has expanded, and with it, the demand for money, the interest rate will be reestablished before all the money that had been issued is withdrawn.
- In other words, sterilization as it is usually conducted by central banks, keeping unaltered the interest rate, may actually expand the money stock.

2. Effects of sterilized interventions in a static model with a banking sector and 2 financial assets, bonds and loans (2/6)

- Why would aggregate demand increase because of sterilized FX purchases?
- To answer that question, I resort to a simple macroeconomic model with a banking sector, akin to the one developed by Bernanke and Blinder ("Credit, Money, and Aggregate Demand", *AER*, Maio,1988), henceforth the BB model.
- This is a modified IS-LM model, where there is a banking sector (call it **the bank**) that allocates its portfolio between bank reserves (required and excess), loans and bonds, and take deposits (money).
- **The bank** allocates its asset portfolio according to two rates *i*, the interest rate, and ρ, the loan rate.

The Bank Balance Sheet	
Assets	**Liabilities**
R (bank reserves)	D (deposits)
B^b (bonds)	
L^s (loan supply)	

2. Effects of sterilized interventions in a static model with a banking sector and 2 financial assets, bonds and loans (3/6)

- Suppose there is an inflow of foreign capital, such as a foreign loan to **the bank**.
- The CB purchases all of the inflow at the prevailing exchange rate and issues the equivalent amount in domestic currency to **the bank**.
- The foreign loan is an additional source of funds for **the bank** to increase its asset portfolio.
- After the FX sterilized purchase, here is the new bank balance sheet.
- The entire FL has been placed in government bonds.
- Since the *i* has been restored to its prior level, this allocation cannot be an equilibrium with the same ρ.

The Bank Balance Sheet	
Assets	**Liabilities**
R (bank reserves)	D (deposits)
B^b + FL (bonds)	FL (foreign loans)
L^s (loan supply)	

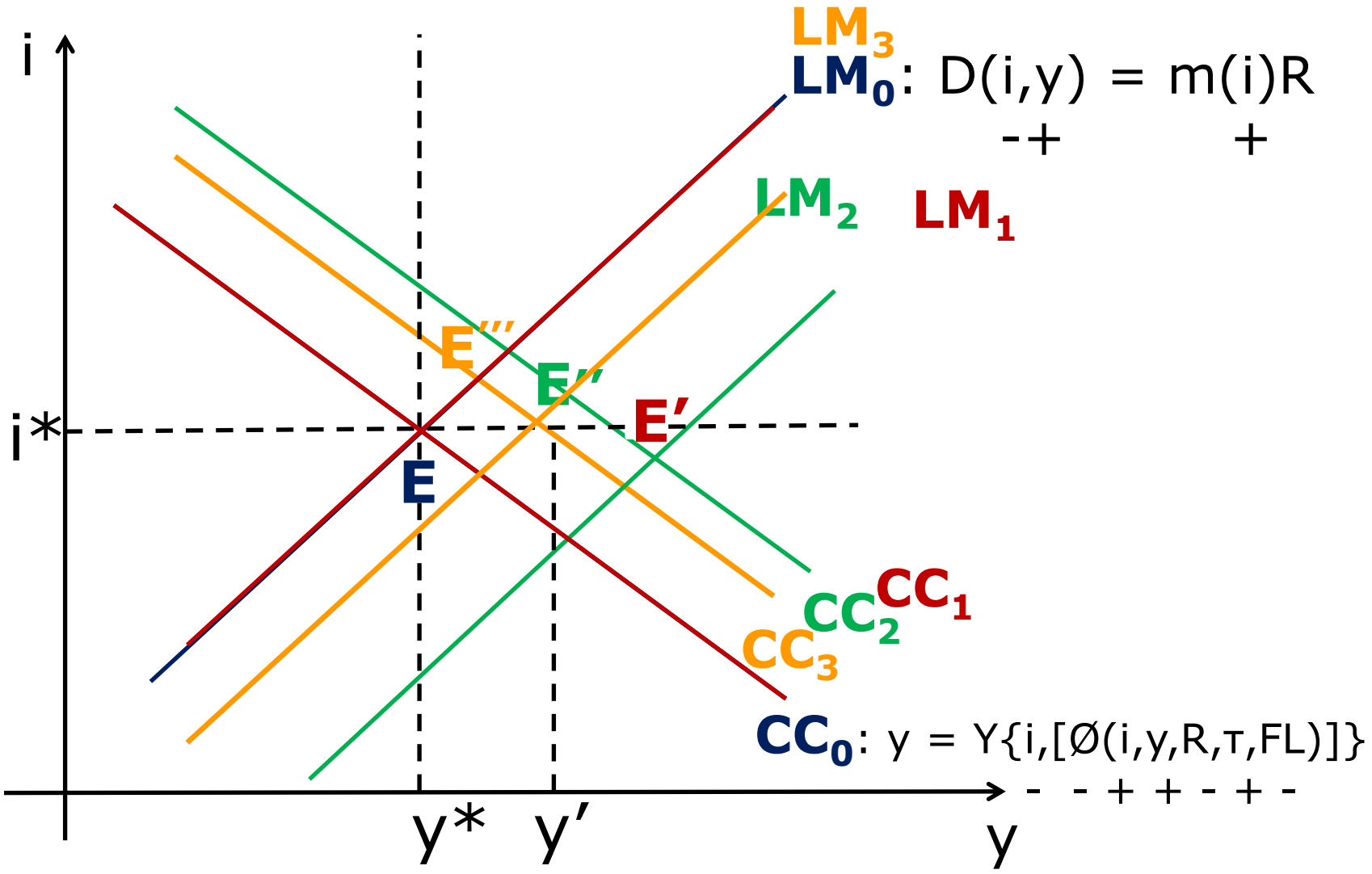
2. Effects of sterilized interventions in a static model with a banking sector and 2 financial assets, bonds and loans (4/6)

