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Brazil: Technical Note on Macroprudential Policy Framework

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FINANCIAL SECTOR ASSESSMENT PROGRAM

BRAZIL

MACROPRUDENTIAL POLICY FRAMEWORK

TECHNICAL NOTE

JANUARY 2013

INTERNATIONAL MONETARY FUND
MONETARY AND CAPITAL MARKETS DEPARTMENT

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GLOSSARY

BCB	Banco Central do Brasil
CDI	Certificados de depósito interbancário (Interbank Certificate of Deposit)
CFM	Capital Flow Management
CMN	Conselho Monetário Nacional (National Monetary Council)
COMEF	Comitê de Estabilidade Financeira (Financial Stability Committee)
COREMEC	Comitê de Regulação e Fiscalização dos Mercados Financeiro, de Capitais, de Seguros, de Previdência e Capitalização (Committee of Regulation and Supervision of Financial, Securities, Insurance, and Complementary Pension)
CVM	Comissão de Valores Mobiliários (Securities and Exchange Commission)
DESIG	Departamento de Monitoramento do Sistema Financeiro (Financial System Monitoring Department)
DSR	Debt-Service to Income Ratio
DTI	Debt-to-Income
FFR	Federal Fund Rate
FGC	Fundo Garantidor de Créditos (Deposit Insurance Fund)
FSI	Financial Soundness Indicator
FSR	Financial Stability Report
GFSR	Global Financial Stability Report
ICRG	International Country Risk Guide
IOF	Imposto sobre Operações Financeiras (Financial Transaction Tax)
LTV	Loan-to-Value
MRC	Monitor de Risco de Crédito (Credit Risk Monitor)
PREVIC	Superintendência Nacional de Previdência Complementar (Superintendence of Complementary Pensions)
RR	Reserve Requirement
SCR	Sistema de Informações de Crédito (Credit Information System)
SISMEF	Sistema de Monitoramento Econômico Financeiro (Economic and Financial Monitoring System)
SMM	Sistema de Monitoramento de Mercado (Market Monitoring System)
SUSEP	Superintendência de Seguros Privados (Superintendence of Private Insurances)

Table 1. Brazil: Main Recommendations

Recommendations	Priority (H/M)	Time Frame (S/M)
Systemic Risk Monitoring and Mitigation		
Ensure compilation and publishing of a housing price index that is based on purchases, with broad geographic coverage, and extend surveillance of asset prices to commercial properties	H	M
Consider providing a graphical summary that captures a diverse range of potential sources of systemic risk (e.g., Financial Stability Map) and publish them in the Financial Stability Report	M	S
Develop advanced analytical models to assess systemic risks based on macro-financial linkages between financial and economic conditions through multi-round feedback loops	M	M
Consider implementing official maximum limits on loan-to-value (LTV) and debt-to-income (DTI) ratios to lean against a build-up of systemic risks in the housing sector	M	M
Institutional Framework for Financial Stability		
Create a multi-partite, high-level committee, comprising all financial safety net providers, with an explicit mandate for systemic risk monitoring and crisis coordination	H	M
Let the new committee be responsible for coherent macroprudential policy implementations in banking and non-banking sectors as a whole to close regulatory gaps in the financial system	M	M
Enhance accountability of the committee through publishing a periodic systemic risk assessment report of the whole financial system and regularly updating *Congresso Nacional do Brasil* (the National Congress of Brazil)	M	M

I. INTRODUCTION[1]

1. **Financial regulation and supervision has traditionally focused on maintaining the stability of individual institutions from a microprudential perspective, but the global financial crisis demonstrated that the traditional microprudential policies had shortcomings.** The limitations of microprudential regulation did not prevent financial institutions to take excessive risks that led to financial instability domestically. Moreover, the risks contributed to cross-country financial stress through various cross-border channels and undermined confidence in the global financial system.

2. **It is now widely recognized that a key missing ingredient was an overarching policy framework responsible for systemic financial stability in the run-up to the recent crisis and thus authorities in many countries are exploring a systemic approach, which is called macroprudential policy.** As Jacome and Nier (2012) mentions, the policy field is still an evolving area and at an early stage of implementation and faces a few crucial issues before it can become fully functional: designing an analytical framework to effectively monitor and assess systemic risks, being prepared with an arsenal of tools to address detected risks preemptively, and building or refining institutional arrangements to foster effective identification of risks and provide incentives to take timely and effective action to counter the risks.

3. **Brazil has been one of the early adopters in this policy area and its experience has received much attention from the international community.** The national monetary council (CMN) and the central bank of Brazil (BCB) play a major role in monitoring and acting to ensure financial stability during the global financial crisis. Especially, the BCB has been actively developing its macroprudential policy framework for some time: devoting fair amount of resources in the systemic risk monitoring, implementing actively various macroprudential or capital flow management measures, and establishing a new Financial Stability Committee (COMEF).

4. **The technical note assesses systemic risks surrounding the financial system in Brazil, examines the macroprudential policy framework including the effectiveness of instruments and institutional setting, and seeks to improve the framework in a few directions.** The rest of the note is organized as follows: Section II provides an overview of systemic risks, identifies prominent vulnerabilities from external and domestic perspectives, and examines the financial system surveillance in the BCB. Section III analyzes the effectiveness of various instruments in place, and also discusses about a range of potential tools to mitigate the identified risks. Section IV reviews strengths and weaknesses of the current institutional framework and proposes a guidance for a better design of macroprudential institutional setups.

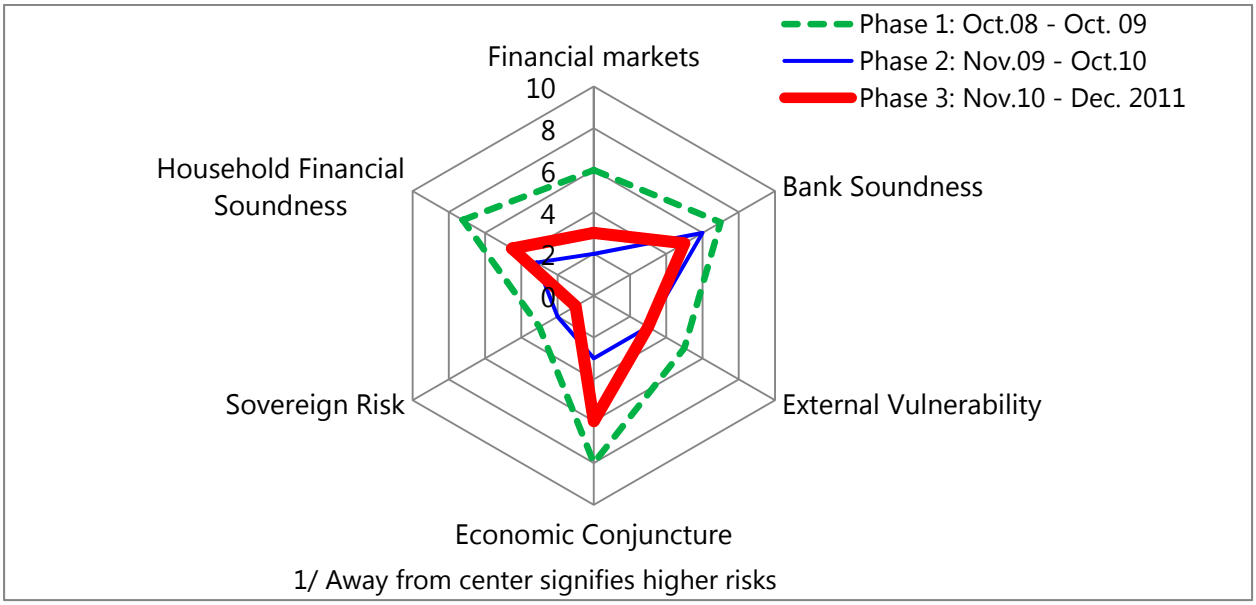
[1] Prepared by Heedon Kang (MCM).

II. Systemic Risk Assessment

A. Overview

5. **Although systemic risk is low, the Brazilian financial system operates in a challenging environment. Policy-makers need to navigate a volatile global environment and monitor for signs of emerging vulnerabilities domestically**. A preliminary evaluation of systemic risk factors in the figure below[2] shows that risk has declined across all dimensions since 2008–09, although more recently (between November 2010 to December 2011) risk appears to have risen somewhat in some areas (macroeconomic conjuncture and household financial soundness). This framework serves as a starting point for assessing current systemic risk, and the preliminary impression conveyed by the figure is corroborated by a more in-depth analysis of the key risk factors that follows.[3]

Figure 1. Brazil: Financial Stability Map[1/]



6. **Theoretically, systemic risk can be decomposed into cyclical and cross-sectional (including cross-border) dimension.** In the cyclical dimension, the build-up of risk occurs over time and moves with the macroeconomic cycle. In particular, there is a procyclical bias with financial institutions tending to take on excessive risks in the upswing of an economic cycle only to become overly risk-averse in a downswing. This characteristic amplifies the boom and bust cycle in the supply of credit and liquidity. In the cross-sectional dimension, the growing size of mounting complexity of the financial system is raising interconnectedness and common

[2] See Appendix I for more information about the Financial Stability Map.

[3] See Pereira da Silva, Soares Sales, and Gaglianone (2012) as an example that uses a Financial Stability Map to summarize graphically systemic risks in Brazil.

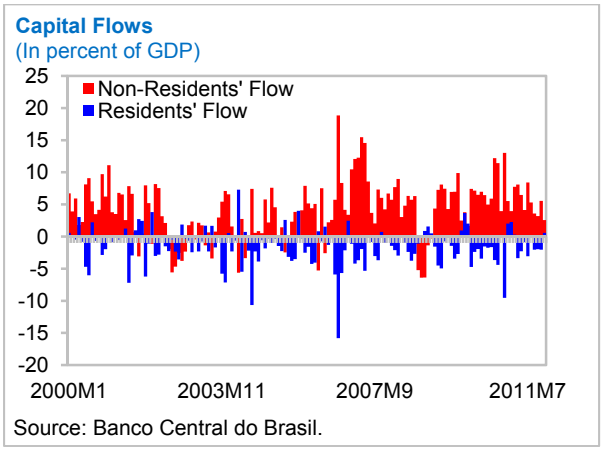
exposures conducive to rapid contagion risk when crises occur. Shocks are amplified and transmitted rapidly between financial institutions. Moreover, the failure of a systemically important financial institution can threaten the system as a whole. In the following subsection and Box 2, the two types of systemic risk in Brazil are assessed.

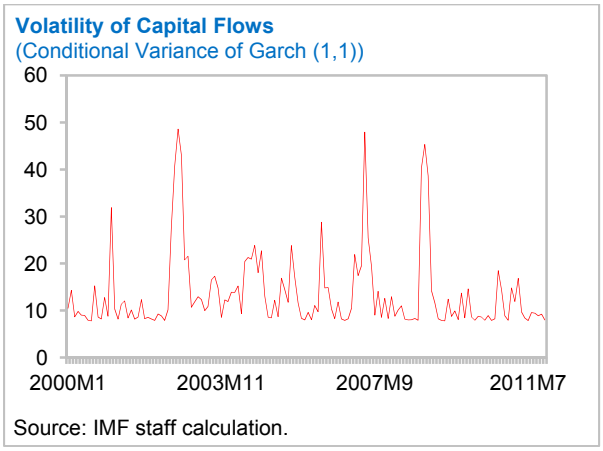
B. Cyclical Systemic Risks

7. **As a relatively open economy and a major player in the global capital and commodity markets, Brazil has been exposed to global economic uncertainty and capital flow volatility**. Although external vulnerability appears low and the FDI comprises the majority of the inflows to Brazil, there are two potential sources of cyclical systemic risks arising from external factors.

- **Although the flexible exchange rate and large international reserves provide a significant policy cushion,[4] managing the effects of external volatility continues to be a challenge, especially in a global environment of heightened uncertainty** (Figure 2). This vulnerability has risen as Brazil attracted increasingly large volumes of capital inflows, reflecting both economic factors at home (deep capital markets, the large, though declining, interest rate differential between Brazil and advanced economies, and strong economic performance) and abroad (spillovers from advanced economies). The pace of inflows accelerated since 2007, and portfolio investment inflows, in particular, reached 10 percent of GDP in October 2009. These capital inflows can be volatile: short-term inflow surges can quickly turn into sudden stops and reversals, which could affect funding of financial institutions and induce exchange rate instability. The equity and derivatives markets are particularly vulnerable to sudden changes in sentiment, since foreign investors account for a significant proportion of trading (Figure 3).

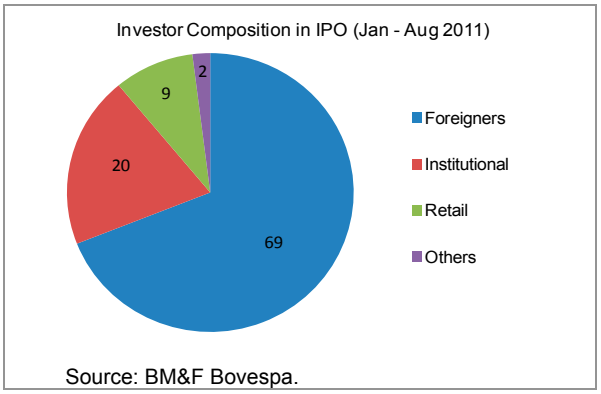
Figure 2. Brazil: Capital Flows and Volatility

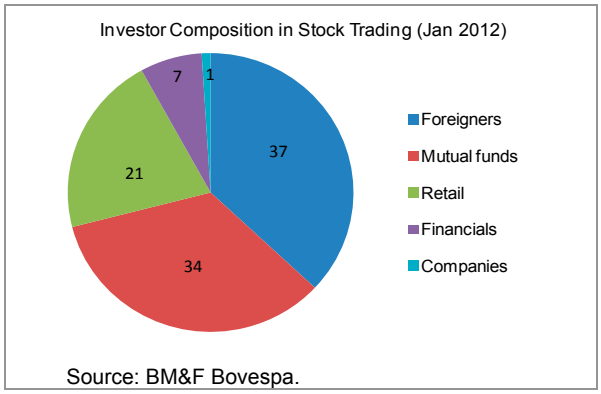




[4] It is well recognized that international reserves acted as an important shock buffer during the recent financial crisis. The reserves increased to around US$375 billion in August 2012, compared to US$200 billion in mid-2008.

