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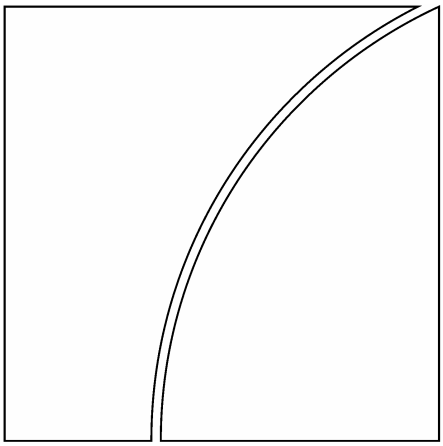

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How does fiscal policy affect monetary policy in emerging market countries?

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Abstract

This paper analyses how fiscal policy affects monetary policy in emerging economies. First, it conducts a test for fiscal dominance, and finds that the evidence points clearly to a regime of fiscal dominance in the case of Argentina and Brazil during the 1990s and early 2000s, while for the other countries in the sample the results are mixed. Next, the paper evaluates whether monetary policy accommodates fiscal policy, by assessing whether fiscal variables enter significantly in the central bank's reaction function. The findings indicate that in the emerging markets under consideration the conduct of monetary policy is not directly affected by changes in real primary balances. Then, the paper explores another mechanism through which fiscal policy could affect monetary policy in an emerging economy, by looking at the impact of fiscal policy on country premium and exchange rates. The empirical analysis is conducted through an event study, assessing the impact of *news* concerning fiscal variables and fiscal policy, on sovereign spread and exchange rate daily movements in Brazil, during the period surrounding the 2002 macroeconomic crisis. The results show that fiscal events have significantly influenced sovereign spreads and exchange rates in that period. Furthermore, fiscal policy actions appear to have contributed to movements in the exchange rates more than unanticipated monetary policy manoeuvres. The findings also suggest that, at that time, fiscal policy might have pushed the economy into an equilibrium in which increases in the policy intervention rate were likely to be associated with a depreciation, rather than an appreciation of the exchange rate.

Contents

1. Introduction[1]

Fiscal policy can affect monetary policy through different channels. Sargent and Wallace (1981) first pointed out that, in a so-called "fiscal dominant" regime, where the fiscal authority sets its budget independently of public sector liabilities, a fiscal expansion may eventually require monetisation, and result in higher inflation. Fiscal policy has an impact on inflation also through its effects on aggregate demand. Recently, models of the fiscal theory of the price level have even suggested that fiscal policy can be the main determinant of inflation. Furthermore, fiscal policy influences other monetary variables, notably interest rates, exchange rates and interest spreads.

The purpose of this paper is to analyse how fiscal policy influences monetary policy in emerging market countries (EM). This is relevant for two main reasons. First, fiscal dominance can be, or become, an important issue for EMs, as these economies have, in recent years, experienced an increase in public debt and fiscal imbalances (IMF, 2003). The macroeconomic crisis suffered by Brazil in 2002, for instance, is an example of how growing public sector liabilities can affect monetary policy conduct and outcomes in an EM. Secondly, although the constraints fiscal policy imposes on monetary policy have been investigated at a theoretical level, and studied empirically with reference to advanced economies, little work has been done on EMs.

One way to evaluate the impact of fiscal policy on monetary policy would be to estimate a multi-equation model, capturing all the possible links between fiscal and monetary variables. This approach is, however, unfeasible, given the shortness of the time series available for fiscal variables on most EMs. Therefore, as a first step, the paper uncovers new empirical evidence on the relation between monetary and fiscal policy in emerging economies, by estimating, for a group of EMs, simple and parsimonious models, previously applied mainly to industrialised countries. Initially, the paper performs a test for fiscal dominance on six emerging economies, following the approach proposed by Canzoneri et al (2001) and Tanner and Ramos (2002), which uses a VAR model to assess whether real primary balances are set exogenously, independently from real public sector liabilities. This methodology is convenient because it only requires the estimation of a relatively small number of parameters and does not impose any structure on the economy. The results of the test point clearly to a regime of fiscal dominance in the case of Argentina and Brazil during the 1990s and early 2000s, whereas for Colombia, Mexico, Thailand and Poland the findings are more ambiguous.

The VAR approach, however, completely disregards how the monetary authority behaves, and how fiscal policy impinges on monetary policy. Therefore, the paper, as a next step, tries to assess whether monetary policy accommodates fiscal policy, by evaluating whether fiscal variables enter significantly in the reaction function of the monetary authority in a group of seven EMs. The estimates reveal that in the countries under consideration the conduct of monetary policy is not significantly affected by changes in real primary balances, indicating that fiscal policy does not impinge directly on the conduct of monetary policy.

The VAR model and the monetary authority's reaction function estimates probably are not able to fully capture all the possible channels of transmission of fiscal dominance in EM countries. In fact, in such economies that are largely integrated in the international capital markets and exposed to capital flows reversal, fiscal policy can influence monetary policy also by affecting credit risk, sovereign spreads, interests rates, exchange rates and, ultimately, inflation. Hence, the second part of the paper explores this channel of transmission of fiscal dominance, uncovering new evidence on the difficulties of running monetary policy in an environment where financial markets have doubts about fiscal sustainability. Specifically, the paper conducts an event study, assessing the impact of *news* concerning fiscal variables and fiscal policy, on sovereign spread and exchange rate daily movements in an EM country, Brazil, at the time of the 2002 macroeconomic crisis. This study shows that fiscal events have significantly influenced sovereign spreads and exchange rates in that period. In fact, fiscal policy actions appear to have contributed to movements in the exchange rates more than unanticipated monetary policy manoeuvres. The exercise even finds an indication that, at that time,

[1] This paper was written while I was visiting the Bank for International Settlements. I am very grateful to Gabriele Galati, who largely contributed to this paper with many insightful inputs and comments. I would like to thank also Andrew Filardo, David Lebow, Ramon Moreno, Frank Packer and Philip Wooldridge for valuable suggestions. The views expressed here are my own and do not necessarily reflect those of the Bank for International Settlements nor the International Monetary Fund.

fiscal policy might have pushed the economy into an equilibrium in which monetary policy had an unconventional effect, namely that increases in the policy intervention rate were likely to be associated with a depreciation, rather than an appreciation of the exchange rate.

The paper is structured as follows. Section 2 reviews the theoretical and empirical literature on the different channels through which fiscal policy can affect monetary policy. Section 3 performs a test of fiscal dominance in six emerging market countries. Section 4 estimates the monetary authority's reaction function for seven emerging markets, including government primary balances among the explanatory variables. Section 5 investigates the impact of fiscal policy news, on country premium and exchange rate daily movements in Brazil, for the period surrounding the 2002 macroeconomic crisis. Section 6 concludes.

2. How fiscal policy can affect monetary policy: a survey of the literature

The economic literature has studied the interaction between monetary and fiscal policy along different lines. One strand analyses the issues related to the coordination of monetary and fiscal policy, especially in the context of the EMU. Another seeks to characterise jointly optimal monetary and fiscal policy. Another investigates the channels through which fiscal actions affect monetary variables and focuses on the constraints imposed by fiscal policy on the monetary authority. This third line of the literature is the most relevant for the paper.[2]

The literature has shown that fiscal policy can affect monetary policy in different ways: first through the impact of government inter-temporal budget constraint on monetary policy; secondly through the effect of fiscal policy on a number of monetary variables, such as interests rates, interest spreads and exchange rates.[3] These links between fiscal and monetary policy are discussed in detail below.[4]

2.1 The government budget constraint and monetary policy

The economic literature long ago has shown how the government inter-temporal budget constraint may affect monetary policy conditions and, in particular, price dynamics. In a celebrated paper, Sargent and Wallace (1981) highlight the difficulties of running monetary policy in an environment where fiscal policy is unsustainable. They introduce the notion of a "monetary dominant" regime, where the monetary authority independently sets monetary policy, versus a "fiscal dominant" regime, where the fiscal authority independently sets its budget, announcing current and future deficits and, hence, determining the amount of revenues that must be raised through bond sales and seignorage. Sargent and Wallace show that, under this second regime, the monetary authority loses its ability to control inflation whenever the real rate of interest exceeds the growth rate of the economy. Indeed, in such a situation, a decline in money growth today, designed to reduce inflation, will increase the debt to GDP ratio, as bond finance replaces monetary finance, thus raising interest payments and deficits in

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[2] On monetary and fiscal policy coordination, see, for instance, Alesina and Tabellini (1987), Debelle and Fischer (1994), Dixit and Lambertini (2001) and Buti et al (2002). Examples of the literature on optimal monetary and fiscal policy include Lucas and Stokey (1983), Chari et al (1991), Benigno and Woodford (2003), Beetsma and Jensen (2002), Schmitt-Grohe and Uribe (2003a,b,c) and Correia et al (2003).

[3] Of course, fiscal policy can also have an impact on inflation, through its effect on aggregate demand. The inflationary consequences of a fiscal manoeuvre depend on a number of factors, including expectations about the duration of the expansion or the contraction, public confidence in fiscal sustainability, accompanying changes in the interest and exchange rate. The review of the extensive theoretical and empirical literature on this topic is beyond the scope of the paper. A comprehensive survey is presented in Hemming et al (2002).

[4] Other papers, not directly connected to the strands of the literature surveyed here, highlight further possible relations between fiscal conditions and monetary policy conduct. For example, Fair (1994) argues that a large amount of government debt can diminish, or even reverse, the impact of higher interest rates in slowing down the economy and in reducing inflation, because debt holders' income rises with higher interest rates, thus stimulating consumption. A number of studies look also at the interaction between monetary policy and debt maturity and structure, under different perspectives. One view maintains that a large share of short-tem debt instruments, representing an additional source of liquidity, may undermine the restrictive effort of the monetary authorities (Rolph (1957)). Another stresses the role of the maturity and indexation of debt instruments in supporting monetary policy announcements, by enhancing the credibility of anti-inflationary policy (Calvo and Guidotti (1992, 1993)).

the future. Eventually deficit financing will require more money growth and generate higher inflation. In short, as Sargent and Wallace put it, "tighter money now can mean higher inflation eventually".[5]

A number of papers have tried to assess from an empirical perspective how monetary and fiscal policies interact and, explicitly or implicitly, have looked for evidence of fiscal dominance. With reference to the empirical work on industrialised countries, most studies find that monetary policy typically has not accommodated fiscal policy in the past decade, and some even suggest that monetary policy has tended to tighten in response to loose fiscal policy. Melitz (1997, 2002), jointly estimating the reaction functions of the monetary and fiscal authorities on a pool of 19 OECD countries over the period 1960–95, finds that monetary and fiscal policy have tended to move in opposite directions.[6] Wyplosz (1999) obtains a similar result for the EMU countries after the introduction of the 1992 Maastricht Treaty. Favero (2002), investigating the joint behaviour of monetary and fiscal authorities in the euro area, also concludes that stabilisation of inflation has been achieved independently from the lack of fiscal discipline, supporting the idea that the monetary authorities in the euro area have been able to affect inflation rates. Von Hagen et al (2002) find that the monetary condition index reacted negatively to an increase in fiscal deficits in EMU and OECD countries over the period 1972–89, but that during the1990s the same variable was not significantly affected by fiscal deficits. A study by Favero and Monacelli (2003) also detects some evidence of fiscal dominance in the United States for limited periods of time, showing that, during the period 1960–87, it is possible to identify time windows where an empirical model based on both monetary and fiscal regime is able to track the dynamics of inflation better than a regime based on a monetary rule only.

The little empirical work conducted on EM countries includes Tanner and Ramos (2002), who evaluate whether the policy regime in Brazil during the 1990s can be better characterised as fiscal or monetary dominant, and IMF (2003), which, estimating a separate fiscal policy reaction function for a group of industrial economies and a set of EMs, finds that primary surpluses respond much more strongly to public debt in the former group. The results of these studies seem to suggest that fiscal dominance might be an issue for EMs more than for industrialised countries.

Fairly recently, the so-called fiscal theory of the price level has identified another channel through which the central bank can lose control of inflation, even in the case of an independent monetary authority that need not accept seignorage targets dictated by the treasury. Contributions to this literature include Cochrane (1988, 1999), Auernheimer and Contreras (1990), Leeper (1991), Woodford (1994, 1995, 1996, 1998, 2000), Sims (1994, 1995, 1997, 1998), Canzoneri and Diba (1998), Canzoneri et al (1997a,b, 2001, 2002), Dupor (1997), Bergin (2000), Christiano and Fitzgerald (2000), Schmitt-Grohe and Uribe (2000) and Benhabib et al (2001). The fiscal theory of the price level sees the government's inter-temporal budget constraint as an equilibrium condition and maintains that, if the sequence of future budget surpluses is exogenously given, the price level is the only variable that can make the stock of nominal bonds inherited from the past consistent with the present value of those primary surpluses. Hence it is the government's inter-temporal budget constraint that determines the price level.[7] This view, though, has been criticised on theoretical grounds (Buiter (1997), McCallum (1997) and Cushing (1999)), and has found mixed empirical support. For instance, Canzoneri et al (2001) conclude that post-war US data are more consistent with a regime where monetary policy, and not fiscal policy, determines the price level. On the other hand, Cochrane (1998) argues that the US data from 1960 are consistent with the fiscal theory of the price level determination. Also Sala (2003) finds that the fiscal theory of the price level characterises at least one phase of the post-war US history, specifically the period 1960–79. On European economies, Afonso (2002) finds that the fiscal theory of the price level does not fit the EU-15 countries. For EMs, to my knowledge the only study uncovering evidence of a regime consistent with the fiscal theory of the price level is Loyo (2000),

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[5] In an amended version of their model, Sargent and Wallace also show that, when the demand for base money depends on expected inflation, tighter money today can lead to higher inflation not only eventually, but starting today.