- Since the allocation after the sterilization cannot qualify as equilibrium with the same rates *i* and ρ that prevailed before the sterilized FX purchase, **the bank** will sell bonds to generate funds to make more loans.
- This portfolio adjustment tends to increase *i* and lower ρ.
- As the inflation-targeting CB counteracts the interest rate increase with expansionary open market operations, the amount of bank reserves is increased.
- In this model, the increase in bank reserves shifts not only the LM curve, but also the new IS, called CC, because more bank reserves expand deposits and part of those deposits are allocated to loans, increasing the demand for goods.

2. Effects of sterilized interventions in a static model with a banking sector and 2 financial assets, bonds and loans (5/6)

- The new equilibrium is reached when the bank completes its portfolio reallocation.
- At the new equilibrium there will be higher aggregate demand, a higher quantity of money, lower loan rate and higher quantity of loans at the same interest rate.
- The timing to arrive at the new equilibrium has to do with how fast banks reallocate their portfolios after the sterilized intervention, not with the few minutes the CB takes to perform a FX sterilized purchase.

2. Effects of sterilized interventions in a static model with a banking sector and 2 financial assets, bonds and loans (6/6)

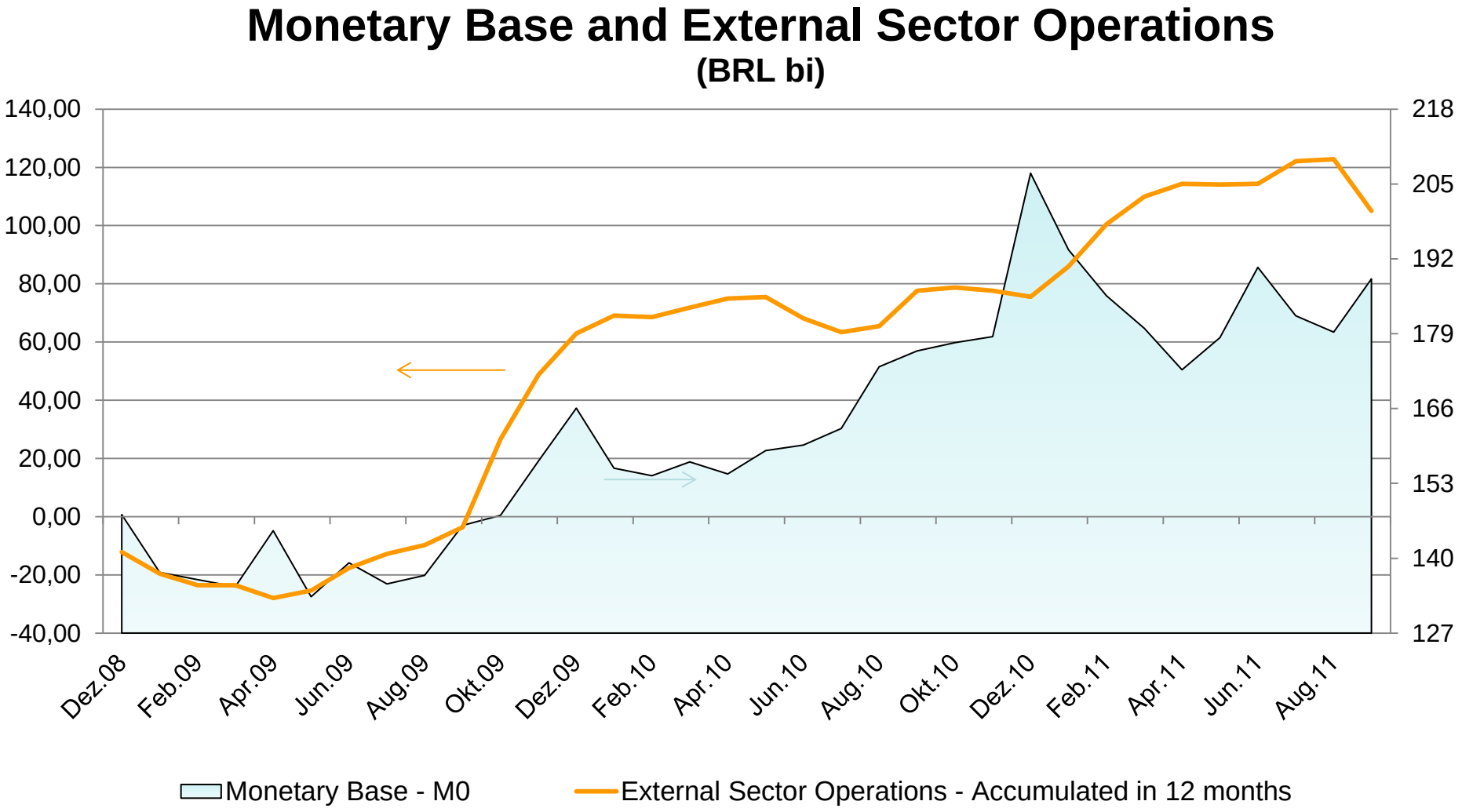


3. Brazil: Empirical evidence of the effects of sterilized interventions (1/8)

- After the 2008 international crisis, during which sterilized FX **sales** where conducted, the Brazilian CB resumed sterilized **purchases** as soon as February 2009.
- By early 2011, foreign reserves had risen from USD 187 bi to over USD 350 bi.
- Chart 2 shows that the monetary base has also expanded fast. In 2010, it increased 25%, or BRL 40 bi, for an inflation rate of 6%. Real GDP expanded by 7.5%.
- As shown in chart 2, one of the main factors in expanding the monetary base were FX purchases: around BRL 80 bi.
- Although causality cannot be implied, *prima facie*, it seems plausible that FX purchases have been, in part, responsible for the expansion in aggregate demand.