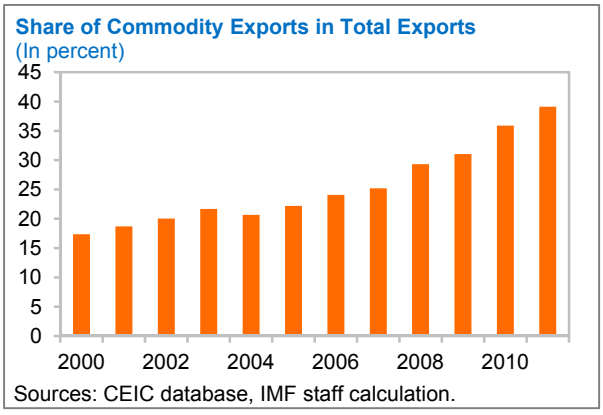
Figure 3. Brazil: Investor Composition in IPO and Stock Trading

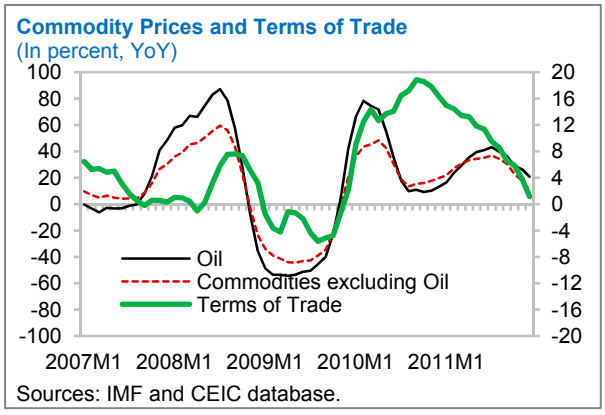




- **As a commodity exporter,[5] Brazil is exposed to fluctuations in commodity prices**. The share of commodity exports has indeed increased in the last decade, and the terms of trade and growth are heavily influenced by movements in commodity prices, including oil (Figure 4). A protracted global recession, fueled perhaps by adverse developments in Europe, or a severe shock in commodity prices, reflecting, for instance, a hard landing in China—a major market for Brazilian commodity exports—could therefore have a considerable impact on the financial sector and the economy as a whole.[6]

Figure 4. Brazil: Commodity Exports and Terms of Trade





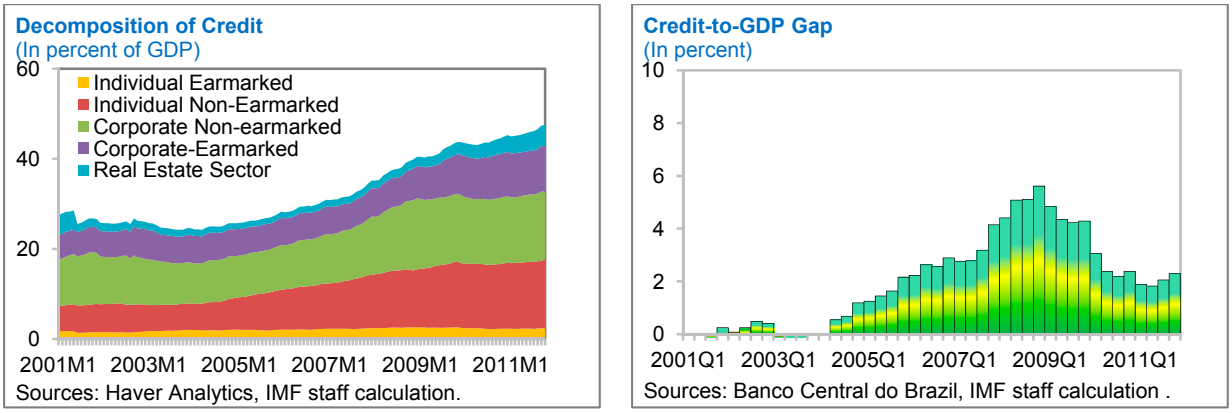
8. **In addition to these external risk factors, there is possibility of domestic distress, mainly associated with the rapid growth of bank credit, particularly to the household sector, in recent years, but there are substantial risk mitigants.** Credit-to-GDP in Brazil has risen from a low base (26 percent of GDP in 2002 to 49 percent in 2011, Figure 5). However, the

[5] Commodity exports, such as crude materials and mineral fuels, have a share in total exports of 39.1 percent and are about 4 percent of GDP in 2011.

[6] However, Brazil's exposure is relatively less than of other commodity exporter countries as exports make up only 12 percent of GDP and a large part of the swings in the export prices is mitigated by large movements in the exchange rate in the opposite direction.

overall level of credit-to-GDP ratio remains relatively low by international standards,[7] while a significant portion of the recent expansion is due to gains in financial inclusion and the effects of macroeconomic stabilization. The pace of credit expansion has slowed recently and the estimated credit-to-GDP gap[8] has declined significantly after peaking in 2009 (Figure 5). Banks hold ample and high-quality capitals, have a strong income position, and stress tests suggest they are resilient to a wide range of adverse shocks, and bank supervision is very strong.[9] But even though overall bank credit growth does not represent a significant systemic risk right now, it may be contributing to the emergence of vulnerabilities in two specific sectors: financial distress in some segments of the household sector and real estate price pressures.

Figure 5. Brazil: Total Credit and Credit-to-GDP Gap



- **There are some signs of financial distress in parts of the household sector**. Although household debt is in line with that in regional peers, the average household debt service-to-income ratio in Brazil (23 percent) is high in comparison to regional peers, reflecting higher interest rates and shorter maturities.[10] This debt service burden appears sustainable now, with relatively high levels of employment and real income growth, but may push certain households into financial distress in a cyclical downturn. Moreover, recent credit and delinquency trends suggest that financial stress may already be under stress.

- **There are indications of rapid real estate price appreciation in prime locations.**[11] Especially in two major metropolitan cities—Rio de Janeiro and Sao Paulo, housing

[7] See Dell'Ariccia and others (2012) for an international comparison of the credit-to-GDP ratio.

[8] The gap is computed as a deviation of the credit-to-GDP ratio from its one-sided Hodrick-Prescott filtered trend.

[9] See the technical note on stress testing.

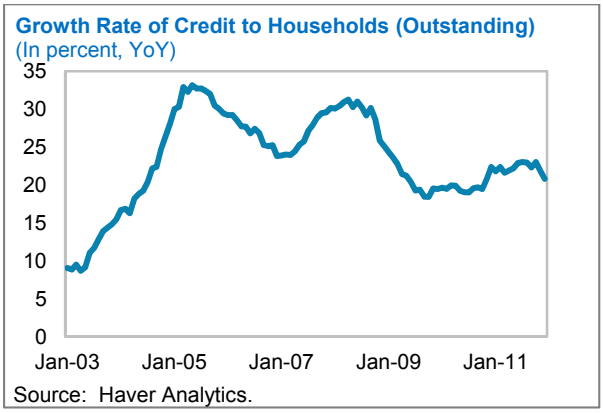
[10] See the technical note on consumer credit growth and household financial distress.

[11] There is a housing price index, publically available, that systemically tracks house prices in Brazil. The *Fundaçáo Instituto de Pesquisas Econômicas* of the University of Sao Paulo publishes the index based on sales announcements received by the ZAP portal, a website dedicated to hose ads of property sales and rentals by following a system used in advanced economies. The index currently covers the seven largest metropolitan areas in Brazil. However, the time

(continued)

prices in Sao Paulo and Rio de Janeiro have been growing by about 30 percent annually in recent years (Figure 7), with the pace moderating somewhat since 2011.[12] Although these increases are very large, the impact on financial stability due to a decline in prices would be mitigated by the low proportion of housing loans in banks' loan portfolios (except for *Caixa Econômica Federal*, a public bank focused on housing loans).[13]

Figure 6. Brazil: Credit Growth and Debt-Service Ratio of Households



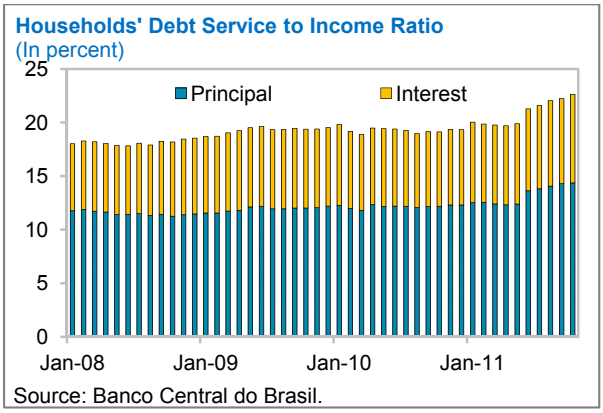
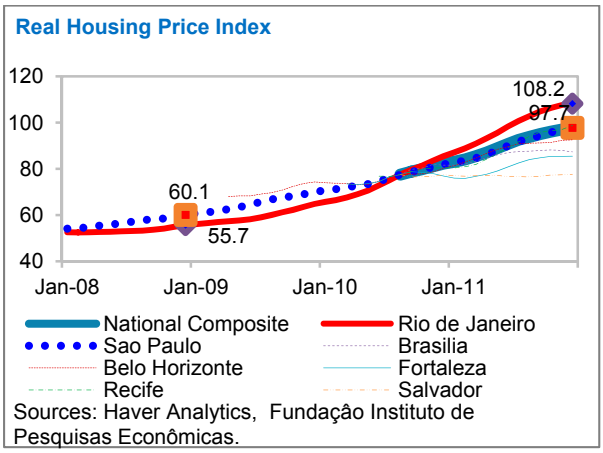
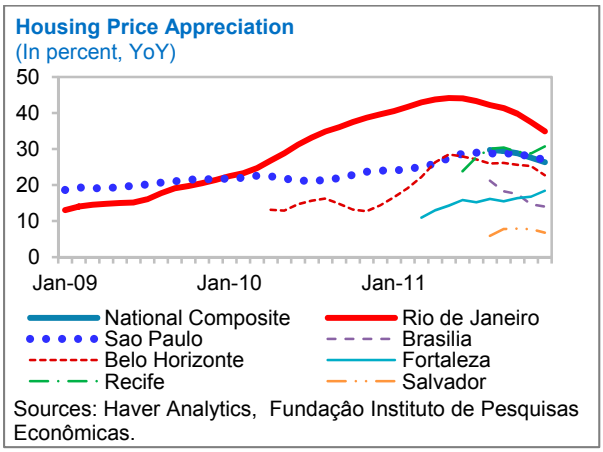


Figure 7. Brazil: Housing Prices in Metropolitan Areas





coverage is rather short, with monthly data for Sao Paulo and Rio de Janeiro available since January 2008, for Belo Horizonte since April 2009, and for the remaining cities since August 2010.

[12] From other countries' experiences, the rapid credit expansion to the housing sector tends to amplify a macro-financial feedback mechanism and eventually lay the ground for the buildup of systemic risks that may threaten financial stability. See Igan and Kang (2011) for detailed information.

[13] It should be noted that the risks to the household sector are mitigated by the low proportion of housing credit in the banks' portfolio (e.g., *Caixa Econômica Federal*). Moreover, there are some peculiarities in the Brazilian market that can muffle the impact of an abrupt decline in housing prices: (i) most of the families are purchasing their first home; (ii) it is difficult to obtain a second mortgage on the same property (this modality of credit is not allowed under *alienação fiduciária* (deed of trust) and the legal procedure under *crédito hipotecário* (mortgage) is very complex); (iii) securitization in Brazil is still incipient and not complex. Therefore, the hike in housing prices would not lead to an increase in leverage.

C. Cross-sectional and Cross-border Systemic Risks

9. **The Brazilian financial system has a dense web of inter-linkages, characterized by a high degree of conglomeration, concentration, public sector presence, and low reliance on foreign funding.** It is organized around a few financial conglomerates that control over 75 percent of the system's assets. Total (gross) assets in the system are equivalent to about 180 percent of GDP, 40 percent of which are held by commercial and multiple banks, 26 percent by mutual funds, 10 percent by pension funds, and 6 percent by insurance companies. Equity market capitalization is around 55 percent of GDP, close to the size of bank deposits. Foreign banks own about 20 percent of banking assets. Public sector presence in the financial sector is significant: government-owned banks account for over 40 percent of total (gross) banking assets, and directed (subsidized) credit for low-income housing, agriculture, and infrastructure represents around 35 percent of total credit. Insurance companies and pension funds, who cannot invest abroad, mainly held claims on other financial institutions, particularly mutual funds which, in turn, held a large share of their claims on the government and banks

10. **Direct contagion risk through bilateral exposures between banks[14] is limited, confirmed by a system-wide stress test[15] conducted by the BCB and IMF staff.** Theoretically, failure of a systemically important financial institution can trigger significant spillovers to other entities or the economy as a whole. These network externalities can arise because individual institutions fail to take sufficient account of the effects of their actions on others. The stress test, however, shows that, in Brazil, in the worst case scenario, the failure of a big bank would trigger a maximum loss of 0.8 percent of the system's assets and knock-on effects would be only on about 20 small financial institutions. Indirect contagion through liquidity channels could have more adverse effects if, at the same time of a default of a large banks (i.e., direct contagion), more than 20–25 percent of the customer deposits were to be withdrawn from all banks at the same time.