[6] However, when the United States and Germany are excluded from the sample, the fiscal policy variable looses significance in the monetary authority's reaction function.

[7] The relevant transmission mechanism works as follows: suppose, for instance, the government introduces a tax cut that reduces the sum of the present discounted value of future primary balances. After the tax cut, real household wealth increases, boosting aggregate demand and the price level. Consequently the real value of government debt declines, restoring balance in the inter-temporal budget constraint.

which argues that in Brazil, in the mid-1980s, a restrictive monetary policy, accompanied by loose fiscal policy, resulted in hyperinflation, even without seigniorage increase.

2.2 Fiscal variables, interest rates and sovereign spreads

Another way fiscal policy may affect monetary policy conditions is through the impact of fiscal variables on interests rates and sovereign spreads.

With regard to the relationship between fiscal policy and interest rates, there seems to be some consensus in policy discussions that higher fiscal deficits are associated with higher intermediate-term and long-term interest rates. For example, the view that fiscal deficits affect long-term interest rates is reflected in two of the Federal Reserve's recent semi-annual monetary policy reports to the Congress (Federal Reserve Board (2001, 2002)), as well as in Chairman Greenspan's speeches and testimonies (Greenspan (2001, 2002)). Also, in EMs, central banks generally regard fiscal policy among the determinants of long-term interest rates (Mohanty and Scatigna (2003)). However, the existing empirical research on this topic, which focuses mainly on industrialised countries, shows mixed results. For example, Plosser (1982, 1987), Boothe and Reid (1989), and Evans (1985, 1987a,b) conclude that there is no significant positive relationship between fiscal deficits and interest rates. In contrast, Wachtel and Young (1987), Ford and Laxton (1999), Kitchen (1996), Elmendorf (1996) and Canzoneri et al (2002) find evidence that budget deficits or government debt exert a statistically significant effect on interest rates. With regard to developing countries and EMs, Agénor and Montiel (1996) and Easterly et al (1994) uncover some evidence of a significant impact of fiscal deficits on real interest rates.

Rather than focusing on the determinants of interest rates, the empirical literature on EMs has paid attention mainly to the determinants of interest spreads. Within this extensive literature, a number of papers find indications of a significant impact of fiscal variables on country premiums.[8] In Edwards (1984, 1986), the ratio of public and publicly guaranteed external debt to GNP positively and significantly affects EM spreads, while government expenditure over GNP does not help explain country premiums. In Arora and Cerisola (2001) government external debt, as well as fiscal balances, help explain movements in sovereign risk spreads in EMs. In Dell' Ariccia et al (2002), fiscal balances have a negative and significant effect on the EMBI Global index. Zoli (2004), estimating a non-linear model for sovereign spreads, finds that the country premiums paid by emerging markets are upward sloping in the amount of public and publicly guaranteed external debt up to a certain critical debt level, above which the supply of foreign funds becomes vertical. In Favero and Giavazzi (2004), primary deficits in excess of the level that keeps the debt to GDP ratio constant (interacted with a measure of international financial shocks), or, alternatively, the deviation of the debt to GDP ratio from an endogenously estimated threshold, have a significant impact on Brazil's EMBI spread. Finally, in Ferrucci (2003) the ratio of fiscal balance to GDP is a significant determinant of sovereign spreads in a number of EMs.[9]

2.3 Fiscal policy and the exchange rate

Fiscal policy can also affect exchange rate movements, and exchange rate policy. The theoretical impact of a fiscal action on exchange rates depends on the associated changes in sovereign default risk, on the openness of the capital account, and on the exchange rate system. Under high capital

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[8] Recent studies on the determinants of emerging markets spreads include Edwards (1984, 1986), Eichengreen and Portes (1989), Cline (1995), Cantor and Packer (1996), Cline and Barnes (1997), Eichengreen and Mody (1998), Min (1998), Kamin and Kleist (1999), Arora and Cerisola (2001), Dell' Ariccia et al (2002), Ferrucci (2003), IMF (2004) and Zoli (2004). All these recent papers analyse bond spreads, while the earlier literature, surveyed in Hajivassiliou (1989) and Huizinga (1989), focused on bank loan spreads.

[9] A related line of the literature investigates the factors affecting the probability of sovereign default in EMs, without, however, assessing the impact of these variables on sovereign spreads. In these works the findings regarding the statistical significance of fiscal variables are not consistent across studies. Eichengreen and Portes (1985), for example, find that changes on the central government fiscal balance help explain defaults, and, more recently, Catão and Sutton (2002) conclude that fiscal balance, as well as different measures of volatility in fiscal policy, significantly affect the default probability. In contrast, Cline and Barnes (1997), and Detragiache and Spilimbergo (2001) find that fiscal variables do not help explain sovereign defaults.

mobility, a constant country premium and a flexible exchange rate system, a fiscal expansion is supposed to lead, albeit temporarily, to an appreciation of the exchange rate. Conversely, with low capital mobility, the exchange rate is expected to depreciate as the fiscal expansion boosts imports, and the current account deficit. In EMs, capitals are typically highly mobile, and country premiums tend to be sensitive to fiscal policy, which implies that an increase in government deficits is likely to raise the probability of default, generate capital outflows and cause currency pressures.

The theoretical literature, in fact, has analysed specifically the link between fiscal policy and currency crises. First-generation models of balance of payments crises show how the inconsistency between fiscal policy fundamentals and the exchange rate peg leads to the abandonment of the peg (Krugman (1979)). Second-generation models suggest that crises may be self-fulfilling, and possibly triggered by investor new perceptions about future fiscal policies (Obstfeld (1994)).

Fiscal policy can affect also the conduct of exchange rate policy. For example, in economies with a large share of foreign currency denominated, or exchange rate linked, government debt, a central bank may decide to fight against currency depreciations, thereby limiting the shock-absorbing role of the exchange rate (Goldstein and Turner (2003)). Conversely, in countries with a large share of interest rate linked public debt, the monetary authority may be reluctant to increase domestic interest rates to counter currency pressures.

From an empirical perspective, the evidence on the impact of fiscal policy on exchange rate movements is mixed. For industrialised countries, some studies find a positive and significant relationship between fiscal expansions and the exchange rate (Feldstein (1986), Melvin et al (1989), Beck (1993) and Caramazza (1993)), while others do not find any statistically significant relationship (McMillin and Koray (1990) and Koray and Chan (1991)). For EMs, the empirical literature has focused mainly on the contribution of fiscal policy to country vulnerability to currency crises, finding indications that large explicit or implicit government deficits, or market perceptions of lack of fiscal sustainability, make an economy more vulnerable to these crises (Kopits (2000)).

2.4 Fiscal policy, sovereign spreads and exchange rates under inflation targeting: a multi-equation approach

Most of the empirical literature reviewed above looks at the impact of fiscal policy on single monetary variables, whether it be the interest rate or interest spreads or the exchange rate, without fully exploring all the links among these variables. A couple of recent papers (Blanchard (2004) and Favero and Giavazzi (2004)), instead consider multi-equation models, which are able to investigate different channels of interaction and transmission from fiscal policy to monetary variables. These works look at the specific case of an inflation-targeting regime in an EM that is particularly vulnerable to capital flows reversal. Their main result is that high public debt, by boosting credit default risk, can push the economy into a bad equilibrium, where a restrictive monetary policy has unconventional effects. The dynamics of the bad equilibrium is the following: in a country where the public debt is large, and mainly short-term, an increase in interest rates aimed at keeping inflation within the target raises the cost of debt service, the debt level, the default probability and the country premium, triggering capital outflows and leading to a depreciation, rather than an appreciation, of the exchange rate. If debt is largely denominated in foreign currency, or linked to a foreign currency, the exchange rate depreciation causes a further increase in the value of debt. Moreover, the exchange rate depreciation affects inflation expectations and, eventually, inflation itself. To reduce inflation, the central bank has to increase the interest rate again, which further raises the cost of debt service, and so on. Such an environment is fundamentally a regime of fiscal dominance, even though there is no monetary relaxation as in Sargent and Wallace's model, because country premium, interest rates, exchange rates and even inflation are largely affected by fiscal policy. In fact, the only way out of the bad equilibrium just described is through a substantial fiscal adjustment that reduces public debt and the default probability.

Blanchard (2004) and Favero and Giavazzi (2004) argue that Brazil found itself in this bad equilibrium in 2002, when the country suffered from a severe macroeconomic crisis, triggered by the high level of public debt, and the uncertainty about the October elections outcome. Blanchard estimates two equations summarising the relations between the exchange rate and of the probability of debt default

for Brazil, between January 1999 and January 2004, and finds that the net effect of an increase in the interest rate of 100 basis points is a depreciation of 258 points.[10] Favero and Giavazzi conduct some simulations on a multi-equation model for Brazil, estimated over the period 1999–2003, showing that an increase in the interest rate leads to a depreciation of the exchange rate and high inflation rates, when primary deficits are not adjusted to stabilise the debt to output ratio.

3. Empirical work

After the review of the different channels through which fiscal policy can affect monetary policy, the paper wants to uncover new empirical evidence on the influence of fiscal policy on monetary policy in EM countries. This seems interesting for two main reasons. First, data indicate that public debt and fiscal imbalances in emerging economies are on the rise, in some cases causing concerns about fiscal sustainability. In fact, public debt in EMs has grown quite sharply since the mid-1990s, reaching an average of about 70% of GDP in 2002. Public debt in EMs is now higher than in industrial countries when compared to GDP, and significantly higher in relation to government revenues (IMF (2003)). This suggests that some form of fiscal dominance might be, or become, an issue for EMs. Secondly, so far, no systematic empirical work on the interaction between monetary and fiscal policy in emerging economies has been conducted.

One of the best ways to investigate the impact of fiscal policy on monetary policy would be to estimate a multi-equation model, in order to capture the possible links between fiscal and monetary variables. It would be very hard, however, to follow this approach, given the limited availability of fiscal variables data on EMs. In fact, the first problem encountered in the empirical analysis of fiscal policy in emerging economies is the shortness of the time series available for variables like public debt and primary deficits.[11] Hence, as a first step, I look for new evidence on fiscal dominance on emerging economies by estimating simple and parsimonious models previously applied mainly to industrialised countries. First, I perform a formal test for fiscal dominance in EMs, following the method proposed by Canzoneri et al (2001) and Tanner and Ramos (2002). This approach, however, completely ignores how the monetary authority behaves in response to fiscal policy. Therefore, as a next step, I try to assess whether fiscal stance affects monetary policy decisions by evaluating whether fiscal variables enter significantly in the reaction function of the monetary authority in a group of EMs. Finally, in order to explore alternative possible channels of transmission of fiscal dominance in EM countries, I conduct an event study, measuring the impact of news concerning fiscal variables and fiscal policy, on sovereign spreads and exchange rates in an EM country, Brazil, in the period surrounding the 2002 macroeconomic crisis.

3.1 A test for fiscal dominance

Although conceptually the difference between a monetary dominant (MD) regime, where the government adjusts primary balances to limit debt accumulation, and a fiscal dominant (FD) regime, where fiscal balances are set independently of public sector liabilities, is quite clear, it is not easy to develop formal empirical tests able to discriminate between the two regimes. This section conducts a test for fiscal dominance for a group of emerging markets, following the methodology suggested by Canzoneri et al (2001), and Tanner and Ramos (2002). This approach uses a VAR model to assess whether primary balances are set exogenously, and independently from public sector liabilities, in the country under consideration. To illustrate, consider the following VAR:

$$X_t = \theta_0 + \theta_1 X_{t-1} + \theta_2 X_{t-2} + \ldots + \nu_t \qquad (1)$$

[10] In Blanchard's model, however, the overall effect of monetary tightening on inflation is unclear. In fact, increases in interest rates can affect inflation not only through exchange rate movements but also through changes in internal demand; nevertheless, this second channel through which monetary policy operates is left out of the model and of the estimation.

[11] For a discussion of the issues arising in the collection of reliable data on public debt in EM countries, see IMF (2003).

where X_t = [real primary balances, real public sector liabilities], θ_j is a vector of coefficients, and ν_t is a vector of error terms.

Considering, first, the temporal relationship running from current liabilities to future primary balances, an MD regime is ruled out if future primary balances respond negatively to increases in today's liabilities, or if there is no relationship between the two variables, indicating that primary balances are exogenous. A positive relationship between current primary balances innovations and future liabilities could indicate that higher primary balances are created to compensate for positive changes in liabilities in order to limit debt accumulation, which would be consistent with an MD regime. However, according to the fiscal theory of the price level, such positive relationship could arise also under an FD regime, in which the price level falls, and the real value of liabilities increases, in anticipation of future higher primary balances.