3. Brazil: Empirical evidence of the effects of sterilized interventions (2/8)

Chart 2

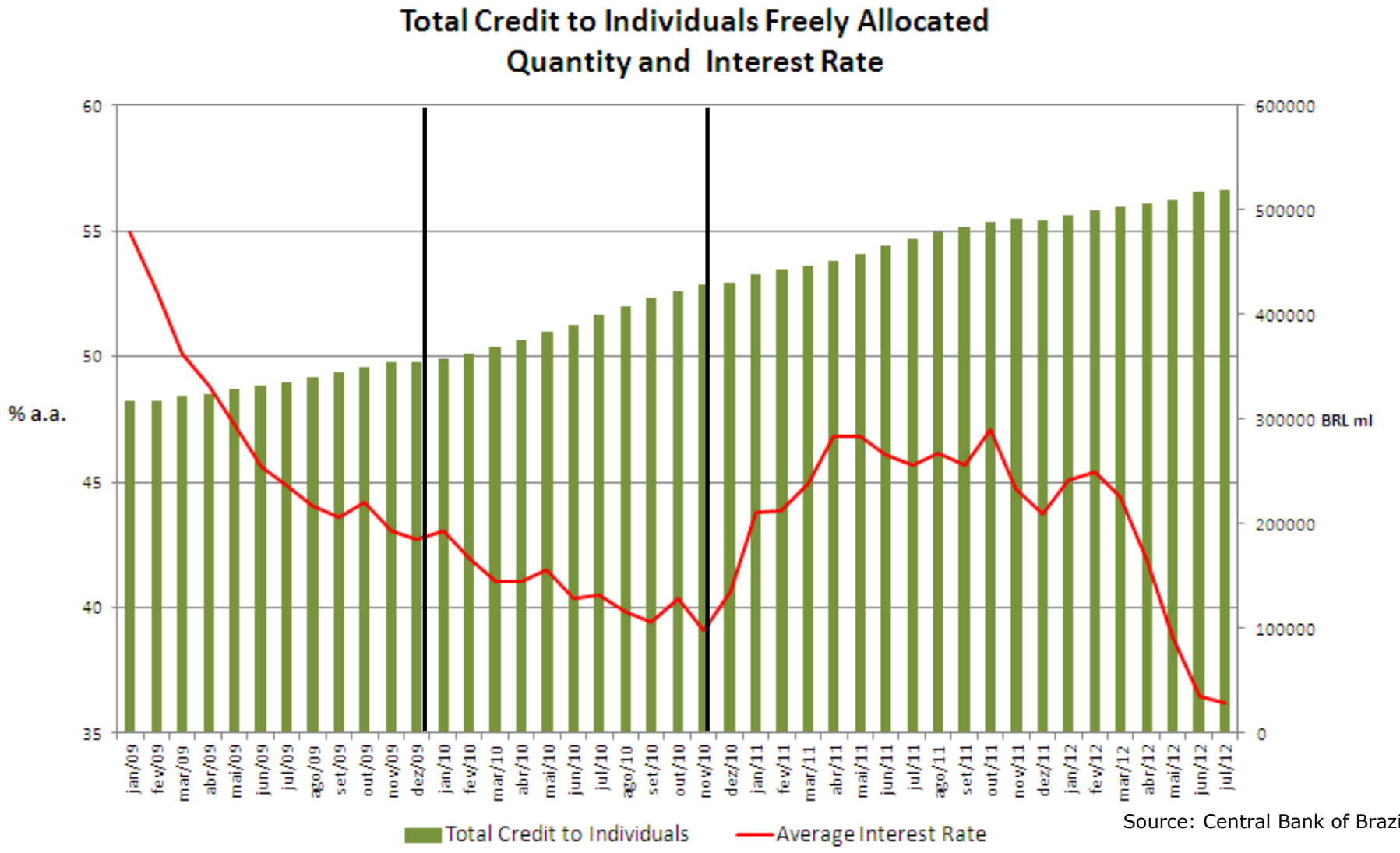


3. Brazil: Empirical evidence of the effects of sterilized interventions (3/8)

- Another relevant piece of empirical evidence to support the model's implications comes from credit markets.
- Chart 3 makes it clear that, even at high costs, bank credit had expanded vigorously in Brazil, while interest rates on credit had fallen (until the December 2010 macroprudential measures).
- These movements are compatible with the expansion in credit supply, exactly what the model predicts given massive sterilizations of capital inflow.