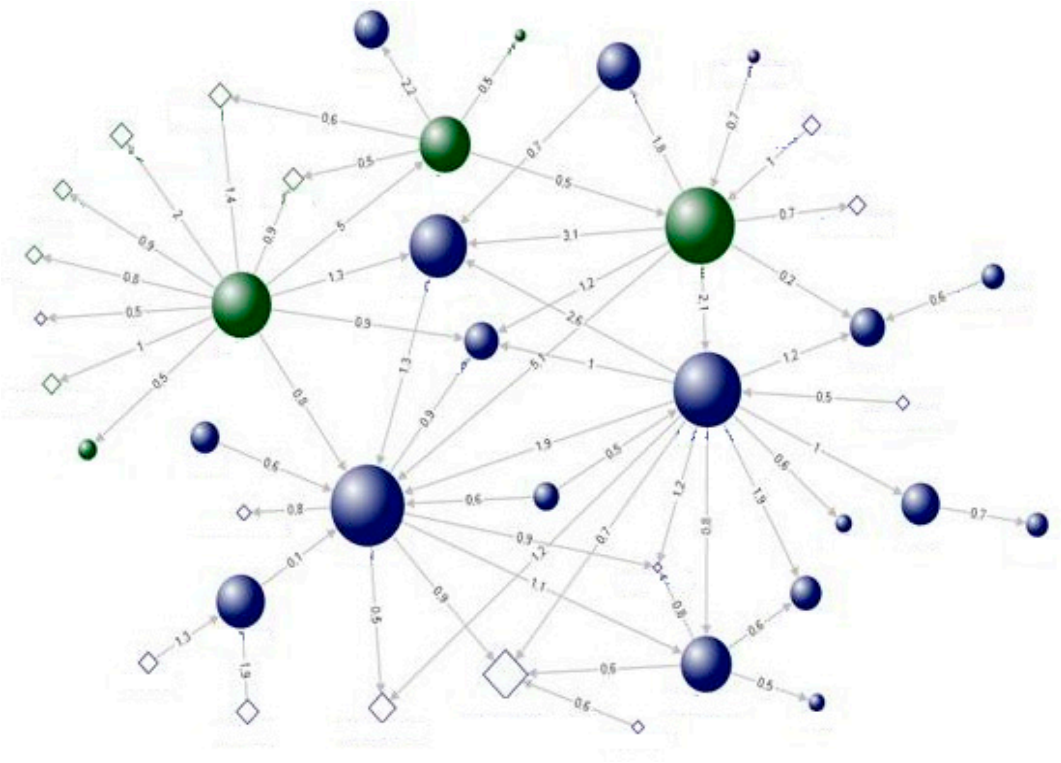
11. **Mutual funds and banks are highly interconnected through repo transactions and funds' investments in bank deposit, CDs, or bonds**. As of April 2012, mutual funds' repo operations with banks accounted for some 20 percent of mutual funds' total portfolio and their holdings of bank deposits or CDs for another 15 percent. Although this represents a high degree of exposure concentration for mutual funds, repos with banks have low risk because the operations are collateralized by government bonds: banks in effect act as an intermediary, given that mutual funds cannot conduct repos with the BCB. Banks' reverse repo transactions with the BCB tend to have slightly longer maturities (around 30 days), which earns them a profit of around 3–4 basis points. For the same reason, these transactions do not represent a major source

[14] Bilateral exposure includes interbank deposits, term deposits, derivatives (swaps, foreign exchange operations, forwards, boxes, flexible options), repos with own securities, "*Letras Financeiras*" bonds and other expected losses to be borne by the underwriting bank.

[15] See the technical note on stress testing.

of funding risk for banks. Mutual funds' holdings of bank CDs, deposits, or bonds, on the other hand, expose them to counterparty risk, but this risk is limited given funds' conservative asset allocation and liquidity buffers. Nevertheless, as the financial instruments' availability improves over time, the authorities should consider lowering the 20 percent single exposure limit for mutual funds. Moreover, market trends need to be monitored closely, as lower interest rates spur investors to seek higher returns and take more risk.

Figure 8. Brazil: Domestic Interconnectedness among Banks



Source: Banco Central do Brasil.

12. **Cross-border financial interconnectedness and associated risk are limited by the moderate share of foreign banks in the financial system and low foreign exposures.** According to BIS banking statistics, cross-border claims of and on Brazilian banks stood only around 5 and 20 percent of GDP, respectively, relatively lower than other countries. As per end-September 2011, less than 4 percent of Brazilian banks' cross-border claims on other countries were related to euro-peripheral countries (Figure 10).[16] Cross-border claims, in their turn, represent about 8.6 percent of Brazilian banks' total lending. Financial institutions' exposure to cross-border funding risk and FX risk is relatively low. The system is funded largely domestically by deposits and repos. Although some large government-owned banks were able to tap international bond markets in late 2009 to early 2010, foreign currency liabilities in the system are relatively low and accounted for less than 9 percent of total liabilities at end-June

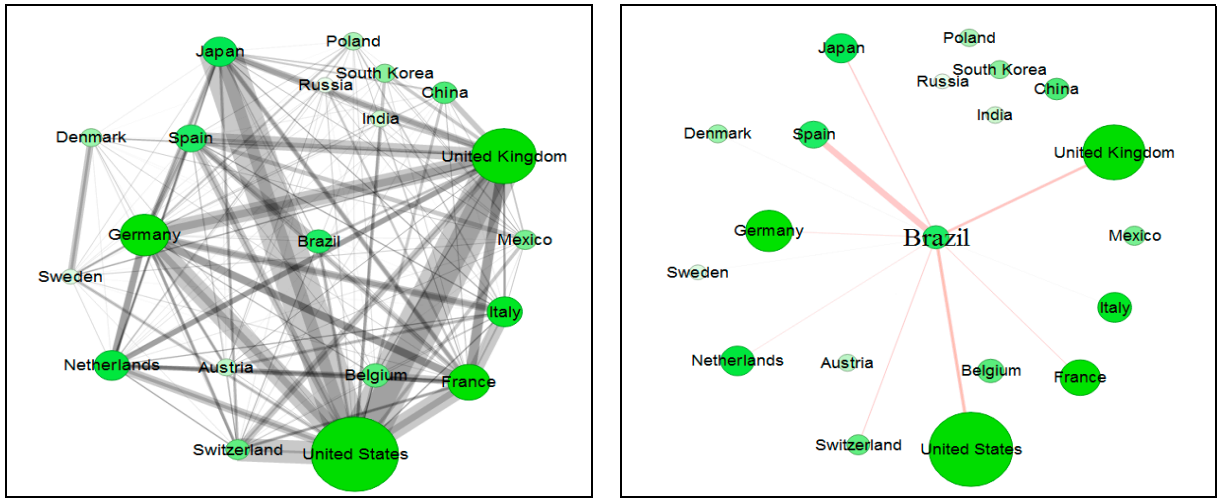
[16] Greece, Ireland, Portugal, Italy and Spain .

2011. Currency mismatches, measured by banks' net open position in FX, are on average small, at around 7 percent of banks' capital at end-June 2011. Thus, direct FX risk appears largely contained due to small net exposures and use of hedging instruments.

Figure 9. Cross-border Interconnectedness[1/, 2/]

(As of September 2011)

(Selected 20 Countries) (Brazil)



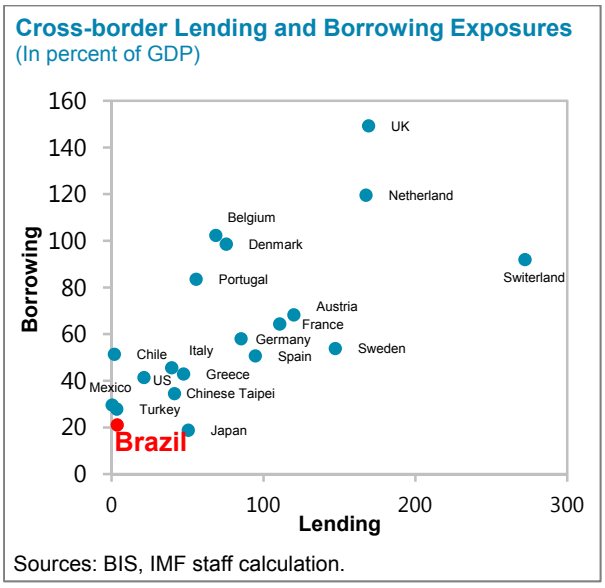
Sources: IMF staff calculation, BIS Consolidated Banking Sector Statistics, and FNA.

1/ The size of a circle shows the amount of foreign bank's lending to each country and its color gets greener as the amount of inflows to the country gets larger. Two-way flows, an outflow and inflow from country A to B, overlap each other with two different gray colors.

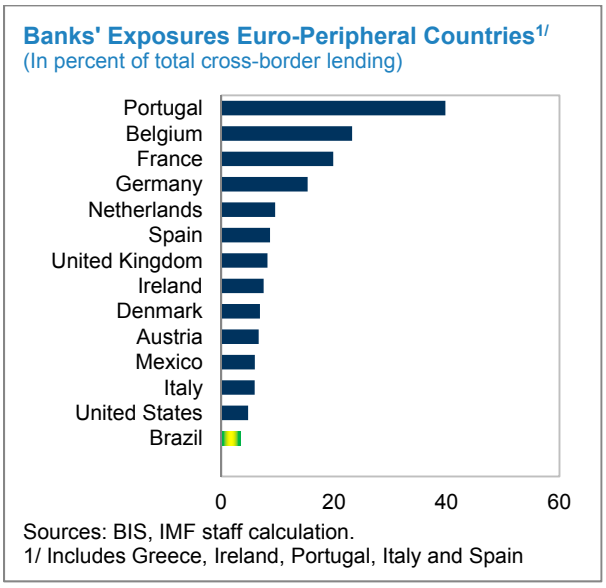
2/ We would like to acknowledge *Financial Network Analytics* for its web-based program of network analysis.

Figure 10. Cross-border Banking Exposures

(As of September 2011)



Sources: BIS, IMF staff calculation.



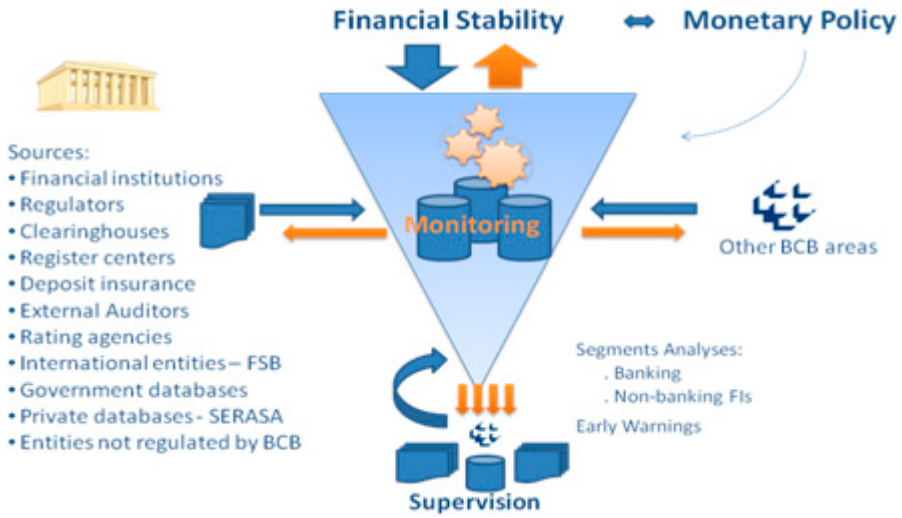
Sources: BIS, IMF staff calculation.

1/ Includes Greece, Ireland, Portugal, Italy and Spain

Box 1. Financial System Monitoring at the BCB

The BCB currently devotes sufficient resources to macro-financial surveillance and the DESIG[1/] plays a leading role to detect and monitor systemic risk. The department consists of 226 staff, including a director, four deputy directors, and fourteen heads of division. Six divisions monitor micro-level sources of financial instability, divided by types of institutions (banking and non-banking), of risks (credit, liquidity, and market risk), or of markets (security and FX). Two divisions are responsible for systemic risk monitoring, stress tests, early warnings, and Financial Stability Reports. The DESIG collects data from many different sources,[2/] uses various tools to efficiently maintain databases, and runs a monitoring intranet to facilitate information sharing among divisions and with other parts of the BCB.

Overview of Financial System Monitoring Process



Divisions in the DESIG

Divisions	Number of Staffs
Banking Sector Monitoring	19
Non-Banking Sector Monitoring	40
Credit Monitoring	30
Liquidity and Market Monitoring	14
Securities' Market Monitoring	21
Foreign Currency Monitoring	13
Systemic Risk Monitoring	6
Financial Stability Monitoring	9
Information Collection Compliance	33
Information Management	4
Regulatory Studies	4
IT support	3
Planning and Control	4
Managers and Administrative Support	23
Total	226

Data Collection

	Financial Institutions
Daily	-Bank Reserve Deposits -Foreign exchange transactions -Statement of capital requirements
Monthly	-Statement of Financial Risk Management: (assets / liabilities and off balance sheet) -Balance Sheets -Statement of Liquidity Risk -Statement of operational limits -Credit portfolio
Quarterly	-Relevant investments
When it changes	-Ownership structure
	Clearings and Depository trust Companies
Daily	-Interbank Deposits -Derivatives -Securities

Source: Banco Central do Brasil

1/ DESIG: *Departamento de Monitoramento do Sistema Financeiro* (Financial System Monitoring Department)

2/ Financial institutions, other regulators (CVM, SUSEP, and PREVIC), register centers, private databases like SERASA, etc.