Looking, next, at the temporal relationship running from current primary balances to future liabilities, under an MD regime, current innovations to primary balances should be negatively related to future government liabilities, because rises in the primary balances would be used to pay down the debt. On the other hand, under an FD regime, there would be no relationship between shocks to current primary balances and future government liabilities.[12]

With these insights, one can try to discriminate between an MD and an FD regime by performing Granger causality tests that assess whether lagged values of public sector liabilities help explain current movements in primary balances and whether lagged values of primary balances help explain current movements in public sector liabilities. Also, to account for possible lags in the variable response, impulse responses functions can be used to trace the effect over time of current innovations in the primary balances on future liabilities and of current innovations in liabilities on future primary balances. The advantages of this methodology are that it only requires the estimation of a relatively small number of parameters and it does not impose any structure on the economy.

It has to be recognised, however, that this approach does not provide a perfect test for fiscal dominance versus monetary dominance. In fact, it suffers from a number of limitations. First, this model completely disregards the fact that primary balances respond also to cyclical movements of the economy. Especially when the test is conducted on a short period, reflecting a unique phase of the cycle, the absence of significant relation between primary balances and public sector liabilities could be the result of the government inability, or unwillingness, to create larger primary balances during periods of recessions, rather than of a regime of fiscal dominance. Secondly, as mentioned above, the case of a positive and significant relationship running from current primary balances to future liabilities would be consistent both with an MD regime and with an FD regime under the fiscal theory of the price level. So, in this event, the test would give ambiguous results. There might be other circumstances in which the findings are unclear or difficult to interpret, for instance when the sign of the impulse response function changes over time.

Even with these limitations, though, the approach described above seems a good starting point for searching for evidence of fiscal dominance versus monetary dominance in EM countries. Hence, I estimate the VAR (1), perform Granger causality tests and evaluate the impulse response function for six emerging markets (Argentina, Brazil, Colombia, Mexico, Poland and Thailand), for different periods and sub-periods during the 1990s and early 2000s[13].

Before proceeding with estimation, the model has to be re-expressed in first differences, because in most cases the variables are non-stationary and the shortness of the available time series does not allow to estimate the long-run cointegrating relationship. Specifically, I estimate the following model:

$$\begin{aligned} \Delta RPB_t &= \alpha_0 + \sum_{j=1} \alpha_j \Delta RPB_{t-j} + \sum_{j=1} \beta_j \Delta LIAB_{t-j} + \varepsilon_t \\ \Delta LIAB_t &= \gamma_0 + \sum_{j=1} \delta_j \Delta RPB_{t-j} + \sum_{j=1} \gamma_j \Delta LIAB_{t-j} + \eta_t \end{aligned} \qquad (2)$$

[12] A positive relationship between current primary balances innovations and future liabilities would also be consistent with a monetary dominant regime, as it would be an indication that the government is creating larger primary surpluses in anticipation of future higher obligations (Tanner and Ramos (2002)).

[13] The choice of the countries to be included in the sample is dictated purely by data availability.

where ΔRPB is the change in real primary balance, and $\Delta LIAB$ is the change in real public sector liabilities. The results for the tests performed on the model are reported in Tables 1–6.

No country exhibits clear evidence of a monetary dominant regime for the whole sample period. Argentina and Brazil seem to be characterised by a regime of FD over the whole sample period and most sub-periods. Only the results for the Real period in Brazil (July 1994–December 1998) are somewhat mixed. These findings on Brazil are broadly in line with Tanner and Ramos (2002), who also detect evidence of fiscal dominance for the decade of the 1990s as a whole.[14]

Colombia exhibits clear evidence of FD for the pre-inflation-targeting period (1st quarter 1995–3rd quarter 1999), while the results for the whole sample period (1st quarter 1995–4th quarter 2003) are more ambiguous. For Mexico, only one of the sub-periods, namely the one after the 1995 crisis and before the adoption of inflation targeting (June 1995–December 1998) shows a clear indication of FD, whereas the findings for the whole period (January 1990–January 2004) and other sub-periods are more difficult to interpret. Also the results on Thailand and Poland are rather ambiguous.

In conclusion, the application of the VAR approach discussed above to six emerging countries does not always allow to distinguish unambiguously between periods of FD and MD. Only in the case of Argentina and Brazil does the evidence clearly point to a regime of FD during the 1990s and early 2000s, whereas for Colombia, Mexico, Thailand and Poland the results are more ambiguous.

4. The reaction function of the monetary authority in emerging markets

The VAR approach followed above investigates the dynamic relation between public sector liabilities and primary deficits to ascertain whether deficits are exogenously set, independently of public sector liabilities, which is a prerequisite for fiscal dominance. Such a test, however, completely disregards how the monetary authority behaves, and how fiscal policy impinges on monetary policy. Are monetary policy decisions affected by fiscal stance? And, in particular, does monetary policy accommodate loose fiscal policy? This section tries to answers such questions by evaluating whether fiscal variables enter significantly in the reaction function of the central bank. Since the seminal paper by Taylor (1993) on monetary rules, a fair amount of literature has analysed monetary authorities' reaction function in advanced economies, whereas less work has been done on emerging markets.[15] In such a reaction function, the dependent variable is typically the central bank's policy rate, and the explanatory variables include the expected deviation of inflation from a target and the output gap. As mentioned in Section 2, some works have investigated whether also a measure of fiscal stance (the primary deficit) enters significantly in the reaction function of the monetary authorities in industrialised countries (Melitz (1997, 2002) and Wyplosz (1999)). Following a similar approach, in this section I estimate the monetary authority's reaction function for seven EMs (Brazil, Chile, Colombia, Mexico, Poland, South Africa and Thailand), including government primary balances among the explanatory variables.[16]

A number of issues arise in the estimation of the central bank's reaction function for these countries. First, since all these economies have changed monetary regime at least once during the estimation period, the conduct of monetary policy underwent through structural breaks. Also, the switch from exchange rate or monetary targeting to inflation targeting that all these countries experienced, has probably modified the mechanism of formation of inflation expectations, producing further breaks in the monetary authority's reaction function. Secondly, in the period preceding the adoption of inflation

[14] The data for Brazil differ from those used by Tanner and Ramos (2002) under three respects. First, they adjust data on public sector liabilities for the period 1996–2000 to take privatisation and arrears recognitions into account. Secondly, they deflate nominal variables using the general price index (IGPDI), while I use the Consumer Price Index. Thirdly, their sample period spans from 1991–2000, while mine includes the years 2001–03.

[15] Prominent references on monetary rules in advanced economies include Clarida et al (1998, 2000). For recent reviews, see Svensson (1999, 2002), and Clarida et al (1999). A collection of articles on this topic can be found in Taylor (1999) and in John Taylor's web page. For monetary rules in emerging markets, see Loayza and Schmidt-Hebbel (2002) and Mohanty and Klau (2004).

[16] Again, the choice of these countries is dictated mainly by data availability.

targeting, it is not obvious whether the appropriate dependent variable should be the monetary base or the policy rate.

To reduce the impact of structural breaks, I estimate the reaction function for different sub-periods corresponding to different policy regimes. Also, the model for the inflation-targeting period differs from the one under other monetary regimes in the specification of the inflation variable on the right-hand side of the equation. The basic estimating model is the following:

$$i_t = \varphi_0 + \varphi_1 i_{t-1} + \varphi_2 INFL_{t-1} + \varphi_3 OUTPUTGAP_{t-1} + \varphi_4 \Delta RPB_{t-1} + \omega_t \quad (3)$$

where i_t is the monetary policy intervention rate, $INFL_t$ in the annual inflation rate, $OUTPUTGAP_t$ is the difference between actual output and potential output, ΔRPB is the change in the real primary balance, and ω is the error term.[17] For the inflation-targeting period, instead, the estimating equation is:

$$i_t = \phi_0 + \phi_1 i_{t-1} + \phi_2 (INFL_t^e - INFL^*) + \phi_3 OUTPUTGAP_{t-1} + \phi_4 \Delta RPB_{t-1} + \varpi_t \quad (4)$$

where $INFL_t^e$ is expected inflation at time *t*, and *INFL** is the inflation target.

Although such specifications of the monetary reaction function are not derived from a theoretical model, they can help assess the direct impact of fiscal policy on monetary policy, over and above the indirect effect through aggregate demand pressure and inflation. In both specifications of the model, a significant and positive relation between primary balances and the policy rate would support the idea that the monetary authority loosens in response to increases in budget deficits, in line with Sargent and Wallace's claim that fiscal expansions eventually trigger a monetary relaxation. No significant relation between the two variables would suggest that fiscal policy does not affect the conduct of monetary policy directly. On the other hand, a significant and negative relation between primary balances and the policy rate would be an indication that monetary and fiscal policies move in opposite directions.

The conduct of monetary policy in EMs is typically also characterised by the desire to achieve exchange rate stability (Calvo and Reinhart (2002)). Such "fear of floating" is driven by the concern for devaluation-induced financial crises, excessive exchange rate volatility, large pass-through effects, and high exchange rate risk premiums. Therefore, as additional explanatory variables, in some regressions I include alternatively the lagged change in the nominal exchange rate (Δ*Nominal exchange rate*$_{t-1}$), or in the real exchange rate ($\Delta REER_{t-1}$). Finally, I introduce dummy variables for known periods of crisis.[18] The estimates are displayed in Tables 7–13.

First of all, the results show that, in all the EMs under consideration, the monetary authority does not significantly respond to changes in primary balances, implying that the monetary authority does not accommodate loose fiscal policy. These findings are in line with the empirical studies on industrialised economies, although for this latter group of countries there is even evidence that central banks tighten when fiscal policy loosens (Melitz (1997, 2002) and Wyplosz (1999)).

With regard to the other explanatory variables in the reaction function, the estimates are generally consistent with the theoretical predictions. The lagged inflation coefficients are significant, and with the expected positive sign, in the case of Chile, Colombia, Mexico and Poland. The deviation of expected inflation from the target enters significantly, and with the expected sign, in the reaction function of Brazil, Colombia, Poland and South Africa after the adoption of inflation targeting. The output gap coefficients are significant, and with the expected positive sign, in the case of Brazil, Colombia, South Africa and Thailand before the adoption of inflation targeting, for Mexico during the inflation-targeting period and for Poland during the whole estimating period (which for the most part coincides with the inflation-targeting period).[19]

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[17] Real primary balances are entered into the model in first differences since unit root tests indicate that the variable is non-stationary in all countries in the sample.

[18] Variables definitions and data sources are reported in Appendix 1.

[19] The results for Brazil are in line with those obtained in other studies. Indeed, also Minella et al (2003), Favero and Giavazzi (2004), and Schmidt-Hebbel and Werner (2002) find that, after the introduction of inflation targeting, the coefficients of expected inflation deviation from the target are positive and significant, while the coefficient of the lagged output gap are not. For Mexico, Schmidt-Hebbel and Werner, like this paper, conclude that expected inflation deviation from the target does not

The estimates also show that the coefficients of the nominal exchange rate variable are significant and positive in the case of South Africa for the whole sample period, Mexico before the adoption of inflation targeting, and Colombia and Poland under inflation targeting, indicating that in these cases the monetary authorities have reacted to an increase in the nominal exchange rate (ie a nominal depreciation) with a tightening policy, in the attempt to avoid an excessive depreciation of the currency. For Chile and Thailand, instead, the nominal exchange rate variable is not significant.[20]

Lagged changes in the real exchange rate enter significantly, and with a negative coefficient, in the central bank's reaction function in only a few cases, namely South Africa, Brazil (during the inflation targeting period) and Mexico (during the post-crisis/pre-inflation-targeting period) suggesting that, in these instances, a real appreciation (ie an increase in the real exchange rate) has been followed by an interest rates reduction. Instead, the real exchange rate coefficients are not significant in all the other cases.

In conclusion, the estimates of the central banks' reaction function in the EMs under consideration indicate that in these countries the conduct of monetary policy has been affected by "usual" variables, such as the output gap, lagged inflation, the deviation of expected inflation from the target, or changes in nominal or real exchange rates. Instead, the fiscal variable does not enter significantly in the central bank's reaction function of these emerging economies, indicating that fiscal policy does not impinge directly on the conduct of monetary policy.