3. Brazil: Empirical evidence of the effects of sterilized interventions (4/8)

Chart 3



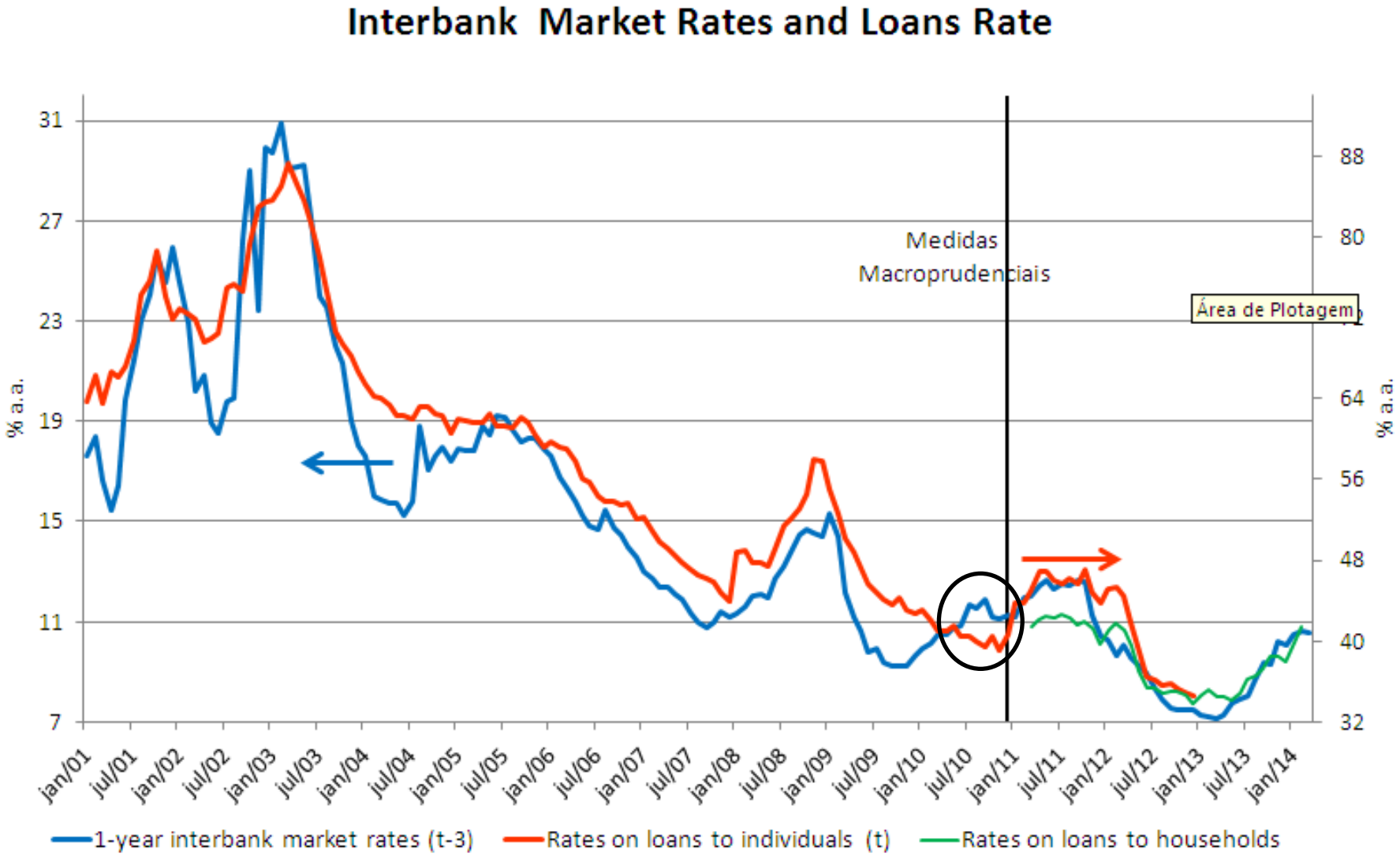
Source: Central Bank of Brazil

3. Brazil: Empirical evidence of the effects of sterilized interventions (5/8)

- Further evidence, which also arises from credit markets, is shown in chart 4 and compares the one-year-interbank rate (swap DI x Pré) to the rate on loans to individuals, in different scales.
- The high correlation between both series emerge from the fact that the rate on loans is usually fixed based upon the banks' cost of funding or interbank rate, which varies with the one-year-interbank rate.
- Note that in the beginning of 2010 the high correlation is broken: while the interbank rate has its direction reversed and starts to rise (because the CB was expected to raise the Selic rate), the loan rate keeps falling, as asserted by the model.
- The macroprudential measures of December reverted the behavior of the rate on loans to individuals, raising it.