Box 1. Financial System Monitoring at the BCB (continued)

The systemic risk monitoring in the DESIG can be broadly grouped along the following types of analyses:

- Aggregate indicators of systemic imbalances: The BCB monitors aggregate indicators like leverage, credit growth, NPLs, and provisions, based on data from banks and non-banks. It also assesses asset prices and other macroeconomic variables to detect the build-up of systemic risks in the financial system and the economy at large. To facilitate timely monitoring processes, staffs uses various tools and databases such as SISMEF (Economic and Financial Monitoring System), SCR (Credit Information System), MRC (Credit Risk Monitor), SMM (Market Monitoring System), etc.

- Macroeconomic Stress Testing: The BCB has developed VAR and dynamic panel models, which relate banks' NPLs and credit portfolios with stressed relevant macroeconomic variables to assess credit portfolio quality of banks under tail-risk scenarios.

- Contagion Risk and Network Analysis: The BCB has identified and been monitoring interconnectedness across domestic financial conglomerates using a network analysis. The network is not limited to interbank deposits, but covers interbank deposits, term deposits, derivates (swaps, foreign exchange operations, forwards, boxes, and flexible options), repos with own securities, "*Letras Financeiras*" bonds, etc. The analysis tests how serious domino effects a failure of a bank (or a set of banks) creates in the financial system.

- Probability of Default of financial institutions: The model is adapted from Merton (1974). The BCB uses the moving average of 36 months for the parameters of return volatility of the asset and the cost of liability.

- Systemic Resilience: The resilience of the banking sector is assessed through a model that uses balance sheet and economic indicators, such as NPL volatility, interest and foreign exchange rate volatility, and credit risk and ROE average, to predict the probability of a financial crisis.

- Quantitative Evaluation Model of SIFIs: SIFIs with high 'SIFI score' have been identified and monitored more closely than other. The SIFI score of each bank is calculated according to its size (total assets), interconnectivity (number of connections, amount of lending and borrowing, etc.), complexity (derivative and FX exposures), and substitutability (share on payment system, geographic coverage in Brazil).

- Financial Stability Reports (FSRs): The BCB publishes semi-annual reports, describing recent national financial system dynamics and presenting stress-test results.

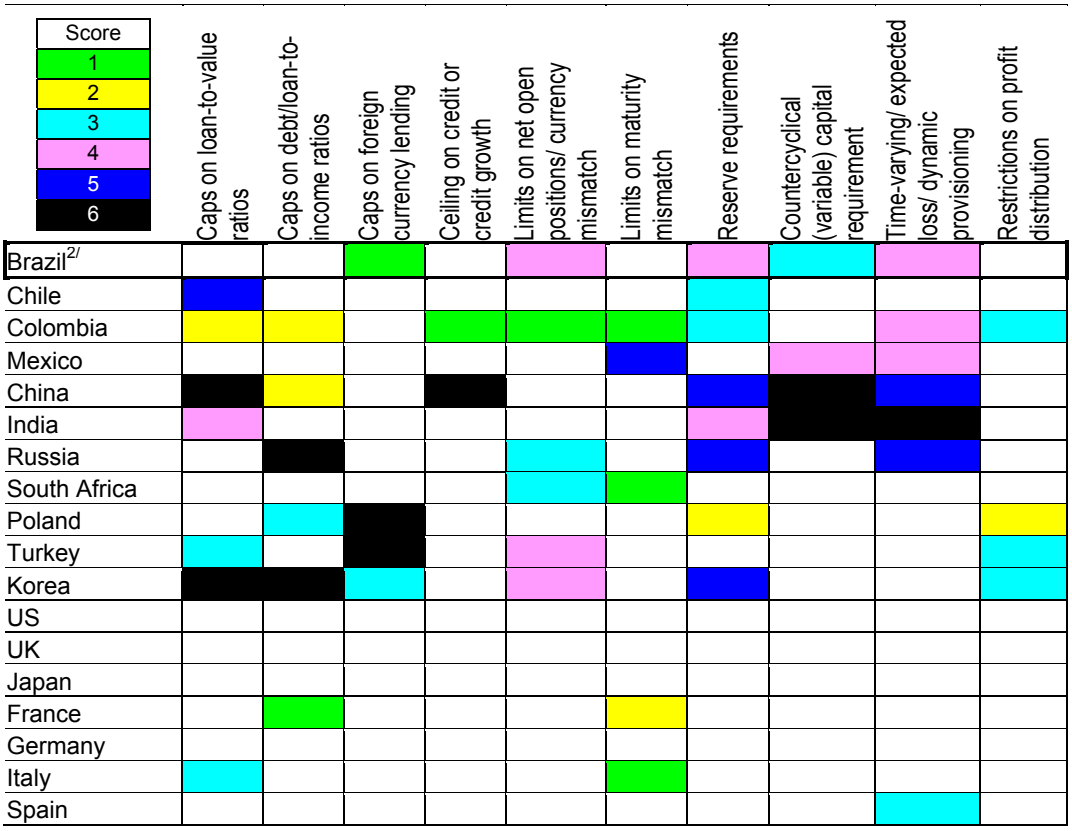
While metrics and approaches described above are useful on their own, it would be desirable to combine them into a graphical comparison of how financial system risks have evolved over time (e.g. financial stability map) in the FSRs. Furthermore, sophisticated analytical models can be developed to assess macro-financial linkages with multi-round feedback loops between the financial system and the real economy, and also to be used for stress-tests. Furthermore, it would be desirable to shorten the publication interval between a Portuguese version and an English version of the FSRs and their supplemented data files.

III. Systemic Risk Mitigation

A. Overview

13. **The Brazilian authorities have used a number of macroprudential instruments and capital flow management measures to contain both domestic and external sources of systemic risk (Table 2).** The measures include caps on foreign currency lending, limits on currency mismatch, reserve requirements, capital requirements, expected loss provisioning, limits on financial institutions' exposures on the interbank market, a financial transactions tax (IOF), etc.

Table 2. Intensity of Use of Macroprudential Instruments for Systemic Risks[1/]



Source: IMF (2011b).
1/ No color represents no use of instruments, and '1' denotes the use of a single instrument. For each of the following attributes, i.e., multiple, targeted, time-varying, discretionary and used in coordination with other policies, the value of '1' is added.
2/ There is no official caps on loan-to-value or debt-to-income ratio to mortgage loans in Brazil. But, it is unique that stricter capital requirements have been applied to vehicle loans with higher LTV ratios.

14. **These have been effective in achieving their immediate targets, but should continue to be used only as part of a broader policy framework aimed at maintaining macroeconomic stability and ensuring adequate financial sector buffers.** In this section, we focus on three instruments that have recently been utilized actively with frequent changes: the

IOF, reserve requirements, and instruments applied to consumer loans, such as differentiated capital requirement.[17]

B. Capital Flow Management Measure (IOF)[18]

15. **In response to a revived capital inflow surge, the authorities started to re-impose the IOF on foreign purchases of domestic bonds and equities from October 2009.** This measure was intended to stem volatile carry trades, lengthen maturities of the inflows, and ease persistent appreciation pressures of the domestic currency. However, incessant capital inflows and appreciation pressures prompted the authorities to adopt a battery of new measures to close potential loopholes (Table 3).[19]

Table 3. Brazil: IOF Tax Rates

(In percent)

Decree Number	Dates	Fixed income	Stocks	Foreign Borrowings	
				Rates	Maturity
Dec. 6,391	2008.3.17	1.5	0.0	5.38	90 days
Dec. 6,613	2008.10.22	0.0	0.0	5.38	90 days
Dec. 6,983	2009.10.19	2.0	2.0	5.38	90 days
Dec. 7,323	2010.10.4	4.0	2.0	5.38	90 days
Dec. 7,330	2010.10.18	6.0	2.0	5.38	90 days
Dec. 7,456	2011.3.28	6.0	2.0	6.0	360 days
Dec. 7,457	2011.4.6	6.0	2.0	6.0	720 days
Dec. 7,632	2011.12.1	6.0	0.0	6.0	720 days
Dec. 7,683	2012.3.1	6.0	0.0	6.0	1080 days
Dec. 7.698	2012.3.9	6.0	0.0	6.0	1800 days
Dec. 7.751	2012.6.13	6.0	0.0	6.0	720 days

Source: Banco Central do Brasil.

[17] See also Pereira da Silva and Harris (2012).

[18] In this subsection, we assess unilateral effectiveness of the IOF. For multilateral effects, see Appendix.

[19] A number of other instruments have also been deployed in order to prevent foreign exchange rate risks in the financial institutions' balance sheet.

- Limits on currency mismatch: Exposure in foreign currencies and gold is capped at 30 percent of a bank's regulatory capital, according to Resolution 3,488, issued on August 29, 2007.
- Caps and reserve requirements on banks' FX open positions: In January 2011 (effective in April 2011), there was an introduction of 60 percent unremunerated reserve requirements on banks' short FX position exceeding US $3 billion or Tier 1 capital, which is smaller, and the limit was lowered to US $1 billion in July 2011.
- Restrictions on foreign currency loans: Foreign currency lending by financial institutions is not allowed in general, except under limited circumstances.

16. **The IOF has been effective in reducing the volume of portfolio inflows and in changing the composition of capital inflows by increasing long-term inflows.**[20] Empirical evidences suggest that one percentage point hike of the IOF rate induces 0.73 percentage point decrease in portfolio inflows as a percent of GDP and 0.64 percentage point increase in long-term investment inflows (Table 4).[21]

Table 4. Brazil: Effectiveness of the IOF[1/, 2/, 3/]

	Capital Inflow without IOF	Capital Inflow	Portfolio Inflow	Long-term Inflow
	Mean Equation			
Constant	11.70***	12.92***	6.98***	1.20
	(2.25)	(2.39)	(2.35)	(1.28)
Brazil Interest Rate	0.035	0.07	0.25*	-0.16
	(0.13)	(0.14)	(0.15)	(0.10)
U.S. Interest Rate	0.15	-0.04	-0.49**	0.56***
	(0.17)	(0.26)	(0.19)	(0.17)
Business Cycle in Brazil	0.10	0.08	0.01	0.03
	(0.10)	(0.10)	(0.08)	(0.05)
Business Cycle in U.S.	-0.14	-0.08	0.00	-0.05
	(0.08)	(0.10)	(0.06)	(0.06)
Current Account	-0.99***	-1.14***	-0.76***	-0.18
	(0.18)	(0.23)	(0.17)	(0.16)
Forward FX Premium	-0.95***	-1.11***	-1.17***	0.36
	(0.33)	(0.35)	(0.33)	(0.26)
VIX	-0.23***	-0.23***	-0.14***	0.02
	(0.06)	(0.06)	(0.03)	(0.02)
EMBIG Sovereign Spread	-0.0059***	-0.0068***	-0.0054***	0.0007
	(0.0011)	(0.0013)	(0.0014)	(0.0010)
ICRG Index	-0.33	-0.28	-0.16	-0.09
	(0.25)	(0.26)	(0.29)	(0.18)
IOF Rate		-0.39	-0.73***	0.64***
		(0.33)	(0.26)	(0.21)
	Variance Equation			
C	19.25***	19.11***	2.94	1.22**
	(4.91)	(5.15)	(2.27)	(0.61)
Resid(-1)^2	-0.05	-0.03	-0.07***	0.60***
	(0.02)	(0.03)	(0.03)	(0.21)
Garch(-1)	-0.77**	-0.76**	0.55	0.41***
	(0.34)	(0.39)	(0.45)	(0.15)
Adjusted R-squared	0.47	0.44	0.27	0.15
Observations	144	144	144	144

1/ To address violations of classical OLS assumptions and a potential endogeneity problem between the policy-related variables and capital flows, we applied three different models: a generalized least squares (GLS), a generalized autoregressive conditional heteroskedasticity (GARCH (1,1)), and a generalized method of moments (GMM) model. In general, results are similar across three different models, and thus, for brevity, the results from GARCH (1,1) are reported. Other detailed results will be available upon request.
2/ ***, **, and * denote significance at the 1, 5, and 10 percent level, respectively.
3/ See Box 3 for further information of the analysis.

[20] As for the maturity of flows, all portfolio investments, derivative investments, and short-term other investments is considered to be short-term. Remaining flows, made up of direct investments and non-short-term other investments, are considered to be long-term flows.

[21] See Baba and Kokenyne (2011) as a reference.

17. **Estimations also show that most pull and push factors are statistically significant.** Domestic interest rates are significant determinants of portfolio inflows; that is, the higher interest rate attracted more portfolio inflows. The level of the foreign interest rate is significant in many different flows and is associated with a negative sign as we expected. Expected appreciation, proxied by a negative three-month forward FX premium, is also a significant factor in determining financial flows. A lower EMBIG sovereign spread[22] and a lower VIX volatility index, both of which are associated with lower risk aversion, encouraged capital inflows to Brazil, but the ICRG index is not statistically significant in most cases.

Box 2. Unilateral Effectiveness of the IOF

The analysis covers the period 2000M1 to 2011M12. The data on the volume and the composition of capital flows are taken from the IMF's *Balance of Payments Statistics*. The balance of payments describes transactions between residents and nonresidents. We use a weighted average of the IOF rates and also construct an index to track the intensity of the IOF restriction based on reported policy changes. Total flows are determined from flows in direct investments, portfolio investments, derivative investments, and other investments. In the balance of payments tables, inflows refer to changes in the liabilities of each component, and outflows refer to changes in the assets of each component. All flows are expressed as a percent of GDP. Outflows are expressed with a negative sign.