5. Fiscal policy news, sovereign spreads and exchange rates: evidence from Brazil

The VAR model in Section 3 indicates that in some EM countries fiscal deficits are exogenously set by the fiscal authority, which is a prerequisite for fiscal dominance. The estimates of the central bank's reaction function, on the other hand, indicate that monetary policy does not accommodate fiscal policy. Those models, however, are probably too simple to completely capture the ways fiscal policy can affect monetary policy in EMs. As discussed in Section 2, the literature has highlighted another, more complex, mechanism through which fiscal policy can affect monetary policy in emerging economies, namely through the impact of fiscal policy on credit risk, sovereign spreads, interests rates, exchange rates and, hence, inflation. This section, therefore, wants to explore this other possible channel of transmission of fiscal dominance. One way to do so would be to estimate a structural model, as done by Blanchard (2004) and Favero and Giavazzi (2004). However, it would be difficult to find adequate data on EMs for that purpose. Hence, the more modest scope of this section is to estimate a reduced form model, focusing on two segments of the transmission mechanism, namely the impact of fiscal policy on country premiums and exchange rates. To get around the endogeneity problem arising in the estimation of a reduced form equation, and to differ from the existing literature, the analysis is conducted through an event study, which evaluates the effect of *news* concerning fiscal variables and fiscal policy, on country premium and exchange rate daily movements, while controlling for other factors that might have affected such movements.[21]

The case study used for the empirical analysis is Brazil, during the period 2 January 2002 to 30 April 2004. This case is interesting because the stylised facts that took place suggest that fiscal policy largely affected monetary variables, as well as monetary policy actions, in Brazil at that time. Starting in the summer of 2002, Brazil experienced an acute macroeconomic crisis, prompted by the uncertainty about the October presidential elections and the associated doubts about the

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enter significantly in the monetary authority's reaction function during the inflation-targeting period. It is difficult, instead, to compare the present findings on Chile with those obtained by Corbo (2002) and Schmidt-Hebbel and Werner (2002), which are mixed and not very robust. Other estimates of the monetary authorities' reaction function are available also for South Africa (Aron and Muellbauer (2002)) and Colombia (Corbo (2002)), but they are not comparable with these, as, for the most part, the estimating period differs.

[20] For Brazil, the change in nominal exchange rate is not introduced among the regressors since it is highly correlated with inflation (the correlation coefficient is over 0.9).

[21] Empirical works looking at the impact of fiscal events on macroeconomic variables are rare. Existing studies on industrialised countries include Peek (1999) and Afonso and Strauch (2004).

macroeconomic policy to be followed by the incoming government, in an economy characterised by high levels of public debt. Investor fears of an imminent sovereign debt default led to a dramatic increase in the spreads of Brazilian dollar-denominated bonds over US Treasury bills, from around 800 basis points (bp) in January 2002 to above 2000 bp in the following September. In the same period, the exchange rate depreciated by over 60%. As a result, the annual inflation rate increased sharply from 8% in January to 12.5% in December. The central bank reacted by raising the overnight interest rate from 18% in October 2002 to 26.5% in March 2003. Since about one half of Brazil's public debt was either denominated in US dollars, or indexed to the US dollar, the depreciation also boosted net public debt, which contributed to further increases in interest spreads. Only after the elections, and after the new president Lula da Silva proved his commitment to high primary surpluses and fiscal reforms, did the perceived probability of debt default decrease, sovereign spreads narrow, the exchange rate appreciate, and interest rates and inflation decline.

The basic estimating equation is the following:

$$\Delta Y_t = \lambda_0 + \sum_{i=1} \lambda_i X_{it} + \xi_t \qquad (5)$$

where Y_t is either a measure of the country premium, or the nominal exchange rate vis-à-vis the US dollar.[22] As a measure of country premium, four alternative indicators are considered. The first is the spread on the Brazilian component of the Emerging Market Bond Index computed by JP Morgan (*EMBI*). This spread measures the difference between the yield on dollar-denominated bonds issued by the Brazilian government and the yield on comparable bonds issued by the US Treasury. The second indicator of country premium is the spread on a dollar-denominated 11% bond, maturing in 2040, which is considered to be the country's benchmark bond (*BENCHMARK*). The third measure of country premium is the spread on the so-called "C bond", another dollar-denominated bond issued by the Federal Republic of Brazil, which is one of the most traded EM bond in the international capital market (*CBOND*).[23] The last measure of Brazil's country premium is the one on five-year credit default swaps (*CDS*). A CDS is a contract providing insurance against default. In such a transaction, one party (the buyer of credit protection) pays a periodic fee to the other party (the seller of protection) in exchange for a contingent payment in the event that the reference entity defaults during the term of the contact. The fee, conventionally called default swap premium, or default swap spread, is considered a good measure of default risk and, in fact, has been used as a measure of default risk in other studies (eg Hull et al (2003)).[24]

For the period under consideration, the correlation among these different indicators of country premium is very high, both in levels and in first difference (Table 14). Only the CDS spread movements do not closely follow those of the others (Figure 1). In addition, the exchange rate fluctuates in parallel with country premiums (Figure 2).

The regressor set X_t includes a group of variables measuring the unanticipated component of announcements of major fiscal and macroeconomic variables of the Brazilian economy, as well as the unexpected component of data releases on US macroeconomic variables, such as changes in the Fed Funds rate, that may affect investor portfolio decisions.[25] The unexpected component of news is measured as the difference between official data announcements and the forecasts available in the days preceding the announcements.[26] Forecasts are obtained either from the Consensus Forecasts, or from the JP Morgan report "Global Data Watch".[27]

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[22] All the dependent variables are differenced to achieve stationarity.

[23] The bond, issued on 15 April 1994, maturing in 2014, pays six-month coupons (4% for the first two years, 4.5% for the next two years, 5% for the fifth and sixth year, and 8% thereafter).

[24] In principle, the spread on a risky bond and the CDS spread on the same bond should be the same. In practice, however, various factors, like the different liquidity in the CDS and bonds market, can cause CDS and bond spreads to diverge. For an analysis of CDS and bond spreads in EMs, see Chan-Lau and Kim (2004).

[25] The complete list of variables, and data sources, are reported in Appendix 2.

[26] The difference between the data release and the forecasts are standardised, dividing such difference by the standard deviation of the forecast errors over the entire period.

[27] For some variables forecasts are not available. In these cases, actual data at the time of their release are entered in the regressions either as a percentage of GDP, or as rate of change.

The regressor set contains also dummy variables that capture particular events concerning fiscal policy that might be relevant for investors assessing the default probability. Such events are grouped into two categories. The first includes concrete fiscal policy actions that might have enhanced investor confidence, such as budgetary cuts, or important steps in the advancement of pension and tax reforms (*ACTION*). The second comprises government announcements representing statements unaccompanied by immediate concrete actions, such as the declaration of the intention to raise the public sector surplus, also aiming at reassuring market participants (*ANNOUNCEMENT*).[28]

Finally, the model has among the explanatory variables a number of dummies accounting for important events that may also have had an impact on investor perception of country risk. Specifically, this set includes a dummy for election days (*ELECTIONS*), one for the day when the IMF agreed to extend a US$ 30 bn loan to Brazil (*IMF*), four dummies corresponding to upgrades or downgrades of Brazil's rating or outlook by the major rating agencies (*OUTLOOKDOWN*, *OUTLOOKUP*, *RATINGDOWN*, *RATINGUP*). Finally, a dummy is entered corresponding to 28 January 2004, the day when the Federal Reserve Bank hinted that an increase in the Fed Funds rate was imminent, which was followed by major movements in the emerging economies' bond market (*US_EXPFEDRATEUP*). All explanatory variables are also entered in the regressions with a lag, to account for the possibility of delays in the response of spreads and exchange rates to news.[29]

The estimates of the impact of news on Brazil's country premium indicate that news on fiscal policy have had a significant effect on sovereign spreads (Table 15). Indeed, the coefficients of the variables *ANNOUNCEMENT* and *ACTION* exhibit significant and negative coefficients, implying that these types of news reduced the perceived risk of default. Among the variables accounting for data releases on fiscal variables, only those measuring net debt (*NET DEBT)* and interest payments (*INTEREST PAYMENTS*) have significant coefficients. Their negative sign is surprising though. However, given that, for these two variables, measures of expectations are not available, and hence actual data at the time of their release are entered as regressors, the negative sign may indicate that investors were expecting a worse scenario and were positively surprised when the data were released. The impact of these variables on country premium is, however, much smaller than the effect of *ANNOUNCEMENT* and *ACTION*.

News about other Brazilian macroeconomic variables, on the other hand, appear to have had a very limited influence on spreads movements. Within the set of US macroeconomic news, the unanticipated component of changes in the Fed Funds rate (*US_FEDRATE*) is the only variable showing a significant coefficient. However, the coefficients on the contemporaneous and lagged variable are of the same magnitude with opposite sign. There was only one episode in the sample period, though, in which the market was surprised by a change in the Fed Funds rate, namely, when the Fed lowered the rate more than expected, on 6 November 2002. Overall, this unanticipated news did not have an impact on Brazilian spreads.[30] In contrast, the expectation of an imminent increase in the Fed Funds rate, triggered by the Fed Monetary Committee's statements on 28 January 2004, had a strong impact on country premium, as indicated by the positive and significant coefficient of *US_EXPFEDRATEUP.* This result is in line with the literature on EM spreads, suggesting that country premiums movements are largely driven by global liquidity, and lenders' "appetite for risk" (Kamin and Kleist (1999), Calvo et al (1993) and Calvo (2002)).

With regard to other events affecting Brazil's spreads, the dummy variable for the election days has a significant and positive coefficient, indicating that the election results contributed to an increase in the country premium. The dummy IMF has the expected negative and significant sign. Also upgrades and downgrades by rating agencies turn out to have had an important impact on Brazil's spreads. All these results are confirmed independently of the measure of country premium adopted.

The estimates for the determinants of exchange rates movements are shown in Table 16. Given that the exchange rate and the country premium oscillate in parallel, as fluctuations in sovereign spreads

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[28] The list and categorisation of these events is in Appendix 2.

[29] To address a possible endogeneity problem between fiscal announcements and country premium, or exchange rate movements, the variable *ANNOUNCEMENT* is entered only lagged in some regressions (with one or two lags). The results reported below, however, do not change.

[30] This result is consistent with the findings of a recent study by Uribe and Yue (2003), showing that, in response to a shock in US interest rates, EM spreads initially fall, then increase and, with time, even overshoot.

are transmitted to the exchange rate by swings in capital flows, the lagged change in the EMBI spread is added to the regressors. The coefficient on this variable turns out to be positive and highly significant. The variable ACTION has a significant and negative coefficient, indicating that good news on fiscal policy actions contributed to an appreciation of the currency. NET DEBT also has a significant coefficient. However, as in the spreads regressions, the sign is negative and small, suggesting again that investors were positively surprised by the data releases on this variable. The dummies ELECTIONS, IMF and RATINGDOWN also have significant coefficients, with the expected sign.

These results suggest that news concerning fiscal policy and fiscal variables had both an indirect effect on the exchange rates through their impact on the EMBI spread, and a direct effect. In contrast, unexpected movements in the Selic did not have a significant impact on exchange rate changes, as the coefficient of the variable accounting for such events (SELIC) is insignificant. Taken together, these findings indicate that fiscal policy actions contributed to movements in the exchange rates in the period under consideration more than monetary policy actions. In fact, it is impossible to find a stable and significant relation between the policy intervention rate and the exchange rate. Indeed, the rolling regression of changes in the exchange rates on the unanticipated component of past Selic movements reveals breaks in the relationship between these two variables (Figure 3). Furthermore, it shows a time window when such a relationship was positive, meaning that unexpected increases in the Selic were likely to be associated with a depreciation, rather than an appreciation of the exchange rate, which is an indication that Brazil might have entered the bad equilibrium described by Blanchard (2004) and Favero and Giavazzi (2004).

In conclusion, the event study suggests that, through the channel of credit risk, an EM country like Brazil, particularly exposed to swings in capital flows, and with high public debt, can be pushed into a regime of fiscal dominance. Unlike in the traditional Sargent and Wallace's (1981) model, where fiscal dominance results in monetary relaxation, fiscal policy in this context affects monetary policy by largely influencing interest spreads and exchange rates.

6. Conclusion

This paper has analysed how fiscal policy affects monetary policy in emerging economies. After the literature review, it has presented new empirical evidence on the relation between fiscal and monetary policy in a group of EMs. Given the limited availability of fiscal variable data on EMs, the paper initially has estimated simple existing models, previously applied mainly to industrialised countries. First, it has performed a formal test for fiscal dominance, following a VAR methodology proposed by Canzoneri et al (2001) and Tanner and Ramos (2002). This approach, however, has not always allowed to distinguish unambiguously between periods of fiscal dominance and monetary dominance. Only in the case of Argentina and Brazil does the evidence point clearly to a regime of fiscal dominance during the 1990s and early 2000s. For Colombia, Mexico, Thailand and Poland, the results are mixed. Next, in order to evaluate whether monetary policy accommodates fiscal policy, the paper has estimated the monetary authority's reaction function for seven EM economies, including real primary balances among the explanatory variables. The results reveal that in the countries under consideration the conduct of monetary policy is not directly affected by fiscal stance.

Then, the paper has explored another mechanism through which fiscal policy can influence monetary policy in an EM country, by looking at the impact of fiscal policy on country premium and exchange rates. Differently from the existing literature, the empirical analysis has been conducted through an event study, assessing the impact of *news* concerning fiscal variables and fiscal policy, on sovereign spread and exchange rate daily movements, while controlling for other factors that might have affected such movements. The experience of Brazil, during the period surrounding the 2002 macroeconomic crisis, shows that fiscal events have significantly influenced sovereign spreads and exchange rates in that period. Furthermore, fiscal policy actions appear to have contributed to movements in the exchange rates more than unanticipated monetary policy manoeuvres. Unlike Blanchard's (2004) and Favero and Giavazzi's (2004) empirical results, this paper has not been able to clearly identify a stable, and unconventional, relationship between monetary policy rate variation and exchange rate movements in Brazil in the period under consideration. Nevertheless, the rolling regression of changes in the exchange rates on the unanticipated component of past Selic movements reveals a time window when the relationship between these two variables was positive, meaning that unexpected increases in the Selic were likely to be associated with a depreciation, rather than an appreciation of the exchange rate, which is an indication that Brazil might have entered the bad equilibrium described by Blanchard and Favero and Giavazzi.