4. Brazil: Empirical evidence of the effects of sterilized interventions (6/8)

Chart 4



4. Brazil: Empirical evidence of the effects of sterilized interventions (6/8)

Chart 4

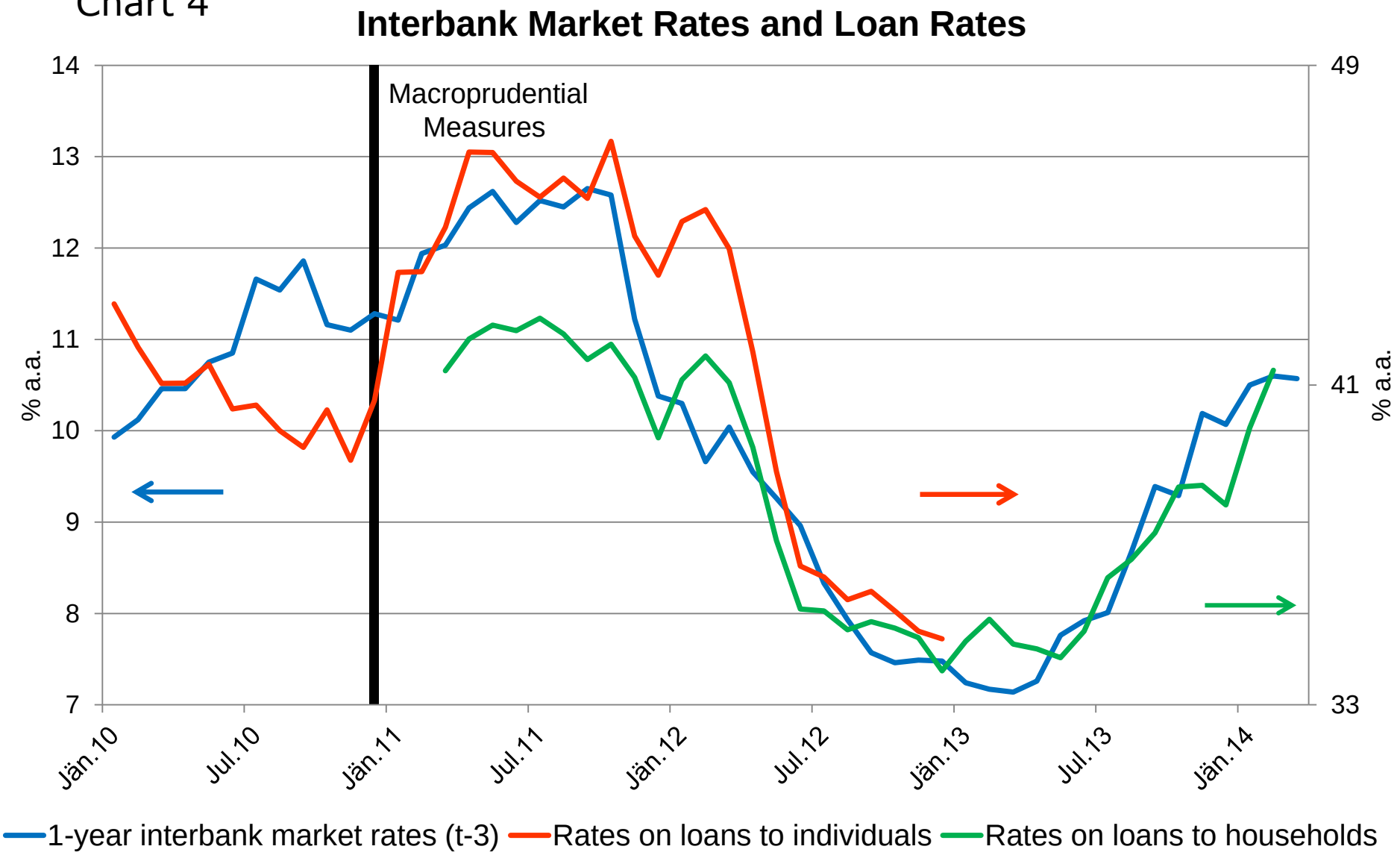


TABLE 2: Cointegration Regression

Dependent Variable: Loan rate to individuals

Independent Variables: One-Year-Interbank rate, FX Purchases (12-month average) and FX Purchases (12-month average) multiplied by a Dummy for 2010

Sample (adjusted): 14 144

Included observations: 131 after adjustments

Cointegrating equation deterministics: C

Long-run covariance estimate (Prewhitening with lags = 1 from HQ
maxlags = 5, Quadratic-Spectral kernel, Andrews bandwidth = 1.1543)

Variable	Coefficient	Stand. Error	t-Ratio	Prob
Constant	28.26229	2.396402	11.79364	0.0000
One-Year-Interbank Rate (t-3)	1.977465	0.122784	16.10528	0.0000
FX Purchases (12-month average)	-0.037931	0.011613	-3.266133	0.0014
FX Purchases (12-month average) multiplied by a Dummy for 2010	-0.105830	0.024147	-4.382788	0.0000

Mean dependent variable	58.31939	S.D. dependent var.	12.51822
Sum squared resid.	1261.924	S.E. of regression	3.152207
R-squared	0.938055	Adjusted R-squared	0.936592
Long-run variance	29.80132	Durbin-Watson	0.851448

5. Conclusion (1/3)

- The literature has studied extensively the effect of FX sterilized interventions on the exchange rate, with mixed results.
- Apart from possible effects via the ER depreciation, sterilized FX purchases are implicitly assumed to keep aggregate demand unchanged, as contractionary OMOs are supposed to fully mop up the liquidity created by the FX purchases.
- Here, I showed in a simple model that keeping the interest rate constant is usually not enough to mop up all liquidity created.

5. Conclusion (2/3)

- This result hinges on a portfolio balance effect on banks.
- After sterilization, the share of bonds, vis-à-vis loans, increase in banks' assets.
- Given imperfect substitution between loans and bonds, the higher bond share requires a higher relative yield on bonds.
- Since sterilization keeps the interest rate (the return on bonds) constant, the loan rate has to fall.
- With the fall of the loan rate, loan demand (and supply) increases, increasing output.

5. Conclusion (3/3)

- Higher income, at the same interest rate, increases money demand.
- In the new equilibrium, money is higher, while the interest rate is kept unchanged.
- Therefore, banks make sterilized FX purchases expansionary, even without any effect on the exchange rate.
- Empirical evidence for Brazil supports the existence of this effect.

Obrigado

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