As for the maturity of flows, we consider all portfolio investments, derivative investments, and short-term other investments to be short-term. Remaining flows, made up of direct investments and non-short-term other investments, are considered long-term flows. Private capital flows are obtained by stripping out public sector flows in portfolio investment assets, other investment assets, and other investment liabilities.

International capital flows into countries that provide better investment opportunities (pull factors) from countries with abundant capital (push factors). We choose potential determinants of capital flows based on the existing literature. The pull factors include domestic interest rates, expected appreciation of a currency, business cycles, investment risks, and current account balance. Corresponding variables in advanced economies are used to control for global push factors, and the United States is used as the benchmark foreign country.

Most variables in the analysis are defined as stationary. First-difference series are used for the ICRG index. For a few series (in particular, the FFR and current account), we cannot reject the null hypothesis of a unit root for our sample period. However, in theory, those variables have to be stationary and the non-stationary null would be rejected for a longer sample. Thus, the following results use these variables in levels.

Interest rates and expected change in the exchange rate

Interest rates in domestic and foreign economies and an expected change in the nominal exchange rate are used to measure an expected return on international investments.

[22] There are a few country-specific risk indicators such as CDS spread and J.P. Morgan EMBI global spread. In this analysis, we use J.P. Morgan EMBI global spread that is available throughout the whole sample period, different from Brazil CDS spread being only available from November 2001.

Box 2. Unilateral Effectiveness of the IOF (continued)

We use money market interest rates in Brazil (Selic overnight rate) and in the United States (Federal Fund rate (FFR)). The expected exchange rate is measured by a three-month forward exchange rate premium, which is defined by the difference between the forward and spot exchange rates. A higher domestic interest rate, a lower foreign interest rate, and an expected appreciation of the currency (lower forward premium) are expected to contribute to an increase in capital flows, especially in portfolio investment flows.

Business cycle

Strong economic growth in Brazil also attracts capital flows. We control for the impact of the business cycle with "Economic Activity Index." A country is more likely to receive capital for a higher expected profit in the future when its economy booms (positive deviations from the trend), and vice versa for the business cycle in foreign economies.

Investment risks

To control for investment risks, we include three different indicators. The first is JPMorgan's EMBI global sovereign spread for Brazil. It tracks the difference between returns on dollar denominated sovereign debt instruments and on U.S. Treasury notes, which are considered to be risk free. The second indicator is the *International Country Risk Guide* (ICRG), whose composite risk ratings take into account the political, financial, and economic risks for each country. Third, we include a volatility index in the options market, the Chicago Board Options Exchange Volatility (VIX) Index, to approximate global risk appetite. A lower EMBIG spread, a higher ICRG index, and a lower VIX index are all associated with lower investment risk and are likely to attract foreign capital.

Current account balance

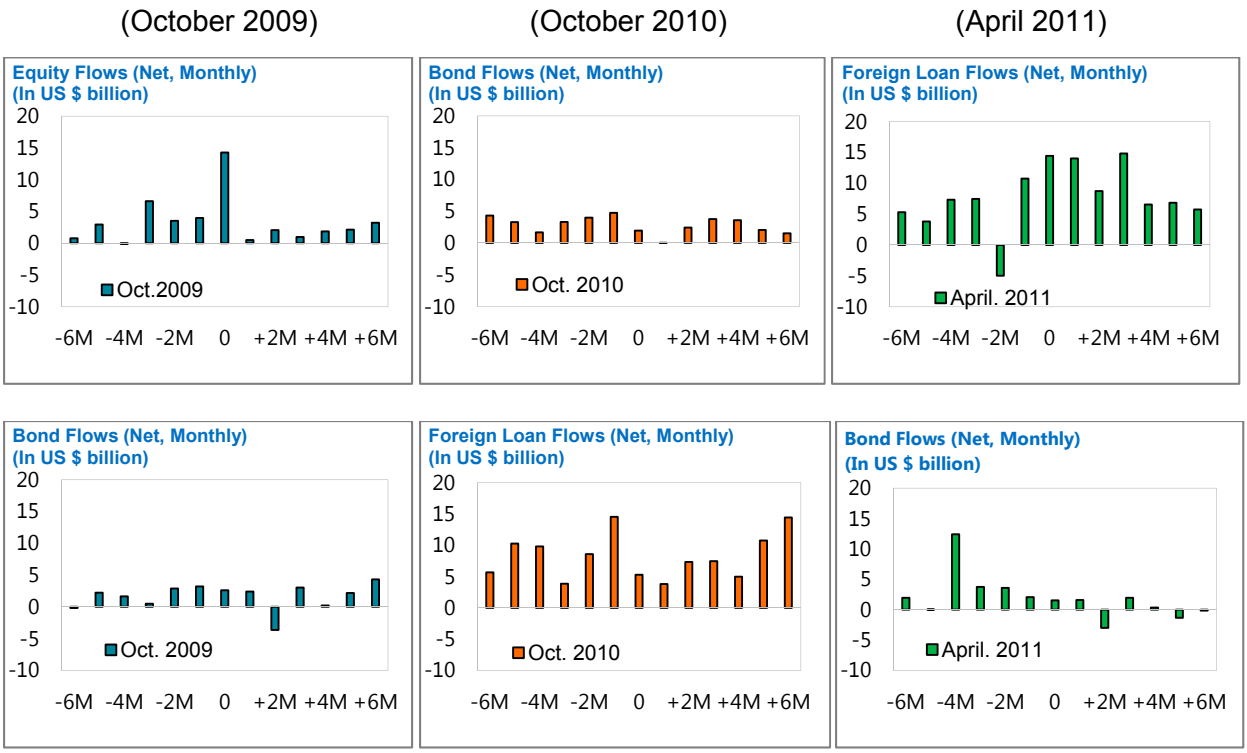
Finally, we include current account balance as a potential determinant of capital flows. A larger current account deficit implies that more funds are available for nonresidents to invest in the capital market. Therefore, we expect a negative sign for the relationship between current account balance and capital flows.

Definition and Source of Variables

Variable	Definition	Source
Capital Flows	Different Categories of Capital Flows	IMF BOP
Brazil Interest Rate	Selic Overnight Rate (monthly average)	Bloomberg
U.S. Federal Fund Rate	Federal Fund Rate (monthly average)	Bloomberg
Brazil Business Cycle	Economic Activity Index	Banco do Central Brasil (BCB)
U.S. Business Cycle	Industrial Production Index	Haver Analytics
Current Account Balance	Current Account Balance (percent of GDP)	Haver Analytics
Forward FX Premium	(Forward FX rate 3M/Spot FX rate – 1) *100	Bloomberg
VIX	Daily Chicago Board Options Exchange Market Volatility Index (monthly average)	Bloomberg
EMBIG Sovereign Spread	J.P. Morgan EMBI global sovereign spread (monthly average)	Bloomberg
ICRG Index	International Country Risk Guide Composite Index	ICRG

18. **The IOF has been largely successful to achieve its goal to reduce specific types of capital inflows, but the extension of the IOF to different instruments and maturities suggests that there was circumvention through other types of inflows after a short period of time.** The October 2009 measure reintroduced 2 percent of the IOF on fixed income and equity flows. It was successful to curtail the equity inflows, but the fixed income inflows remained at the similar level as before. The hike of the IOF on fixed income inflows in October 2010 reduced its target inflows, but there was a substantial increase in foreign loans by residents as a new route of circumvention of the IOF. In March and April 2011, the IOF was extended to loans with a maturity of less than 360 days and to 720 days respectively as it became clear that the maturity of loans was shifting to avoid the IOF tax (Figure 11).[23] Moreover, there is no strong evidence that the IOF has had adverse multilateral effects,[24] consistent with the finding in an IMF policy paper (IMF, 2011d).

Figure 11. Brazil: Event Studies of the IOF Measures[1/]



Source: IMF staff calculation.

1/ '0' denotes the month that each measure was implemented and similarly '+2M' and '-2M' denote 2 months after and before the month respectively.

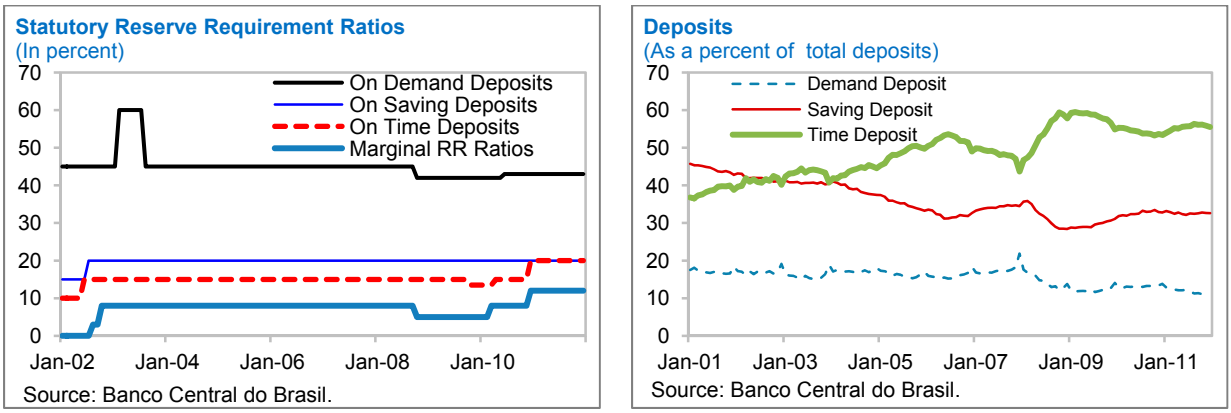
[23] The authorities announced the taxable maturity to be extended from 720 days to 1080 days on March 1, 2012.

[24] Estimated equity prices responses in neighboring countries to changes in the IOF are mixed: in Peru, equity returns increased, in Mexico returns decreased, while in Chile and Colombia the impacts were statistically insignificant. See the appendix II.

C. Reserve Requirements

19. **The BCB varied reserve requirement ratios (RRs) to manage credit cycles countercyclically and to ease liquidity constraints in the financial system.** Right after the disruption of the global financial crisis, the BCB used it as a liquidity buffer not only to release a part of required reserves but also to grant large banks reductions on their requirements if they extended liquidity to illiquid small and medium banks. In March and December 2010, RRs were used as speed limits to slowdown credit growth in the conjunction with tightening measures on consumer loans (Figure 12).[25]

Figure 12. Brazil: Statutory Reserve Requirements Ratios and Deposits



20. **Increases in reserve requirements (RRs) were temporarily effective in raising interest rate spreads and curtailing credit growth.** Impulse responses to a one percent shock in weighted average RRs show a moderate but transitory slowing of credit growth. VAR impulse responses to a 1 percent shock in weighted average of RRs show that RRs have a moderate and transitory impact in slowing the credit growth (Figure 13).[26]

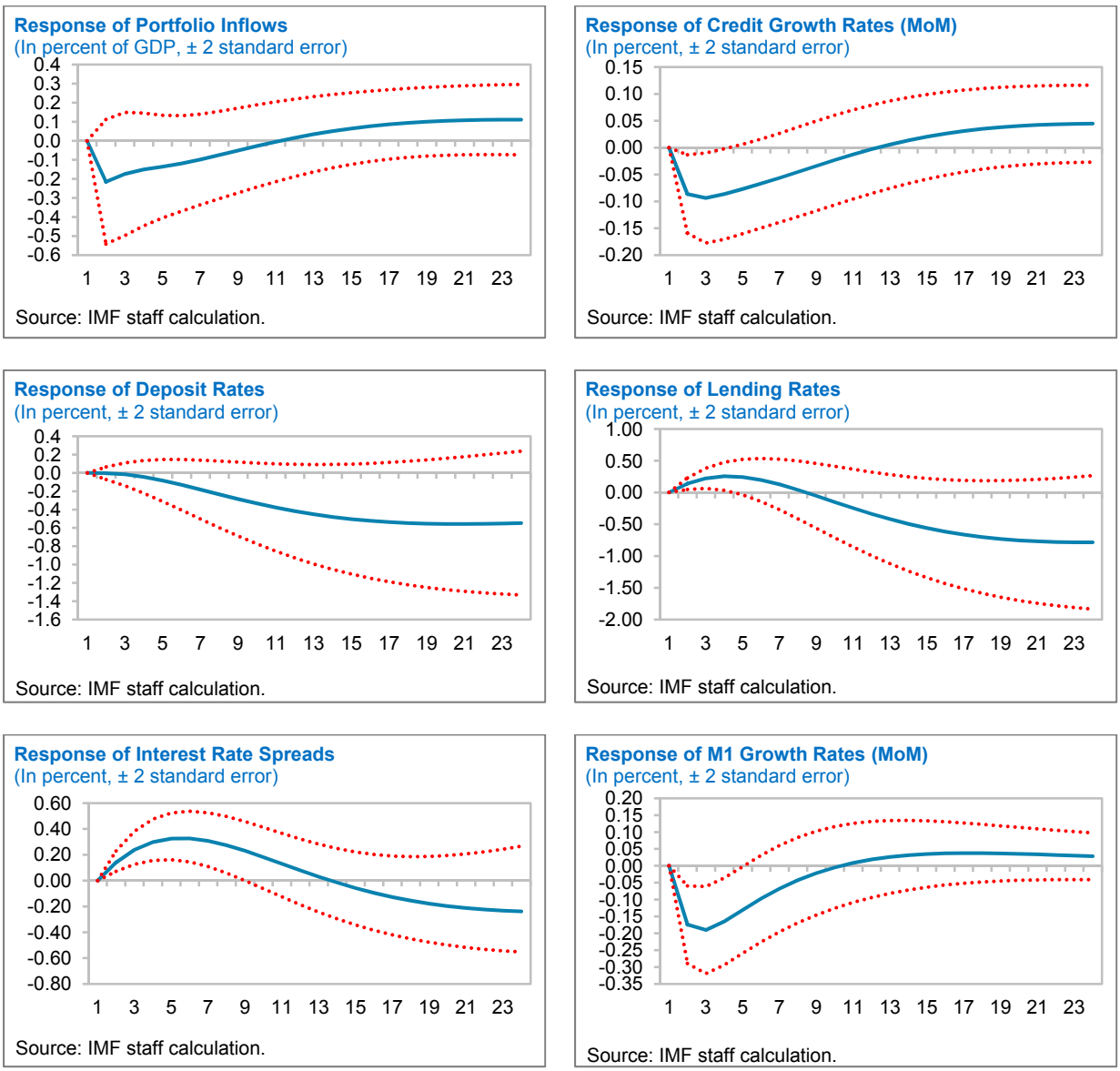
21. **The transitory impact is partly due to the fact that the high level of RRs generates incentives for moving away from stable deposit funding and finding a way to circumvent**

[25] Policymakers in emerging market economies often face a dilemma: if they raised interest rates to control inflation and credit growth, they risk attracting capital inflow surges. Such inflows could generate appreciation pressure and stimulate credit growth and push up asset prices against financial stability. However, raising RRs is less likely to attract capital inflows than is an increase in policy rates, and thus they rely on the RRs to promote financial stability.