Table 1

VAR Argentina

	Change in real liabilities → Change in real primary balance			**Change in real primary balance → Change in real liabilities**		
	P-value[1]	**Sum of coefficients in VAR[2]**	**Impulse response[3]**	**P-value[1]**	**Sum of coefficients in VAR[4]**	**Impulse response[3]**
Whole period 1995Q1–2003Q4[5]	0.48	–6.49 [0.65]	FD	0.66	0.01 [0.35]	FD
Pre-devaluation 1994Q1–2001Q4[6]	0.30	0.22 [0.20]	FD	0.15	0.24 [0.88]	FD

Note: Quarterly data; the number of lags in the VAR is chosen on the basis of different information criteria, and the qualitative results do not change when different lag lengths are considered.

[1] P-value of Granger causality. [2] In brackets p-value of Wald test for the Ho: $\Sigma\beta_j = 0$ in model (2). [3] The impulse response functions are consistent with fiscal dominance (FD), monetary dominance (MD) or give ambiguous results (ambiguous) [4] In brackets p-value of the Wald test for the Ho: $\Sigma\delta_j = 0$ in model (2). [5] 3 lags, 32 obs. [6] 3 lags, 25 obs.

Table 2

VAR Colombia

	Change in real liabilities → Change in real primary balance			**Change in real primary balance → Change in real liabilities**		
	P-value[1]	**Sum of coefficients in VAR[2]**	**Impulse response[3]**	**P-value[1]**	**Sum of coefficients in VAR[4]**	**Impulse response[3]**
Whole period 1995Q1–2003Q4[5]	0.31	0.13 [0.34]	FD	0.02	0.69 [0.00]	MD
Pre-inflation targeting 1995Q1–1999Q3[6]	0.14	-0.21 [0.14]	FD	0.95	-0.03 [0.95]	FD
Inflation targeting 1999Q4–2003Q4[7]	0.48	-0.17 [0.48]	FD	0.74	0.10 [0.74]	MD

Note: Quarterly data; the number of lags in the VAR is chosen on the basis of different information criteria, and the qualitative results do not change when different lag lengths are considered.

[1] P-value of Granger causality. [2] In brackets p-value of Wald test for the Ho: $\Sigma\beta_j = 0$ in model (2). [3] The impulse response functions are consistent with fiscal dominance (FD), monetary dominance (MD) or give ambiguous results (ambiguous) [4] In brackets p-value of the Wald test for the Ho: $\Sigma\delta_j = 0$ in model (2). [5] 3 lags, 31 obs. [6] 1 lag, 17 obs. [7] 1 lag, 16 obs.

Table 3

VAR Brazil

	Change in real liabilities → Change in real primary balance			**Change in real primary balance → Change in real liabilities**		
	P-value[1]	**Sum of coefficients in VAR[2]**	**Impulse response[3]**	**P-value[1]**	**Sum of coefficients in VAR[4]**	**Impulse response[3]**
Whole period 1991M1–2004M1[5]	0.16	-0.54 [0.16]	FD	0.60	0.18 [0.60]	FD
Pre-*Real* 1991M1–1994M6[6]	0.71	0.11 [0.25]	Ambiguous	0.08	1.43 [0.50]	FD
Post-*Real* 1994M7–2004M1[7]	0.28	0.02 [0.28]	FD	0.59	0.23 [0.59]	FD
Post-*Real*, pre-devaluation 1994M7–1998M12[8]	0.07	0.17 [0.07]	FD	0.36	0.14 [0.36]	MD
Inflation targeting 1999M6–2004M1[9]	0.76	0.01 [0.76]	FD	0.49	0.45 [0.49]	FD

Note: Quarterly data; the number of lags in the VAR is chosen on the basis of different information criteria, and the qualitative results do not change when different lag lengths are considered.

[1] P-value of Granger causality. [2] In brackets p -value of Wald test for the Ho: $\Sigma\beta_j = 0$ in model (2). [3] The impulse response functions are consistent with fiscal dominance (FD), monetary dominance (MD) or give ambiguous results (ambiguous) [4] In brackets p -value of the Wald test for the Ho: $\Sigma\delta_j = 0$ in model (2). [5] 1 lag, 155 obs. [6] 4 lags, 37 obs. [7] 1 lag, 115 obs. [8] 1 lag, 54 obs. [9] 1 lag, 56 obs.

Table 4

VAR Mexico

	Change in real liabilities → Change in real primary balance			**Change in real primary balance → Change in real liabilities**		
	P-value[1]	**Sum of coefficients in VAR[2]**	**Impulse response[3]**	**P-value[1]**	**Sum of coefficients in VAR[4]**	**Impulse response[3]**
Whole period 1990M1–2004M1[5]	0.25	0.10 [0.09]	Ambiguous	0.92	0.47 [0.73]	MD
Pre-crisis 1990M1–1994M11[6]	0.02	0.19 [0.02]	Ambiguous	0.94	0.02 [0.94]	MD
Post-crisis 1995M6–2004M1[7]	0.53	0.04 [0.53]	Ambiguous	0.94	-0.01 [0.94]	MD
Post-crisis, pre-inflation targeting 1995M6–1998M12[8]	0.26	-0.10 [0.11]	FD	0.29	1.30 [0.15]	FD
Inflation targeting 1999M1–2004M1[9]	0.16	0.18 [0.16]	Ambiguous	0.68	-0.05 [0.68]	MD

Note: Quarterly data; the number of lags in the VAR is chosen on the basis of different information criteria, and the qualitative results do not change when different lag lengths are considered.

[1] P-value of Granger causality. [2] In brackets p-value of Wald test for the Ho: $\Sigma\beta_j = 0$ in model (2). [3] The impulse response functions are consistent with fiscal dominance (FD), monetary dominance (MD) or give ambiguous results (ambiguous) [4] In brackets p-value of the Wald test for the Ho: $\Sigma\delta_j = 0$ in model (2). [5] 5 lags, 163 obs. [6] 1 lag, 57 obs. [7] 1 lag, 104 obs. [8] 2 lags, 43 obs. [9] 1 lag, 61 obs.

Table 5

VAR Poland

	Change in real liabilities → Change in real primary balance			**Change in real primary balance → Change in real liabilities**		
	P-value[1]	**Sum of coefficients in VAR[2]**	**Impulse response[3]**	**P-value[1]**	**Sum of coefficients in VAR[4]**	**Impulse response[3]**
Whole period 1997M1–2003M12[5]	0.03	0.12 [0.03]	Ambiguous	0.11	-0.33 [0.11]	FD
Inflation targeting 1998M10–2003M12[6]	0.03	0.15 [0.03]	Ambiguous	0.06	-0.38 [0.06]	FD

Note: Quarterly data; the number of lags in the VAR is chosen on the basis of different information criteria, and the qualitative results do not change when different lag lengths are considered.

[1] P-value of Granger causality. [2] In brackets p-value of Wald test for the Ho: $\Sigma\beta_j = 0$ in model (2). [3] The impulse response functions are consistent with fiscal dominance (FD), monetary dominance (MD) or give ambiguous results (ambiguous) [4] In brackets p -value of the Wald test for the Ho: $\Sigma\delta_j = 0$ in model (2). [5] 1 lag, 82 obs. [6] 1 lag, 63 obs.

Table 6

VAR Thailand

	Change in real liabilities → Change in real primary balance			**Change in real primary balance → Change in real liabilities**		
	P-value[1]	**Sum of coefficients in VAR[2]**	**Impulse response[3]**	**P-value[1]**	**Sum of coefficients in VAR[4]**	**Impulse response[3]**
Whole period 1997M1–2003M12[5]	0.04	-0.01 [0.83]	FD	0.07	-2.43 [0.09]	FD
Inflation targeting 2000M4–2003M2[6]	0.18	-0.05 [0.60]	FD	0.08	-2.69 [0.04]	FD

Note: Quarterly data; the number of lags in the VAR is chosen on the basis of different information criteria, and the qualitative results do not change when different lag lengths are considered.

[1] P-value of Granger causality. [2] In brackets p -value of Wald test for the Ho: $\Sigma\beta_j = 0$ in model (2). [3] The impulse response functions are consistent with fiscal dominance (FD), monetary dominance (MD) or give ambiguous results (ambiguous) [4] In brackets p -value of the Wald test for the Ho: $\Sigma\delta_j = 0$ in model (2). [5] 3 lags, 79 obs. [6] 3 lags, 44 obs.

Table 7

Reaction function for Brazil

	Explanatory variables						
	i_{t-1}	$INFL_{t-1}$	$INFL^{e}_{t-1}$	$Outputgap_{t-1}$	ΔRPB_{t-1}	$\Delta REER_{t-1}$	Adj. R^2 **(no obs.)**
Whole post-real period (1995M1–2004M1)	0.88 (18.71)	0.003 (0.57)	–	0.30 (2.06)	0.02 (1.03)	–	0.83 (109)
	0.89 (18.36)	0.003 (0.54)	–	0.34 (2.20)	0.02 (1.03)	–0.03 (0.78)	0.83 (109)
Post-real, pre-devaluation period (1995M1–1998M12)	0.90 (10.26)	–0.01 (0.81)	–	0.88 (2.65)	0.03 (0.93)	–	0.77 (48)
	0.88 (9.66)	–0.01 (0.96)	–	0.90 (2.69)	0.04 (0.96)	0.13 (0.59)	0.76 (48)
Inflation-targeting period (2000M1–2003M12)[1, 2]	0.89 (15.87)	–	0.39 (5.56)	0.04 (1.54)	–0.0003 (0.11)	–	0.96 (48)
	0.90 (27.24)	–	0.22 (4.36)	0.05 (1.90)	0.0002 (0.07)	–0.03 (2.91)	0.98 (48)

Note: Monthly data; a constant was added to the regressors. Absolute value of t statistics in parenthesis.

Variable names: i_{t-1} = nominal interest rate; $INFL_{t-1}$ = actual inflation rate; $INFL^{e}_{t-1}$ = expected inflation deviation from target; $Outputgap_{t-1}$ = Output gap; ΔRPB_{t-1} = change in real primary government balance; $\Delta REER_{t-1}$ = change in real effective exchange rate; Adj. R^2 (no. obs) = Adjusted R^2 with number observation.

[1] t-statistics obtained using Newey-West heteroskedasticity and autocorrelation consistent standard errors. [2] Inflation targeting was introduced in June 1999; however the central bank survey data on inflationary expectations are available only from January 2000.

Table 8

Reaction function for Chile

	Explanatory variables							
	i_{t-1}	$INFL_{t-1}$	$INFL^{e}_{t-1}$	$Outputgap_{t-1}$	ΔRPB_{t-1}	ΔNER_{t-1}	$\Delta REER_{t-1}$	Adj. R^2 **(no obs.)**
Whole period (1990Q3–2002Q4)	0.25 (1.78)	0.30 (2.71)	–	0.28 (0.88)	0.0004 (0.90)	–	–	0.37 (50)
	0.24 (1.63)	0.30 (2.61)	–	0.22 (0.63)	0.0004 (0.83)	–	0.05 (0.45)	0.36 (50)
	0.19 (1.31)	0.35 (3.04)	–	0.23 (0.73)	0.0003 (0.78)	-0.15 (1.48)	–	0.39 (50)
Inflation targeting (1991Q1–2002Q4)	0.37 (2.74)	–	0.06 (0.25)	0.14 (0.42)	0.0005 (0.96)	–	–	0.20 (48)
	0.27 (1.78)	–	-0.03 (0.12)	-0.07 (0.19)	0.0003 (0.69)	–	0.21 (1.53)	0.22 (48)
	0.34 (2.48)	–	0.01 (0.04)	0.11 (0.31)	0.0004 (0.91)	-0.10 (0.92)	–	0.19 (48)

Note: Quarterly data; a constant, and a dummy for 1998Q3, when the exchange rate band came under attack, were added to the regressors. Absolute value of t statistics in parenthesis.

Variable names: i_{t-1} = nominal interest rate; $INFL_{t-1}$ = actual inflation rate; $INFL^{e}_{t-1}$ = expected inflation deviation from target; $Outputgap_{t-1}$ = Output gap; ΔRPB_{t-1} = change in real primary government balance; ΔNER_{t-1} = change in nominal exchange rate; $\Delta REER_{t-1}$ = change in real effective exchange rate; Adj. R^2 (no. obs) = Adjusted R^2 with number observation.