[26] We use a VAR model to assess the impact of increases in RRs on other six endogenous variables (portfolio inflows to GDP, monthly credit growths, lending and funding rates, interest rate spreads, and monthly money growths). The ordering of variables for Cholesky decomposition is decided according to the following transition mechanism. A monetary authority first decides on reserve requirement ratios, and then the growth rate of monetary quantity (M1) is realized, determining interest rates, credit growths, and portfolio inflows accordingly in the given order. We confirmed robustness of the result by conducting sensitivity analyses with different orders of variables. Seasonal variables and a dummy variable controlling the global financial crisis period is used as an exogenous variable. The model is estimated with monthly data for 2003–2011 with one lag, based on two lag length criteria (Schwarz and Hannan-Quinn information criterion). Detailed results will be available upon request.

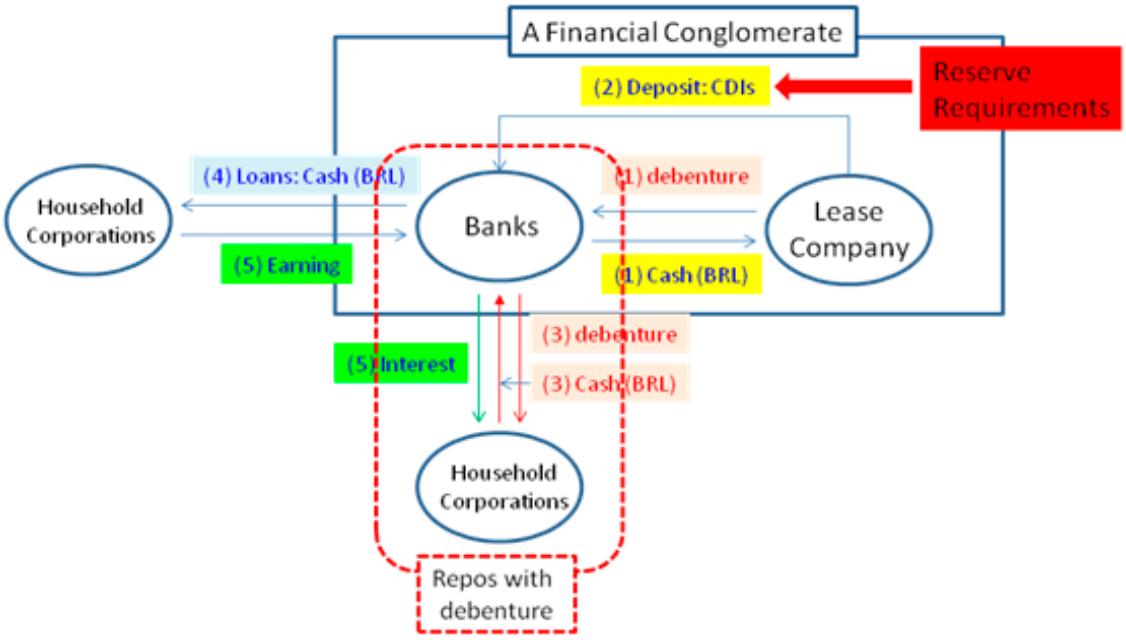
RRs. Figure 14 shows an example how Brazilian banks used their affiliated leasing companies to circumvent RRs. The mechanism is as follows; (i) a bank could buy debentures from its affiliated leasing company; (ii) the proceeds from this sale directly deposited back to the bank in the form of short-term interbank deposits, so called CDIs (*Certificados de depósito interfinanceiro*), which was out of reserve requirement regulatory perimeter; (iii) Then, the bank engaged a repo transaction with the debenture with private investors; (iv) made new loans; and (v) gained profits without fulfilling any RRs. The BCB had to impose a 100 percent RRs on the short-term interbank deposits to close the loophole on January 31, 2008.

Figure 13. Brazil: Impulse Response to Increase of Reserve Requirements[1/]



1/ Solid lines depict the response of endogenous variables, and the dashed lines report the plus or minus two standard error bands, which yield the 95 percent confidence intervals. If the 95 percent confidence intervals include zero, it means that the impact in the period of the specific variable is not statistically significant.

Figure 14. Brazil: An Example of Reserve Requirement Circumvention



22. **In order to make RRs more effective, the BCB could consider the possibility of expanding the coverage regarding deposit-like operations that are currently not subject to RRs.**

D. Restrictions on Consumer Loans

23. **Capital requirements on new credit operations to households were increased in December 2010 to tackle potential adverse effects from a rapid consumer loan growth (Table 5).** The measure mainly focused on personal credits, payroll-deducted loans, and vehicle financing, involving longer maturities or higher loan-to-value ratios. In November 2011, a recalibration of the measure revoked the previous Circular and the capital requirements for consumer loans were lowered through a reduction in risk weights, removing loan-to-value ratio criteria, in order to make it more effective.

24. **Increases in the capital requirements on consumer loans appear to have contributed to reducing the speed of household credit growth.** After the implementation of the December 2010 measure, the annual growth rate of credit granting to households decreased 11 percentage points from 22 percent in December 2010 to 11 percent in December 2011.[27] The average duration of vehicle loans reduced from 19.1 months in December 2010 to 18.6 months in October 2011, and especially the proportion of the vehicle loans with maturity higher than 60 months in total vehicle loans reduced about 20 percentage points (Figure 15).

[27] It should be noted that the decrease occurred against the backdrop of a slowing economy.

Table 5. Brazil: Macroprudential Instruments on Consumer Loans

(December 2010)

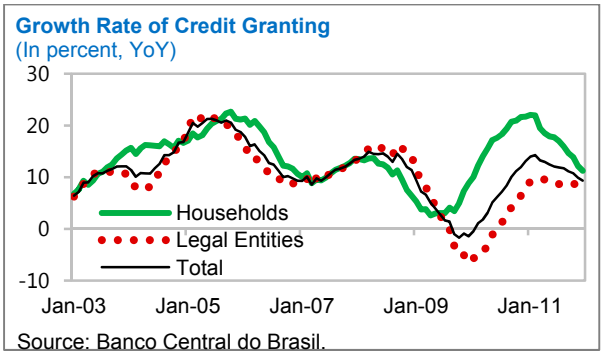
Operation	Maturity and LTV	Capital requirement (in percent)
Vehicles loans	Maturity between 24 and 36 months and LTV > 80 percent Maturity between 36 and 48 months and LTV > 70 percent Maturity between 48 and 60 months and LTV > 60 percent Maturity higher than 60 months and any LTV	16.5
Payroll deduction loans	Maturity higher than 36 months	
Personal loans	Maturity higher than 24 months	
Other consumer loans classified as retail		8.5

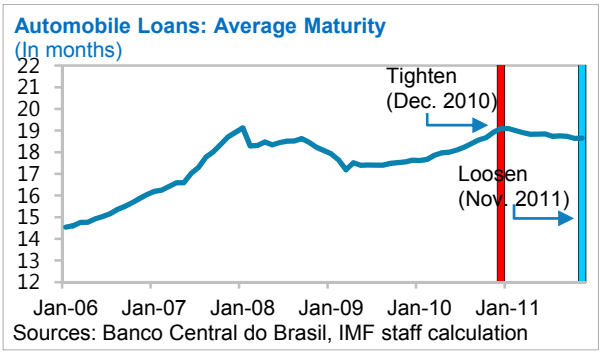
(November 2011)

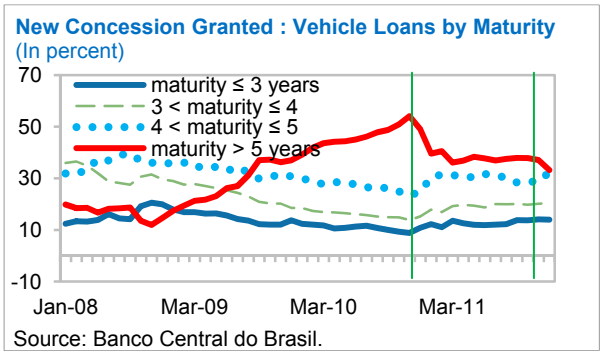
Operation	Maturity and LTV	Capital requirement (in percent)
Vehicle loans	Maturity under 60 months and classified as retail (risk weight: 75 percent)	8.25
	Maturity under 60 months and not classified as retail (risk weight: 100 percent)	11.0
	Maturity higher than 60 months (risk weight: 150 percent)	16.5
Personal Loans	Maturity under 36 months (risk weight: 75 percent)	8.25
	Maturity between 36 and 60 months (risk weight: 150 percent)	16.5
	Maturity higher than 60 months (risk weight: 300 percent)	33.0
Other consumer loans (risk weight: 100 percent)		11.0
Other consumer loans classified as retail (risk weight: 75 percent)		8.5

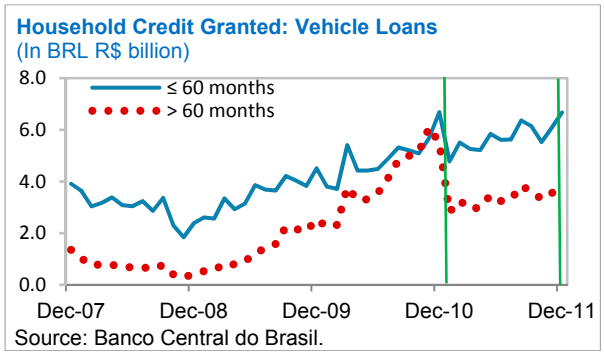
Source: Banco Central do Brasil

Figure 15. Brazil: Effectiveness of Capital Requirements on Consumer Loan









E. Potential Macroprudential Instruments

25. **There may be room for improvement in the systemic risk monitoring and macroprudential tool box**. At a minimum, to improve the monitoring of housing prices, comprehensive transactions-based data should be collected. Targeted macroprudential policy instruments, i.e., limits on loan-to-value or debt-to-income ratios, have proved effective in other countries prevent a build-up of systemic risks in the housing sector and should be considered. The early implementation of Basel III countercyclical capital buffers planned by the authorities would also be useful.

Limits on LTV and DTI Ratios

26. **The global financial crisis brought real estate boom-bust cycles to the fore of policy discussions and highlighted the importance of closely monitoring housing sector developments as an essential tool to safeguard financial stability.** Extensive international experience documents that the deepest and longest recessions have been proceeded by credit crunches related with housing price busts.

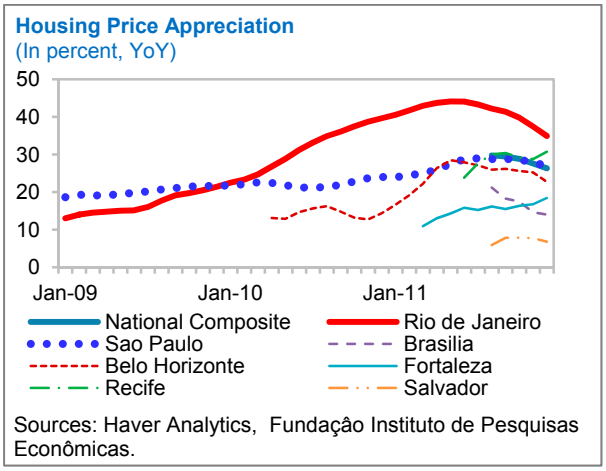
27. **Brazil has been experiencing a sizable expansion in mortgage loans and rapid housing price appreciation in the past three years.** While from a low level, mortgage loans (mostly directed lending by the public savings bank, i.e., *Caixa Econômica Federal*) has more than doubled during the last three years and now accounts for about 11 percent of the total loans. The expansion of the mortgage loans was accompanied by a rapid housing price appreciation.[28] Housing prices in Brazil have risen rapidly, especially in two major metropolitan cities—Rio de Janeiro and Sao Paulo—where real housing prices are up some 80 percent over the last three years based on available data (Figure 16).

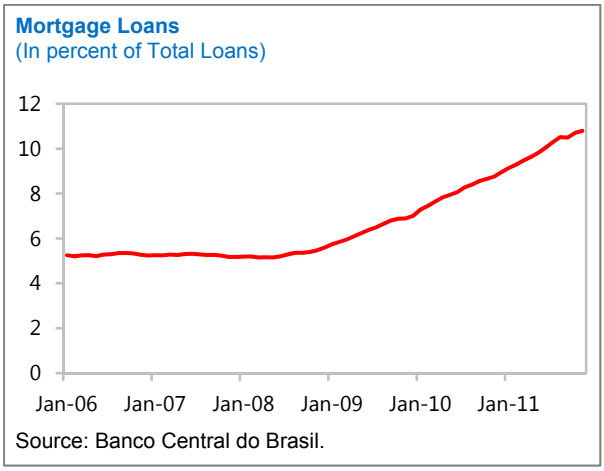
28. **This rapid house price growth and the strong expansion of mortgage loans stresses the need for close monitoring along with household and banks' balance sheets.** To strengthen its surveillance capacity of the housing sector, the BCB will need to ensure compilation and publishing of a housing price index that is based on transaction data with broad geographic coverage. Furthermore, the BCB may consider implement official maximum limits on loan-to-value (LTV) and debt-to-income (DTI) ratios to preemptively prevent a build-up of systemic risks in the housing sector. The two instruments are complementary each other, with the LTV addressing the wealth aspect, and the DTI the income aspect. The former can curb the

[28] Strong growth in mortgage loans can be explained by a strong economic growth and labor incomes. Another factor was the implementation of the social program "My House My Life" (*Minha Casa Minha Vida*) which aims at providing new homes for low-income households. Moreover, the strong growth of mortgage loans can also be explained by the change in the legal/institutional framework that facilitated posting and recovery of collateral. Other key macroeconomic factors are also important to explain the behavior of housing prices in Brazil. In particular, the strong real exchange rate appreciation, resulting from the commodity boom since 2003 and led to strong valuation of asset prices in general, and of housing prices in particular. Credit alone seems to be more relevant in the most recent years (maybe from 2008–2009 onwards).

feedback loop between mortgage credit availability and house price appreciation, and the latter can help reduce the incidence and loss given default of residential mortgage loan delinquencies (IMF (2011b); Igan and Kang (2011)). However, LTV and DTI limits should be carefully designed, for they imply high observance costs and complex calibration.

Figure 16. Brazil: House Price and Mortgage Loans





Countercyclical Capital Buffers

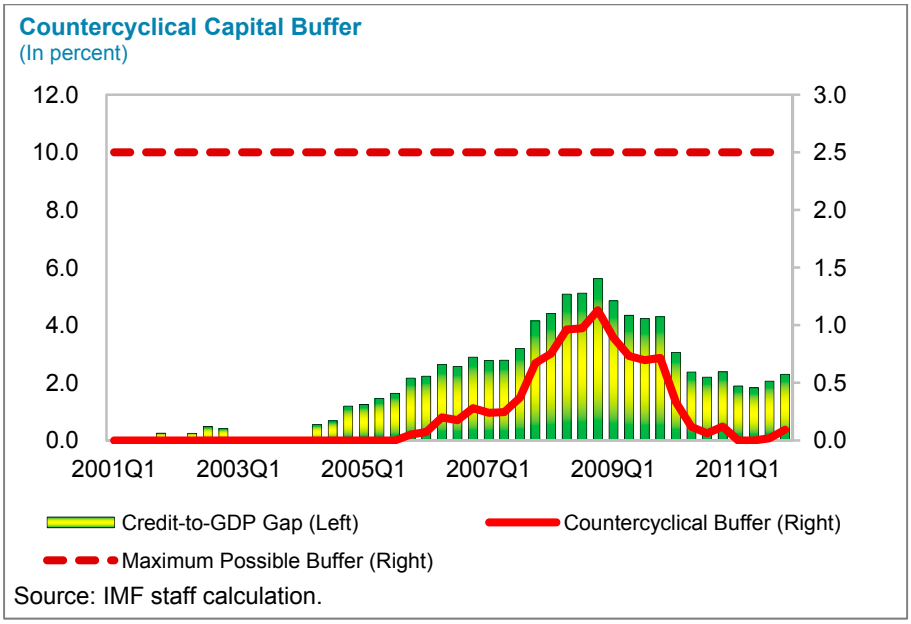
29. **Another lesson from the recent crisis is that measures against procyclicality need to be implemented to address the build-up of financial imbalances through serving a shock absorber.** The financial system is inherently procyclical and interacts with the real economy, thereby amplifying economic fluctuations. During booms, self-reinforcing processes of taking larger amount of risks can develop, resulting in the build-up of financial imbalances, and these processes operate in a reverse direction during contractions.

30. **As an automatic stabilizer of the financial imbalances, the early implementation of Basel III countercyclical capital buffers planned by the authorities would also be useful.** As a G-20 country and member of the Basel Committee on Banking Supervision (BCBS), Brazil is firmly committed to implementing Basel III, including countercyclical capital and surcharges for systemically important banks (SIBs). Indeed the BCB has announced that it will start implementing Basel III capital requirements in 2013, ahead of schedule: the phase-out of deferred tax assets (DTAs) will start in 2012 (rather than 2014), and banks would be required to meet counter-cyclical capital charges beginning in 2014 (rather than 2016).

31. **The BCBS (2010), suggests using the credit-to-GDP gap as the conditioning variable, computed as a deviation of the credit-to-GDP ratio from its HP trend, which links the required level of the capital buffers with the size of financial imbalances**, even though the Basel agreement does not mandate how the buffer should be calculated, leaving flexibility to individual jurisdictions. A BIS working paper, Drehmann et al. (2010), delivers a comprehensive review of candidates for conditioning variables, and concludes that the credit-to-GDP gap shows the best performance.

32. **The buffer would have raised the Brazilian banks' capital in the run-up to the recent crisis and lowered it after the crisis subdued** (Figure 17). The figure plots the estimated credit-to-GDP gap and countercyclical capital buffers, calculated according to the BCBS' guidance. The gap is estimated with the one-sided HP filter with a smoothing parameter of 400,000 for quarterly private sector credit-to-GDP ratio data between 2001 and 2011.[29] This estimation is purely illustrative but promising, because it shows that the measure can play a role as an automatic stabilizer for the financial imbalances in Brazil.

Figure 17. Brazil: Credit-to-GDP Gap and Countercyclical Capital Buffer[1/, 2/]



1/ The countercyclical buffer is 0 percent when the value of the credit-to-GDP gap is below 2 percent. It is 2.5 percent when the gap is above 10 percent. For gaps between 2 and 10 percent, the buffer is calculated as 2.5/8 times the value of the gap exceeding 2 percent.

IV. Institutional Architecture

A. Current Institutional Arrangements

33. **A macroprudential institutional architecture needs to be designed to foster effective identification of developing systemic risks; provide strong incentives to take timely and effective action to counter the risks; and facilitate coordination across policies (Jacome et al. (2012)).** In this regard, it is important to identify a macroprudential authority (an institution or a policy committee), which should have a clear mandate and objectives with operational independence. The authority should also have adequate powers to collect information, establish

[29] Because of the structural break of the credit-to-GDP ratio at the beginning of the decade, the earlier data series is not used, unlike the BCBS (2010).

the perimeter of reporting and regulation, and calibrate instruments under its direct control, while a formal mechanism should be in to ensure its accountability and transparency.

34. **The national monetary council (CMN)[30] and the central bank of Brazil (BCB) have a *de facto* mandate for, and play a major role in, monitoring and acting to ensure financial stability.** The CMN, made up of the Minister of Finance, the Minister of Planning, Budget and Management, and the Governor of the BCB, issues regulations and provides guidelines to be implemented by the BCB and the securities commission (CVM) in their role of monitoring, supervising, and regulating banks and securities markets, respectively. The National Council of Private Insurances and the Superintendence of Private Insurances (SUSEP) regulates and monitors insurance companies, open private pension funds, capitalization markets and reinsurance, whereas the National Council of Complementary Social Security and the Superintendence of Complementary Pensions (PREVIC) is responsible for supervising and regulating activities of closed private pension funds and for putting into practice policies for the complementary pension regime.

35. **Based on guidelines of the CMN, the BCB[31] executes monetary and foreign exchange policies, and regulates/supervises the banking sector.** The monetary policy committee (COPOM) of the BCB sets the target for the SELIC base rate. For prudential policy, the BCB established a Financial Stability Committee (COMEF) in May 2011,[32] chaired by the Governor and comprised of the Deputy Governors with its goals to identify and monitor the sources of systemic risk, define strategies to mitigate such risks, and allocate responsibilities among departments within the BCB.

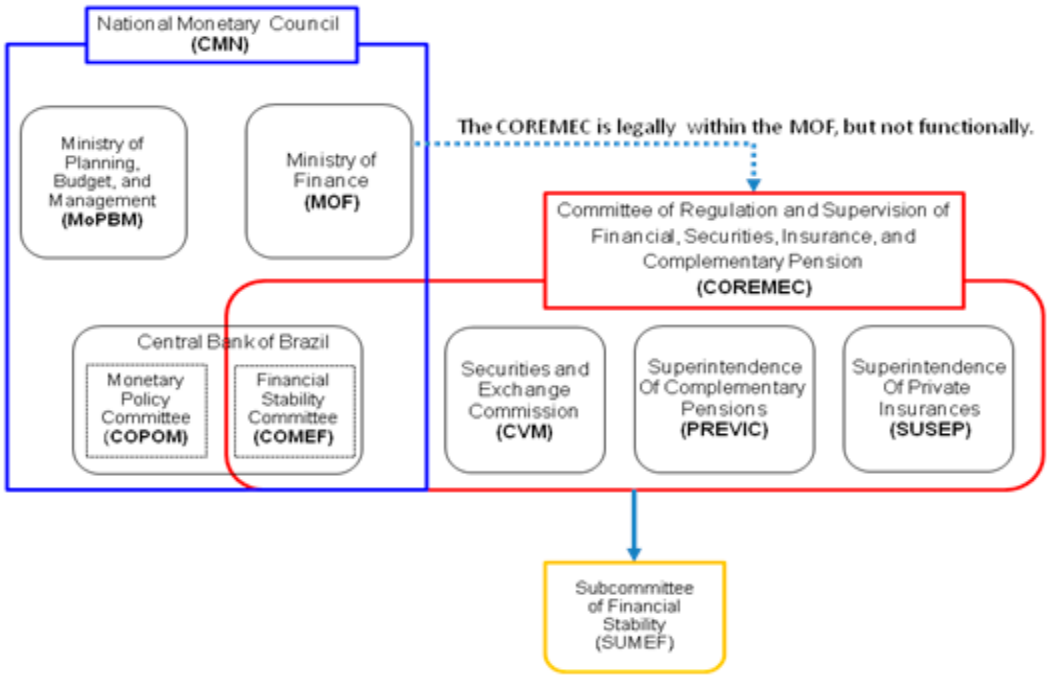
36. **Brazil has a well-developed architecture for supervisory cooperation and information sharing**. In 2006, the government created the Committee of Regulation and Supervision of Financial, Securities, Insurance, and Complementary Pension (COREMEC) to promote coordination among the agencies responsible for regulating and supervising financial institutions and sharing information on financial conglomerates. In 2010, a Subcommittee to Monitor the Stability of the National Financial System (SUMEF) was created to expedite information sharing and coordinate supervisory policies. And in May 2011, the BCB established a Financial Stability Committee (COMEF), to better identify and monitor the sources of systemic risk and define strategies to mitigate such risks. Figure 18 summarizes the current institutional arrangements.

[30] The CMN was created by Law 4,595, issued on December 31, 1964. For detailed information of the responsibilities and composition of the CMN, see section VI.

[31] The BCB mission is defined by its Board of Governors as "to ensure the stability of the purchasing power of the currency and the soundness and efficiency of the financial system."

[32] The heads of departments whose work is related to the maintenance of financial stability also participate in the COMEF meetings, but do not hold voting rights.

Figure 18. Brazil: Current Institutional Arrangements



B. Strengths and Weaknesses of Brazilian Institutional Architecture

37. **Since the legal framework does not assign explicit responsibility for financial stability to any agency, in practice the BCB takes a leading role.** The CMN and the BCB assume de facto accountability for timely macroprudential policy action, and the BCB has legal power to implement prudential instruments in its regulatory perimeter. The COREMEC has a purely advisory role. The agencies in the COREMEC proved that they had the willingness to avoid the risk of delayed policy action by collaborating decisively to contain the negative impact from the global financial crisis.

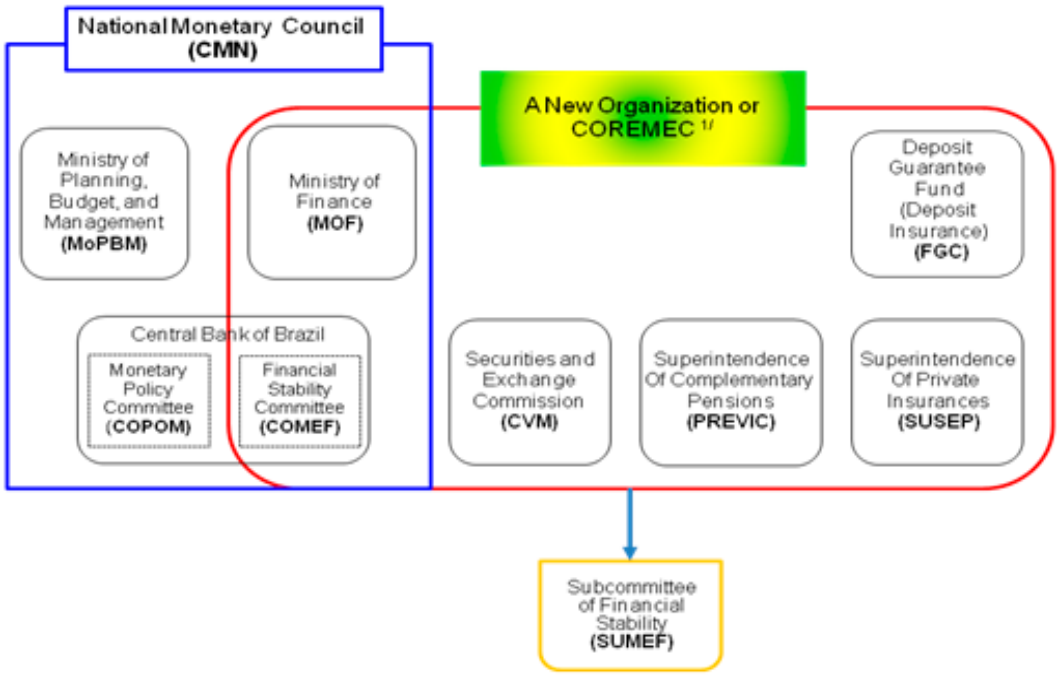
38. **Although these arrangements have been successful, they may not be sufficient for identifying cross sectoral risks.** As the financial system gets more complex, risks can arise not only in a single sector but as an interlinked, system-wide issue. Closer coordination and action among the various supervisory agencies will thus become increasingly important. While the BCB will likely always retain a key role, also reflecting its expertise in systemic risk analysis, more explicit cooperation arrangements, as well as greater transparency and accountability, might be warranted going forward.