Table 9

Reaction function for Colombia

	Explanatory variables							
	i_{t-1}	$INFL_{t-1}$	$INFL^{e}_{t-1}$	$Outputgap_{t-1}$	ΔRPB_{t-1}	ΔNER_{t-1}	$\Delta REER_{t-1}$	Adj. R^2 **(no obs.)**
Whole period (1998M3–2003M10)	0.87 (19.99)	0.15 (2.07)	–	1.83 (2.13)	0.01 (0.77)	–	–	0.98 (68)
	0.88 (19.39)	0.14 (1.89)	–	1.85 (2.10)	0.01 (0.76)	0.001 (0.11)	–	0.98 (68)
	0.88 (19.52)	0.14 (2.03)	–	1.84 (2.11)	0.01 (0.76)	–	-0.001 (0.08)	0.98 (68)
Inflation targeting (1999M9–2003M10)	0.94 (17.92)	–	0.26 (2.81)	1.16 (0.82)	0.01 (0.49)	–	–	0.89 (50)
	0.97 (18.17)	–	0.31 (3.31)	0.95 (0.68)	0.01 (0.32)	–	-0.02 (1.82)	0.88 (50)
	0.96 (19.54)	–	0.35 (3.85)	1.43 (1.09)	0.01 (0.37)	0.03 (2.88)	–	0.90 (50)

Note: Monthly data; a constant was added to the regressors. Absolute value of t statistics in parenthesis.

Variable names: i_{t-1} = nominal interest rate; $INFL_{t-1}$ = actual inflation rate; $INFL^{e}_{t-1}$ = expected inflation deviation from target; $Outputgap_{t-1}$ = Output gap; ΔRPB_{t-1} = change in real primary government balance; ΔNER_{t-1} = change in nominal exchange rate; $\Delta REER_{t-1}$ = change in real effective exchange rate; Adj. R^2 (no. obs) = Adjusted R^2 with number observation.

Table 10

Reaction function for Mexico

	Explanatory variables							
	i_{t-1}	$INFL_{t-1}$	$INFL^{e}_{t-1}$	$Outputgap_{t-1}$	ΔRPB_{t-1}	$\Delta REER_{t-1}$	ΔNER_{t-1}	Adj. R^2 **(no obs.)**
Whole post-crisis period (1995M6–2003M12)[1]	0.62 (6.40)	0.29 (3.30)	–	0.09 (0.58)	-0.001 (0.96)	–	–	0.94 (103)
	0.61 (6.02)	0.31 (3.35)	–	0.17 (1.30)	-0.001 (0.10)	-0.03 (1.15)	–	0.94 (103)
	0.56 (4.90)	0.28 (3.70)	–	0.39 (3.36)	-0.001 (1.08)	–	0.07 (2.46)	0.95 (103)
Post-crisis-pre inflation targeting (1995M6–1998M12)[1]	0.30 (1.80)	0.35 (3.69)	–	-0.70 (1.90)	-0.003 (0.91)	–	–	0.87 (43)
	0.23 (1.18)	0.41 (3.77)	–	-0.23 (0.50)	-0.003 (0.50)	-0.11 (2.01)	–	0.88 (43)
	0.21 (1.09)	0.38 (3.42)	–	0.29 (0.65)	-0.003 (0.87)	–	0.13 (3.07)	0.90 (43)
Inflation targeting (1999M1–2003M12)	0.81 (16.02)	0.15 (2.11)	–	0.26 (3.99)	-0.0005 (0.53)	–	–	0.98 (60)
	0.81 (15.93)	0.15 (2.10)	–	0.25 (3.90)	-0.0005 (0.50)	–	-0.01 (0.52)	0.97 (60)
	0.81 (15.96)	0.15 (1.98)	–	0.26 (3.96)	-0.005 (0.49)	0.01 (0.86)	–	0.97 (60)
	0.89 (36.47)	–	0.10 (0.46)	0.25 (3.62)	-0.001 (0.49)	0.02 (1.10)	–	0.97 (59)
	0.91 (44.61)	–	-0.06 (0.44)	0.24 (3.49)	-0.001 (0.54)	–	–	0.97 (59)

Note: Monthly data; a constant, and a dummy for the period 1998M09-1999M02, were added to the regressors. Absolute value of t statistics in parenthesis.

Variable names: i_{t-1} = nominal interest rate; $INFL_{t-1}$ = actual inflation rate; $INFL^{e}_{t-1}$ = expected inflation deviation from target; $Outputgap_{t-1}$ = Output gap; ΔRPB_{t-1} = change in real primary government balance; $\Delta REER_{t-1}$ = change in real effective exchange rate; ΔNER_{t-1} = change in nominal exchange rate; Adj. R^2 (no. obs) = Adjusted R^2 with number observation.

[1] t-statistics obtained using Newey-West heteroskedasticity and autocorrelation consistent standard errors.

Table 11

Reaction function for Poland

	Explanatory variables							
	i_{t-1}	$INFL_{t-1}$	$INFL^{e}_{t-1}$	$Outputgap_{t-1}$	ΔRPB_{t-1}	$\Delta REER_{t-1}$	ΔNER_{t-1}	Adj. R^2 **(no obs.)**
Whole period (1998M4–2003M7)	0.78 (14.52)	0.17 (2.31)	–	0.12 (3.46)	-0.000 (0.04)	–	–	0.98 (64)
	0.83 (13.26)	0.10 (1.13)	–	0.11 (2.88)	-0.000 (0.07)	–	0.02 (1.50)	0.98 (64)
	0.72 (10.37)	0.21 (2.69)	–	0.13 (3.60)	-0.000 (0.07)	0.02 (1.44)	–	0.98 (64)
Inflation targeting (2000M1–2003M6)[1, 2]	0.85 (25.49)	–	0.21 (3.68)	0.11 (3.24)	-0.000 (0.01)	–	–	0.99 (42)
	0.90 (33.40)	–	0.13 (2.21)	0.07 (2.84)	-0.001 (0.46)	–	0.03 (2.49)	0.99 (42)
	0.84 (11.61)	–	0.21 (3.72)	0.18 (2.17)	-0.000 (0.01)	0.00 (0.16)	–	0.99 (42)

Note: Monthly data; a constant was added to the regressors. Absolute value of t statistics in parenthesis.

Variable names: i_{t-1} = nominal interest rate; $INFL_{t-1}$ = actual inflation rate; $INFL^{e}_{t-1}$ = expected inflation deviation from target; $Outputgap_{t-1}$ = Output gap; ΔRPB_{t-1} = change in real primary government balance; $\Delta REER_{t-1}$ = change in real effective exchange rate; ΔNER_{t-1} = change in nominal exchange rate; Adj. R^2 (no. obs) = Adjusted R^2 with number observation.

[1] t-statistics obtained using Newey-West heteroskedasticity and autocorrelation consistent standard errors. [2] Inflation targeting was introduced in October 1998, however the central bank survey data on inflationary expectations are available only from January 2001.

Table 12

Reaction function for South Africa

	Explanatory variables							
	i_{t-1}	$INFL_{t-1}$	$INFL^{e}_{t-1}$	$Outputgap_{t-1}$	ΔRPB_{t-1}	$\Delta REER_{t-1}$	ΔNER_{t-1}	Adj. R^2 **(no obs.)**
Whole period (1995Q1–2003Q3)[1]	0.85 (11.75)	-0.13 (1.10)	–	0.0001 (3.35)	-0.001 (0.55)	–	–	0.82 (35)
	0.86 (10.92)	-0.05 (0.35	–	0.0001 (2.31)	-0.001 (0.54)	–	0.02 (2.34)	0.84 (36)
	0.87 (11.98)	-0.08 (0.63)	–	0.0002 (2.78)	-0.001 (0.43)	-0.03 (2.64)	–	0.84 (36)
Inflation targeting (2000Q1–2003Q4)[1]	0.63 (3.23)	–	1.24 (8.39)	-0.0000 (0.88)	0.002 (0.95)	–	–	0.82 (16)
	0.85 (4.07)	–	0.90 (5.22)	-0.0000 (0.69)	0.003 (1.50)	-0.02 (2.28)	–	0.85 (16)
	0.89 (4.51)	–	0.83 (3.87)	-0.0000 (0.45)	0.002 (1.09)	–	0.02 (2.07)	0.84 (16)

Note: Quarterly data; a constant, and a dummy for 1998Q3–1998Q4, were added to the regressors. Absolute value of t statistics in parenthesis.

Variable names: i_{t-1} = nominal interest rate; $INFL_{t-1}$ = actual inflation rate; $INFL^{e}_{t-1}$ = expected inflation deviation from target; $Outputgap_{t-1}$ = Output gap; ΔRPB_{t-1} = change in real primary government balance; $\Delta REER_{t-1}$ = change in real effective exchange rate; ΔNER_{t-1} = change in nominal exchange rate; Adj. R^2 (no. obs) = Adjusted R^2 with number observation.

[1] t-statistics obtained using Newey-West heteroskedasticity and autocorrelation consistent standard errors.

Table 13

Reaction function for Thailand

	Explanatory variables							
	i_{t-1}	$INFL_{t-1}$	$INFL^{e}_{t-1}$	$Outputgap_{t-1}$	ΔRPB_{t-1}	$\Delta REER_{t-1}$	ΔNER_{t-1}	Adj. R^2 **(no obs.)**
Whole period (1995M3–2003M10)[1]	0.89 (11.70)	0.07 (0.54)	–	0.02 (3.06)	-0.000 (0.03)	–	–	0.93 (104)
	0.87 (11.06)	0.09 (0.67)	–	0.003 (3.22)	-0.000 (0.01)	-0.01 (0.91)	–	0.93 (104)
	0.83 (8.99)	0.09 (0.71)	–	0.004 (3.34)	0.000 (0.04)	–	0.02 (1.78)	0.94 (104)
Pre inflation targeting (1995M3–2000M3)	0.94 (13.10)	-0.03 (0.20)	–	0.004 (3.67)	-0.000 (0.09)	–	–	0.88 (61)
	0.84 (6.92)	0.06 (0.42)	–	0.004 (3.07)	0.000 (0.002)	-0.04 (1.19)	–	0.88 (61)
	0.74 (4.90)	0.06 (0.42)	–	0.01 (3.20)	0.000 (0.11)	–	0.05 (1.91)	0.89 (61)
Inflation targeting (2000M4–2003M10)[1]	0.80 (8.52)	–	-0.09 (0.97)	-0.001 (2.29)	0.000 (0.79)	–	–	0.80 (43)
	0.80 (8.13)	–	-0.10 (0.97)	-0.001 (1.85)	0.000 (0.78)	–	0.001 (0.16)	0.79 (43)
	0.83 (8.54)	–	-0.13 (1.25)	-0.001 (2.36)	0.001 (0.82)	-0.008 (1.11)	–	0.80 (43)

Note: Monthly data; a constant, and a dummy for 1997M6–1997M12, corresponding to the Asian crisis period, were added to the regressors. Absolute value of t statistics in parenthesis.

Variable names: i_{t-1} = nominal interest rate; $INFL_{t-1}$ = actual inflation rate; $INFL^{e}_{t-1}$ = expected inflation deviation from target; $Outputgap_{t-1}$ = Output gap; ΔRPB_{t-1} = change in real primary government balance; $\Delta REER_{t-1}$ = change in real effective exchange rate; ΔNER_{t-1} = change in nominal exchange rate; Adj. R^2 (no. obs) = Adjusted R^2 with number observation.

[1] t-statistics obtained using Newey-West heteroskedasticity and autocorrelation consistent standard errors.

Table 14

Correlation among different measures of country risk

In levels				**In first differences**			
	CBOND	*EMBI*	*CDS*		∆*CBOND*	∆*EMBI*	∆*CDS*
BENCHMARK	0.995	0.997	0.983	∆*BENCHMARK*	0.963	0.961	0.859
CBOND		0.998	0.989	∆*CBOND*		0.979	0.864
EMBI			0.988	∆*EMBIBR*			0.882

Table 15

The impact of news on country premium in Brazil

	∆*EMBI*	∆*EMBI*	∆*CDS*
LAGGED DEPENDENT VARIABLE	**0.19** (2.57)	**0.19** (2.62)	**0.23 (**3.35)
ANNOUNCEMENT	**–0.38** (1.83)	**–0.38** (1.85)	**–0.77 (**2.04)
ANNOUNCEMENTt-1	**–0.25** (1.80)	**–0.25** (1.80)	
ACTION	**–0.24** (2.03)	**–0.24** (2.11)	**–0.29** (2.11)
ACTIONt-1	0.03 (0.40)		
NET DEBT	**–0.002** (2.15)	**–0.002** (2.10)	**–0.003** (1.99)
NET DEBTt-1	–0.001 (0.61)		
PRIMARY PSBR	–0.01 (1.29)		
PRIMARY PSBRt-1	–0.03 (0.46)		
INTEREST PAYMENTS	–0.001 (0.72)		
INTEREST PAYMENTSt-1	**–0.005** (2.69)	**–0.005** (2.85)	**–0.005 (**2.04)
SELIC	–0.12 (1.11)		
SELICt-1	0.07 (0.71)		
RESERVE	**0.02** (1.70)	**0.02** (1.75)	**–0.01** (2.15)
RESERVEt-1	–0.002 (0.22)		
US_FEDRATE	**–0.21** (32.40)	**–0.21** (34.12)	**–0.33** (18.04)
US_FEDRATEt-1	**0.20** (11.91)	**0.20** (12.36)	**0.27** (9.55)
ELECTIONS	**0.86** (7.83)	**0.86** (7.971)	**1.11** (5.75)
ELECTIONSt-1	0.70 (1.14)	0.71 (1.16)	**1.88** (2.88)
IMF	**–2.03** (76.51)	**–2.03** (80.42)	**–2.88** (27.5)
IMFt-1	**–1.21** (8.02)	**–1.22** (8.52)	**–2.94** (16.07)
RATINGDOWN	**0.85** (2.14)	**0.86** (2.14)	1.56 (1.19)
RATINGDOWN t-1	–0.03 (0.13)		
RATINGUP	**–0.16** (1.82)	**–0.12** (5.79)	
RATINGUPt-1	**–0.09** (3.84)	**–0.09** (4.10)	
US_EXPFEDRATEUP	**0.04** (1.87)	**0.04** (2.06)	**0.26** (8.02)
US_EXPFEDRATEU t-1	**0.42** (18.73)	**0.42** (20.01)	**0.75** (20.73)
Adjusted R2 (number of observations)	0.14 (531)	0.15 (531)	0.19 (531)

Note: In parenthesis, absolute value of the t-statistics obtained using Newey-West heteroskedasticity and autocorrelation consistent standard errors. The coefficients in bold are significant either at the 10, 5 or 1% level.