39. **Moreover, the current framework does not sufficiently recognize the enhanced role of the deposit guarantee fund (FGC).** The FGC, which is a crucial component of the financial safety net, is not a member of any of the existing agencies, such as the COREMEC.

C. Key Desirables for More Effective Institutional Framework

40. **Although these arrangements have been sufficient in the past, the authorities should consider establishing a multipartite high-level committee, comprising all players in the financial safety net, with an explicit mandate for financial stability and crisis coordination.** This could be a new committee, or an "upgraded" existing committee, such as the COREMEC. An explicit financial stability mandate should be set out clearly in the form of legislation and assigned to this committee. All agencies in the financial safety net, including the BCB, the CVM, the SUSEP, the PREVIC, the FGC (after the proposed changes to its governance structure comes into force),[33] and the Ministry of Finance should be members of this committee.[34] Figure 19 summarizes the proposed structure.

Figure 19. Brazil: New Proposed Institutional Framework



1/ The COREMEC or a new organization would have an express financial stability mandate.

41. **This committee should also be responsible for financial system-wide risk monitoring and macroprudential policy implementation, closing regulatory gaps, and reducing the room for regulatory arbitrage.** The member agencies should conduct regular joint-assessments of systemic risks in the financial sector as a whole. This committee could also publish periodic

[33] See a technical note on Financial Safety Nets for more information.

[34] The legal mandate of each agency should be able to support macroprudential policies by having the mandate to contribute to or to foster financial stability.

financial stability assessment reports that might be presented to the National Congress of Brazil (*Congresso Nacional do Brasil*).[35]

42. **The committee would ensure that all legal and operational hurdles for information exchange among participants are cleared.** Consideration could be given to strengthening the cooperation among supervisors (currently in the form of MOUs) by establishing joint databases to facilitate the sharing of information.

43. **A leading role of the BCB in the new committee would be important to harnesses the BCB's expertise in systemic risk assessment, as well as its role as the lender of last resort.** Participation of the MOF on the committee is important, so as to ensure the cooperation of the government when successful mitigation of systemic risk requires a change in the law, e.g., to expand the regulatory powers of prudential agencies, or when it requires a change in specific policies (e.g., taxes or subsidies) that foster the build-up of systemic risk. However, a leading role of the government can pose risks, since macroprudential policy is subject to important political economy challenges that favor inaction or insufficiently forceful action in good times when risks are building up. A strong role for the government may also impinge the operational autonomy of member agencies or be seen to have the potential to reduce the independence of these agencies.

[35] The reports would complement the BCB's FSR, focusing on systemic risk issues in the entire financial system as a whole, including banking and non-banking sectors.

APPENDIX I. FINANCIAL STABILITY MAP

44. **The Financial Stability Map provides a graphical summary and serves as a starting point for further analysis that captures a diverse range of potential sources of systemic risk**, as in Financial Stability Reports of many countries and Global Financial Stability Reports (GFSR). The key notion underpinning the Map (an example of which may be found in the April 2012 GFSR) is that financial stability cannot be distilled into a single indicator but is better understood by trying to identify underlying risks and conditions that could give risk to a systemic threat. But, unlike the one in GFSRs, the Map extracts information from variables which describes vulnerabilities in different sectors and markets in an economy.

45. **The Map tracks three sectors and three underlying conditions (markets) considered to be relevant for financial stability in an open economy like Brazil**: risks in private (household financial soundness),[36] public (sovereign risk), and banking sectors (bank soundness), and financial, domestic and external economic conditions. "Household Financial Soundness" measures credit stress in household balance sheets. "Sovereign Risk" results from unsustainable fiscal paths and rising debt burdens can create a possibility of sovereign default. Under "Bank Soundness," various types of risks that banks face are captured with Financial Soundness Indicators (FSIs). Domestic economic conditions (Economic Conjuncture) affect financial stability through various channels; for example, production, wage income, and consumption underpin credit risk, and inflation/deflation risk can impact real debt burdens. External Vulnerability captures potential impact from external shocks, and finally 'Financial Market' conditions gauge the cost and availability of funding via volatility in the bond, stock, and FX markets.[37]

46. **The choice of specific variables to assess each segment is guided by their relevance and various practical considerations**. The estimated value of vulnerabilities is an aggregate of

[36] It would be desirable to expand this segment by including potential source of risks from corporate balance data.

[37] The following indicators are deliberately chosen to cover important aspects of risks in each segment as minimal as possible.

- Household Financial Soundness: loan default rate, households' debt-to-income ratio, average real income growth, saving deposit to GDP, consumer confidence index, and households' DSR.
- Sovereign Risk: public net debt to GDP (percent), budget deficit to GDP (percent), JP Morgan EMBI+ sovereign spread, foreign reserves to imports, and ICRG country risk rating.
- Bank Soundness: regulatory capital to risk-weighted assets, NPL to total gross loans, return on assets, liquid assets to total assets, and FX net open position to capital
- Economic Conjuncture: growth rate of industrial production (y/y), private consumption growth rate (y/y), CPI (y/y), average real income growth rate (y/y), and current account to GDP.

Financial Market Condition: volatility estimated with Garch (1,1) models of five indicators such as policy interest rate, stock price index, nominal foreign exchange rate (R$/U$), domestic liquidity index (Selic overnight—CETIP interbank overnight), and foreign liquidity index (cupom cambial 3M— libor 3M).

a range of monthly or quarterly indicators, which attempt to capture all possible sources of risks in the relevant segment. All the individual indicators in each segment are standardized separately with their mean and standard deviation, because they are aggregated into each of the six rays using equal weights. Current vulnerabilities are summarized in a scale of 0 to 10, with higher values signifying higher risks relative to their historical norm. The Map divides the recent period (since the crisis) into three phases according to Brazilian business cycles and estimates the level of vulnerabilities along each of its axes for each phase.

APPENDIX II. MULTILATERAL EFFECTS OF THE IOF[38]

47. **Theoretically, CFMs can transmit multilaterally through the diversion of capital flows.** The adoption of CFMs can divert capital flows to other countries considered reasonable substitutes by international investors, or away from them if CFMs adopted by one country raise expectations that other recipient countries could also adopt them. There may also be an impact on the equity prices and exchange rates of similar countries even without an increase in capital inflows.

48. **We estimate the multilateral impact of Brazilian CFM measures to four neighboring Latin American countries (Chile, Colombia, Mexico, and Peru).** Specifically, we examines if immediate responses in equity prices of the neighbor countries (i.e., one-day responses) to the IOF announcements are significant and we use daily data because a variable over a longer frequency would be infected due to other factors.[39] The analysis also accounts for domestic conditions (domestic policy rates and sovereign risks) and global market conditions (e.g., global risk aversion, oil and non-oil commodity prices, and U.S. asset prices) to separate out as much as possible the impact of CFMs from those arising from changes in other financial conditions.

49. **Empirical analysis of the existence and magnitude of multilateral impacts of the IOF on equity prices yields mixed results.[40]** As expected, the positive coefficients for the equity return correlations indicate that the equity markets are highly correlated across countries,[41] and global factors such as VIX, commodity prices, U.S. equity index and interest rate are found to be important determinants of Latin American countries' equity returns. However, the IOF events had both negative and positive effects on the one-day equity returns to neighboring countries, associated with higher equity returns in Chile and Mexico—consistent with a diversion of flows to these countries—and with lower returns in Colombia and Peru, consistent with market perceptions of increased likelihood that these countries could follow suit with similar measures.

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[38] We would like to acknowledge Mali Chivakul (IMF SPR) for her help on the methodology and data. See IMF (2011d) for detailed information.

[39] We also conducted the similar analysis as equity fund flows to four countries being another dependent variable, but we could not find any statistically significant result. This could be due to the nature of daily equity fund flows in EPFR database, which is very discontinuous.

[40] The multilateral effects are very difficult to measure. For example, market reactions could occur on the day of policy announcements or when measures actually become effective, while diversion of capital flows is more likely to spread out over some time horizon. In addition, the intensity of the effects—and even the direction over a given time period—could depend on whether the policy announcements are a surprise, largely anticipated, or made in steps. Investors' reaction would also be affected by the severity of the measure as well as the degree of uncertainty about its details. In some cases, investors may not react immediately to policy announcements, but may respond once they understand the precise nature of the measure and its implications.

[41] It is important to note that the coefficients of equity-return relationships only capture correlations between Brazilian and counterparty country's market reaction respectively and do not necessarily identify causal relationships.

Moreover, the estimated effects for Mexico and Peru were statistically significant, while those for Chile and Colombia were not.

Table 6. Brazil: Multilateral Impacts of IOF[1/]

Model: Dummy Variable OLS

Equity Prices in US dollar terms	One-day	Two-day	Five-day
Constant	0.00068***	0.00068***	0.0036***
	(0.00015)	(0.00015)	(0.00037)
Domestic Interest Rate	-0.000019	-0.00004*	-0.00008***
	(0.000019)	(0.00002)	(0.00002)
U.S. Libor Rate	-0.00028***	-0.00028***	-0.0001*
	(0.00009)	(0.00007)	(0.00006)
Oil Prices	0.0038	0.038*	-0.11***
	(0.1825)	(0.020)	(0.02)
Non-oil Commodity Prices	0.13***	0.15***	0.25***
	(0.02)	(0.03)	(0.03)
U.S. Stock Prices	0.06*	0.18***	0.21***
	(0.03)	(0.03)	(0.03)
VIX	-0.00069***	-0.0010***	-0.0014***
	(0.0002)	(0.0002)	(0.0002)
CDS Spread	-0.00035***	-0.00032***	-0.00037***
	(0.00004)	(0.00003)	(0.00003)
Correlation of Stock Prices			
Brazil and Chile	0.28***	0.24***	0.23***
	(0.019)	(0.017)	(0.017)
Brazil and Colombia	0.20***	0.15***	0.15***
	(0.02)	(0.02)	(0.02)
Brazil and Mexico	0.43***	0.40***	0.37***
	(0.02)	(0.02)	(0.02)
Brazil and Peru	0.23***	0.21***	0.21***
	(0.02)	(0.02)	(0.02)
Impact of IOF Changes			
on Chile	-0.16	0.06	-0.68
	(0.12)	(0.17)	(0.12)
on Colombia	0.07	-0.12	-0.36
	(0.29)	(0.24)	(0.33)
on Mexico	-0.51***	-0.60***	-0.40*
	(0.15)	(0.17)	(0.24)
on Peru	0.15*	0.31	0.37
	(0.08)	(0.28)	(0.30)
R-squared	0.45	0.47	0.48
F-Statistics	161.10	238.58	282.94
Prob (F-Statistics)	0.00	0.00	0.00
Observations	7468	7463	7449

1/ ***, **, and * denote significance at the 1, 5, and 10 percent level, respectively.

Box 3. Multilateral Effectiveness of the IOF: Methodology and Data

Daily data from 2003 to 2011 were collected in four Latin American countries (Chile, Colombia, Mexico, and Peru). Responses to events were measured using the daily market response.[42] In particular, the specification is:

$$\Delta y_{it} = \alpha i + (\beta_i + \gamma \text{EVENTS}_{it})\Delta x_{it} + \delta \Delta z_t + \varepsilon_{it}$$

where y_{it} is equity returns in U.S. dollar terms in the neighboring countries, x_{it} is equity returns in U.S. dollar terms in Brazil, EVENTS_{it} is a matrix of dummy variables equal to one on the dates of the CFM announcements, and $z_t$is a matrix of domestic and global market conditions (control variables) as below.

Definition and source of variables

Variable	Definition	Source
Equity returns in USD	(1+% ΔEquity indices)*(1+% ΔBi a real USD exchange rate) -1	Bloomberg
Equity indices	Daily equity indices from each market	Bloomberg
Exchange rate	Daily local currency per U.S. dollar	Datastream
Domestic Interest Rates	Overnight policy rate	Bloomberg
Libor Rate	Daily overnight Libor	Haver
Oil prices	Daily oil prices	Datastream
Non-oil commodity prices	Daily non-oil commodity price indices	Datastream
U.S. equity price	Daily S&P 500 indices	Bloomberg
VIX	Daily Chicago Board Options Exchange Market Volatility Index (daily)	Bloomberg
CDS	Daily 5-year CDS spreads	Datastream

[42] Some of monthly variables used in the unilateral analysis are not available daily. Thus, we use other control variables such as oil and non-oil commodity prices.

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