Table 16

The impact of news on exchange rate in Brazil

	∆EXCHANGE	*∆EXCHANGE*	*∆EXCHANGE*
∆EMBI(-1)	**0.03** (8.00)	**0.03** (8.38)	**0.03** (8.38)
ANNOUNCEMENT	–0.01 (1.03)		
ANNOUNCEMENT$_{t-1}$	–0.004 (0.36)		
ACTION	**–0.02** (2.95)	**–0.02** (2.94)	**–0.03** (3.14)
ACTION$_{t-1}$	–0.007 (0.86)		
NET DEBT CHANGE	–0.001 (0.30)		
NET DEBT CHANGE$_{t-1}$	**–0.01** (2.77)	**–0.009** (2.64)	**–0.009** (2.65)
PRIMARY PSBR	–0.01 (0.91)		
PRIMARY PSBR$_{t-1}$	–0.01 (0.98)		
INTEREST PAYMENTS	–0.000 (1.47)		
INTEREST PAYMENTS$_{t-1}$	–0.000 (0.31)		
SELIC	–0.01 (1.11)	–0.02 (1.13)	
SELIC $_{t-1}$	–0.001 (0.06)	–0.003 (0.25)	
CURRENT ACCONT BALANCE	0.002 (0.37)		
CURRENT ACCONT BALANCE$_{t-1}$	**0.01** (1.72)		
US_FEDRATE	–0.01 (1.42)		
US_FEDRATE$_{t-1}$	0.003 (0.39)		
ELECTIONS	0.02 (0.67)		
ELECTIONS$_{t-1}$	**0.05** (1.86)	**0.05** (1.84)	**0.05** (1.84)
IMF	**–0.16** (4.44)	**–0.16** (4.44)	**–0.16** (4.45)
IMF$_{t-1}$	**–0.09** (2.57)	**–0.09** (2.56)	**–0.09** (2.57)
RATINGDOWN	**0.05** (2.57)	**0.05** (2.60)	**0.05** (2.60)
RATINGDOWN$_{t-1}$	–0.02 (0.79)		
RATINGUP	0.03 (0.70)		
RATINGUP$_{t-1}$	–0.03 (0.68)		
US_EXPFEDRATEUP	0.01 (0.33)		
US_EXPFEDRATEUP$_{t-1}$	**0.06** (1.71)		
Adjusted R^2 (number of observations)	0.19 (534)	0.20 (534)	0.20 (534)

Note: Absolute value of the t statistics in parenthesis. The coefficients in bold are significant either at the 10, 5 or 1% level.

Figure 1 **Different indicators of country risk for Brazil**

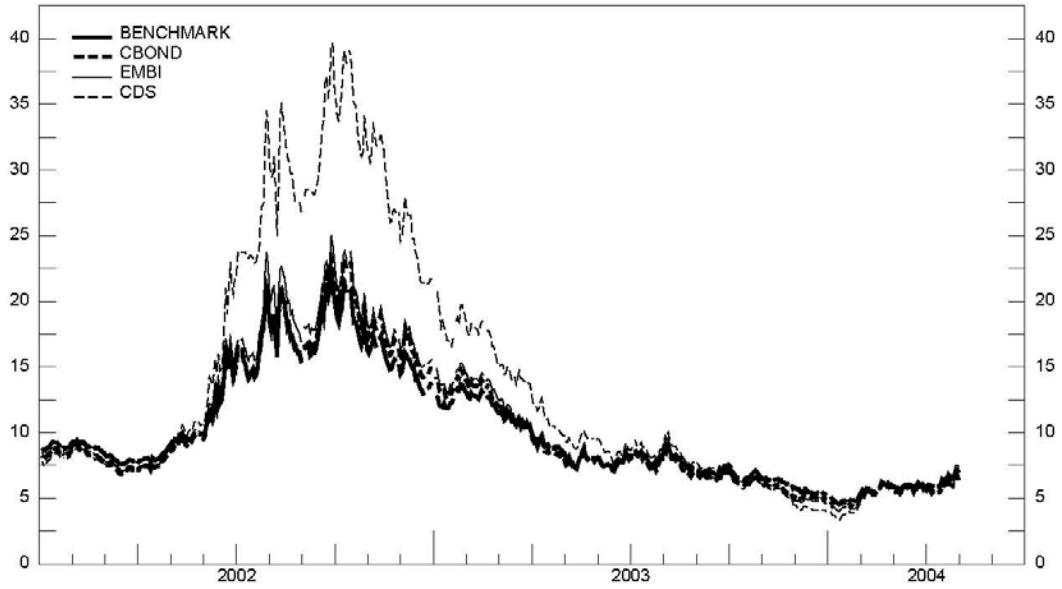


Figure 2 **Brazil's exchange rate vis-à-vis the US dollar**

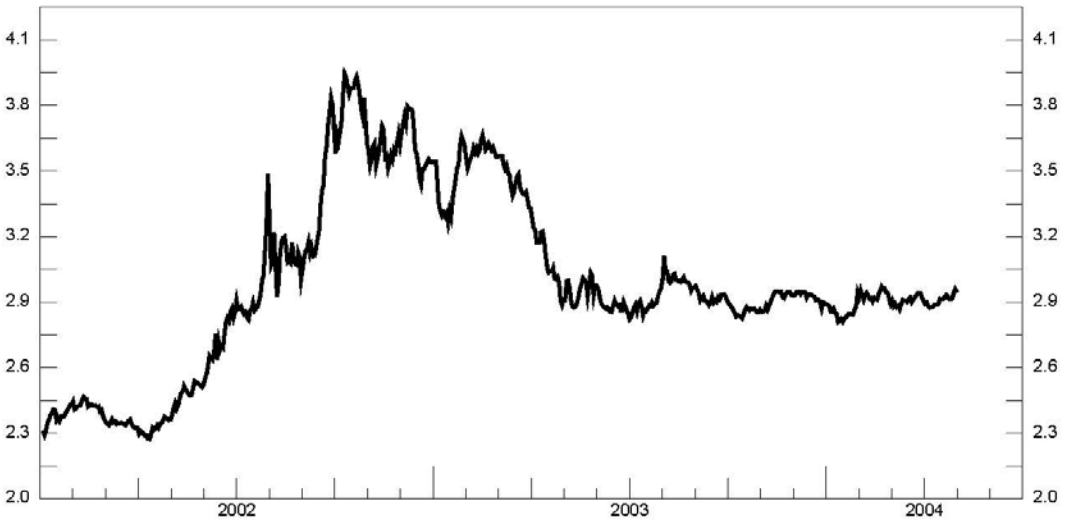
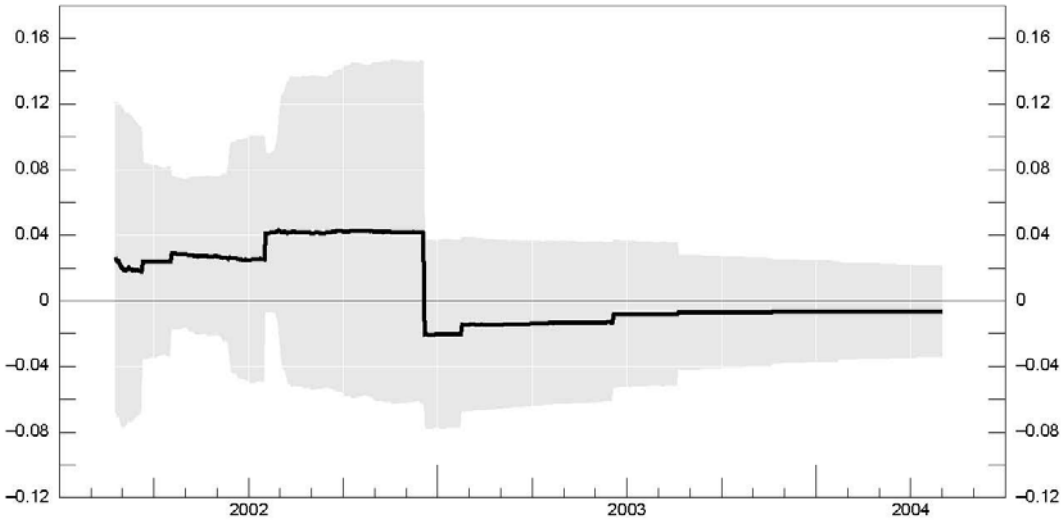


Figure 3 **Coefficients of the rolling regression of $\Delta EXCHANGE_t$ on $SELIC_{t-1}$**



Note: The shaded area represents ±2 standard errors around the estimate.

Appendix 1: Variable definitions and data sources for empirical work of Sections 3 and 4

Argentina

Real public sector liabilities: gross consolidated debt of the public sector, plus the monetary base (millions of pesos), deflated by the consumer price index. Sources: Ministry of the Economy, Boletin Fiscal; International Financial Statistics (IFS).

Real primary balance: primary balance of the public sector (millions of pesos), deflated by the consumer price index. Source: Ministry of the Economy web-site.

Brazil

Real public sector liabilities: net debt of the non-financial public sector and the central bank, which includes also the monetary base (millions of reais), deflated by the consumer price index. Sources: Central bank web-site; IFS.

Real primary balance: primary balance of the non-financial public sector (millions of reais), deflated by the consumer price index. Sources: Central bank web-site; IFS.

Policy rate: Selic rate, annualised, in per cent. Source: Datastream.

Inflation: annual percentage change in the consumer price index.

Output gap: difference between actual and potential output. The seasonally adjusted General Production indicator (1991=100) is used as a measure for output. Source: Central bank web-site. Potential output is estimated using the Hodrick-Prescott filter.

ΔReal effective exchange rate: annual change in the real effective exchange rate index in terms of relative consumer prices (1999=100). An increase indicates an appreciation. Source: BIS databank.

Expected inflation deviation: deviation of expected inflation from the inflation target. Expected inflation is obtained from the daily survey that the central bank conducts among financial institutions and consulting firms (Source: Central bank web-site). In Brazil year-end inflation targets are set for the current and the following two years. Following Minella et al (2003), as a single measure of the deviation of expected inflation from the target, I use a weighted average of the current year's and following year's expected deviation of inflation from the targets, where the weights are inversely proportional to the number of months remaining in the year. The results are not affected if, instead of the weighted average, only the current year's expected deviation of inflation from the target is considered.

Chile

Policy rate: since the policy intervention rate was changed in 1995, and again in 2001, to have a continuous time series for the dependent variable, the Interbank Average Interest Rates (TIP) on Unindexed Loans under 30 days is used a proxy for the policy rate. The correlation between the official intervention rate and the TIP is 0.63 for the period 1995M5-2001M7, and 0.99 for the period 2001M8-2003M12. Source: Central bank web-site.

Output gap: difference between actual and potential output. Output is measured by the seasonally adjusted real GDP (Source: IFS). Potential output is estimated using the Hodrick-Prescott filter.

Inflation: annual percentage change in the consumer price index. Source: IFS.

Real primary balance: public sector primary balance (millions of pesos), deflated by the consumer price index. Sources: Ministry of Finance web-site; IFS.

ΔReal effective exchange rate: annual percentage change in the real effective exchange rate index in terms of relative consumer prices (1995=100). An increase indicates an appreciation. Source: IFS.

ΔNominal exchange rate: annual percentage change in the nominal exchange rate vis-à-vis the US dollar. An increase indicates a depreciation. Source: IFS.

Expected inflation deviation: deviation of expected inflation from the inflation target. Expected inflation is measured as the difference between the nominal interest rates and inflation indexed interest rates on 90 to 365 days deposits. Source: BIS.

Colombia

Real public sector liabilities: gross debt of the central national government, plus the monetary base (billions of pesos), deflated by the consumer price index. Sources: Central bank web-site; IFS.

Real primary balance: primary balance of the central national government (billions of pesos), deflated by the consumer price index. Sources: Central bank web-site; IFS.

Policy rate: one-day repo reverse rate, annualised, in per cent. Source: Bloomberg.

Inflation: annual percentage change in the consumer price index. Source: IFS.

Output gap: difference between actual and potential output. To measure output, the seasonally adjusted real GDP is interpolated to obtain a monthly series (Source: IFS). Potential output is estimated using the Hodrick-Prescott filter.

∆Real effective exchange rate: annual percentage change in the real effective exchange rate index in terms of relative consumer prices (1999=100). An increase indicates an appreciation. Source: IFS.

∆Nominal exchange rate: annual percentage change in the nominal exchange rate vis-à-vis the US dollar. An increase indicates a depreciation. Source: IFS.

Expected inflation deviation: deviation of expected inflation from the inflation target. Expected inflation is obtained from Consensus Forecast. As a measure of the deviation of expected inflation from the target, I use a weighted average of the current year's and following year's expected deviation of inflation from the targets, where the weights are inversely proportional to the number of months remaining in the year. The results are not affected if, instead of the weighted average, only the current year's expected deviation of inflation from the target is considered.

Mexico

Real public sector liabilities: gross debt of the central public sector, plus the monetary base (millions of pesos), deflated by the consumer price index. Sources: Central bank web-site; IFS.

Real primary balance: primary balance of the central public sector (millions of pesos), deflated by the consumer price index. Sources: Central bank web-site; IFS.

Policy rate: 91-day-Cetes rate, annualised, in per cent. Source: Central bank web-site.

Inflation: annual percentage change in the consumer price index.

Output gap: difference between actual and potential output. The seasonally adjusted Industrial Production index (1991=100) is used as a measure for output (Source: IFS). Potential output is estimated using the Hodrick-Prescott filter.

∆Real effective exchange rate: annual change in the real effective exchange rate index in terms of relative consumer prices (1999=100). An increase indicates an appreciation. Source: BIS databank.

∆Nominal exchange rate: annual percentage change in the nominal exchange rate vis-à-vis the US dollar. An increase indicates a depreciation. Source: IFS.

Expected inflation deviation: deviation of expected inflation from the inflation target. Expected inflation is obtained from the Monthly Survey on Economic Expectations of the Main Private Consulting Firms (Source: Central bank web-site). As a measure of the deviation of expected inflation from the target, I use a weighted average of the current year's and following year's expected deviation of inflation from the targets, where the weights are inversely proportional to the number of months remaining in the year. The results are not affected if, instead of the weighted average, only the current year's expected deviation of inflation from the target is considered.

Poland

Real public sector liabilities: gross debt of the consolidated central government, plus the monetary base (millions of zlotys), deflated by the consumer price index. Sources: Ministry of Finance web-site; IFS.

Real primary balance: primary balance of the consolidated central government (millions of zlotys), deflated by the consumer price index. Sources: Ministry of Finance web-site; IFS.

Policy rate: 14-day repurchase rate, annualised, in per cent. Source: Bloomberg.

Inflation: annual percentage change in the consumer price index. Source: IFS.

Output gap: difference between actual and potential output. To measure output, the seasonally adjusted real GDP is interpolated to obtain a monthly series (Source: IFS). Potential output is estimated using the Hodrick-Prescott filter.

∆Real effective exchange rate: annual percentage change in the real effective exchange rate index in terms of relative consumer prices (1999=100). An increase indicates an appreciation. Source: BIS.

∆Nominal exchange rate: annual percentage change in the nominal exchange rate vis-à-vis the US dollar. An increase indicates a depreciation. Source: IFS.

Expected inflation deviation: deviation of expected inflation from the inflation target. Expected inflation is obtained from the survey on inflation expectations of consumers for the following 12 months. Source: Inflation Report.

South Africa

Policy rate: repo middle rate, annualised, in per cent. Source: BIS.

Inflation: annual percentage change in the consumer price index. Source: IFS.

Output gap: difference between actual and potential output. Output is measured by the seasonally adjusted real GDP (Source: IFS). Potential output is estimated using the Hodrick-Prescott filter.

Real primary balance: primary balance of the consolidated central government (millions of rands), deflated by the consumer price index. Sources: Central bank web-site; IFS.

∆Real effective exchange rate: annual percentage change in the real effective exchange rate index in terms of relative consumer prices (1999=100). An increase indicates an appreciation. Source: BIS.

∆Nominal exchange rate: annual percentage change in the nominal exchange rate vis-à-vis the US dollar. An increase indicates a depreciation. Source: IFS.

Expected inflation deviation: deviation of expected inflation from the inflation target. Expected inflation is obtained from Consensus Forecast. As a measure of the deviation of expected inflation from the target, I use a weighted average of the current year's and following year's expected deviation of inflation from the targets, where the weights are inversely proportional to the number of quarters remaining in the year. The results are not affected if, instead of the weighted average, only the current year's expected deviation of inflation from the target is considered.

Thailand

Real public sector liabilities: gross debt of the national government, plus the monetary base (millions of baht), deflated by the consumer price index. Sources: Central bank web-site; IFS.

Real primary balance: primary balance of the national government (millions of baht) , deflated by the consumer price index. Sources: Central bank web-site; IFS.

Policy rate: repo 14-day rate, annualised, in per cent. Source: Datastream.

Inflation: annual percentage change in the consumer price index. Source: IFS.

Output gap: difference between actual and potential output. To measure output, the seasonally adjusted real GDP is interpolated to obtain a monthly series (Source: IFS). Potential output is estimated using the Hodrick-Prescott filter.

∆Real effective exchange rate: annual percentage change in the real effective exchange rate index in terms of relative consumer prices (1999=100). An increase indicates an appreciation. Source: BIS.

∆Nominal exchange rate: annual percentage change in the nominal exchange rate vis-à-vis the US dollar. An increase indicates a depreciation. Source: IFS.

Expected inflation deviation: deviation of expected inflation from the inflation target. Expected inflation is obtained from Consensus Forecast. As a measure of the deviation of expected inflation from the target, I use a weighted average of the current year's and following year's expected deviation of inflation from the targets, where the weights are inversely proportional to the number of quarters remaining in the year. The results are not affected if, instead of the weighted average, only the current year's expected deviation of inflation from the target is considered.

Appendix 2: Variable definitions and data sources for empirical work of Section 5

Variable definitions and data sources

Dependent variables

∆*EMBI*: daily changes in the strip spread of the Brazilian component of the Emerging Market Bond Index. Source: JP Morgan.

∆*CBOND*: daily changes in the strip spread of the C-bond on a comparable dollar-denominated bond issued by the US Treasury. Source: JP Morgan.

∆*BENCHMARK*: daily changes in the strip spread of the dollar-denominated 11% bond, maturing in 2040 on a comparable dollar denominated bond issued by the US Treasury. Source: JP Morgan.

∆*CDS*: mid-price quote on five-year credit default swaps on bonds issued by the Federal Republic of Brazil. Source: JP Morgan.

∆*EXCHANGE*: daily changes in the exchange rate vis-à-vis the US dollar. An increase indicates a depreciation. Source: IFS.

Explanatory variables

News on Brazilian fiscal variables

GOVBALANCE: previous month central government primary, difference between official data release and its forecasted value. Source: JP Morgan "Global Data Watch".

INTEREST PAYMENTS: previous month public sector interest payments, rate of change respect to the previous data release. Source: Bloomberg.

NET DEBT: previous month net debt, as a percentage of GDP. Source: JP Morgan "Global Data Watch".

NET DEBT CHANGE: previous month net debt, as a per centage of GDP, difference in respect to the previous data release. Source: JP Morgan "Global Data Watch".

PRIMARY PSBR: previous month Primary Public Sector Borrowing Requirement, difference between official data release and its forecasted value. Source: JP Morgan "Global Data Watch".

PSBR: previous month Public Sector Borrowing Requirement, rate of change in respect to the previous data release. Source: Bloomberg.

News on Brazilian macroeconomic variables

CURRENT ACCOUNT BAL.: previous month current account balance, difference between official data release and its forecasted value. Source: Bloomberg.

GDPA: latest annual gross domestic product growth (in per cent), difference between official data release and its forecasted value. Source: Bloomberg.

GDPQ: latest quarterly gross domestic product growth (in per cent), difference between official data release and its forecasted value. Source: Bloomberg.

INFL: previous month inflation rate (IPCA, in per cent), difference between official data release and its forecasted value. Source: Bloomberg.

IPI: previous month change in Industrial Production Index (in per cent), difference between official data release and its forecasted value. Source: Bloomberg.

RESERVE: previous month international reserve (cash), rate of change in respect to the previous data release. Source: Bloomberg.

SELIC: latest SELIC target rate (in per cent), difference between official data release and its forecasted value. Source: Bloomberg.

TRADE: previous month trade balance, difference between official data release and its forecasted value. Source: Bloomberg.

News on US macroeconomic variables

US_CPI: previous month consumer price index inflation rate (in per cent), difference between official data release and its forecasted value. Source: Bloomberg.

US_GDP: latest annual gross domestic product growth (in per cent), difference between official data release and its forecasted value. Source: Bloomberg.

US_PAYROLL: previous month change in nonfarm payrolls (in thousands), difference between official data release and its forecasted value. Source: Bloomberg.

US_FEDRATE: latest Fed Funds target rate (in per cent), difference between official data release and its forecasted value. Source: Bloomberg.

US_TRADE: previous month trade balance, difference between official data release and its forecasted value. Source: Bloomberg.

Fiscal events

ACTION: fiscal policy actions that might have enhanced investor confidence, such as budgetary cuts, or important steps in the advancement of pension and tax reforms (for a detailed list, see below).

ANNOUNCEMENT: government announcements representing statements unaccompanied by immediate concrete actions, such as the declaration of the intention to raise the public sector surplus, also aiming at reassuring market participants (for a detailed list, see below).

Other events

ELECTIONS: dummy for election days (7 and 28 October 2002).

IMF: dummy for the day when the IMF agreed to extend a US$ 30 bn loan to Brazil (7 August 2002).

OUTLOOKDOWN: dummy corresponding to the days when Brazil's outlook was downgraded by one of the major rating agencies (Moody's, Standard & Poor's, Fitch IBCA).

OUTLOOKUP: dummy corresponding to the days when Brazil's outlook was upgraded by one of the major rating agencies (Moody's, Standard & Poor's, Fitch IBCA).

RATINGDOWN: dummy corresponding to the days when Brazil's rating was downgraded by one of the major rating agencies (Moody's, Standard & Poor's, Fitch IBCA).

RATINGUP: dummy corresponding to the days when Brazil's rating was upgraded by one of the major rating agencies (Moody's, Standard & Poor's, Fitch IBCA).

US_EXPFEDRATEUP: Dummy for expected increase in Fed Funds rate (28 January 2004).

Chronology of fiscal policy announcements

4 September 2002:	Government raises target for primary surplus.
1 October 2002:	Front runner in the presidential election promises to honour public debt, if elected.
17 October 2002:	Front runner in the presidential election promises to raise public sector surplus.
28 October 2002:	Newly elected president promises to honour public debt.
7 January 2003:	President maps strategy for pension reforms.
22 January 2003:	President guarantees commitment to tax reform.
5 February 2003:	Treasury sets limits and targets for debt stock and maturity.
14 February 2003:	President's speech in front of Congress shows commitment to reforms.

22 February 2003: President and governors sign a letter of intent calling for reforms of tax and pension system.

10 March 2003: President promises to send to Congress proposal for tax and pension reform within the next month.

10 April 2003: Fovernment announces plan to keep 2004 budget surplus at 4.25% of GDP, which is the same as the IMF target for 2003.

Chronology of fiscal policy actions

8 February 2002: Government withholds 12.4 bn in spending from 2002 budget approved by Congress.

13 June 2002: Government introduces package of measures to increase surplus, and pay back some of foreign debt.

30 October 2002: New president rejects calls from state governors for an immediate renegotiation of debt.

18 December 2002: Congress approves budget law envisaging a surplus for 2003.

11 February 2003: Government introduces a series of budgetary cuts.

30 April 2003: President delivers tax and pension reform plan to Congress.

28 May 2003: Lower house judicial committee approves tax reform bill.

4 June 2003: Lower house judicial committee approves pension reform bill.

23 July 2003: Lower house pension ad hoc committee approves pension reform plan.

5 August 2003: Lower house approves pension reform (first vote).

26 August 2003: Lower house approves pension reforms (second vote).

27: August 2003: Lower house pension ad hoc committee approves tax reform plan.

3 September 2003: Lower house approves tax reform (first vote).

23 September 2003: Government introduces spending cuts.

24 September 2003: Lower house approves tax reforms (second vote).

3 October 2003: Senate judicial committee approves pension reform.

5 November 2003: Senate judicial committee approves tax reform.

26 November 2003: Senate approves pension reforms (first vote).

11 December 2003: Senate approves pension reforms (second vote) and tax reform (first vote).

17 December 2003: Senate approves tax reforms (second vote).

24 December 2003: Congress approves budget for 2004 envisaging a surplus at 4.25% of GDP, which is the same as IMF target for 2003.

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