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Discretionary fiscal policy and sovereign risk

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Abstract

The quality and magnitude of public spending is a central concern for those who want to have an assessment of the risk implied in the sovereign bonds of a country. In this paper, we investigate the effect that discretionary fiscal policy, measured by the Fiscal Impulse, may have on the sovereign risk. Using data comprising the period from March 2004 to December 2016, we have found evidence that the adoption of discretionary fiscal policies affects the Brazilian sovereign credit risk. Additionally, there is evidence that for the period under analysis, the Brazilian sovereign risk was determined by internal factors and not by global conditions.

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1. Introduction

Although there exist theoretical studies indicating beneficial effects of discretionary fiscal policy (e.g., Fontana et al., 2017); on the other hand, the evidence suggests that discretionary fiscal policy might be the cause of undesired fiscal and economic outcomes (e.g., Fatás and Mihov, 2003a 2003b and 2009; Tsuri, 2005; Ciro and de Mendonça, 2016). Concerning the effect of discretionary fiscal policy on the financial market, Kuncoro (2017) finds that it tends to induce stock return volatility.

Once the fiscal impulse captures the discretionary behavior of the government in relation to fiscal policy, it reveals the changes in fiscal policy resulting from intentional actions of the policymaker which are not due to the economic cycle, but in fact are due to new political preferences (Blanchard, 1990; Alesina and Perotti, 1995).[1] In general, the literature points out that fiscal policy is more sustainable, more disciplined and more effective, the lower the fiscal impulse is (i.e., the lower the possibility of the government to act in a discretion way). The literature suggests that discretionary fiscal policy generates excessive deficits, increases public debt and eliminates the effectiveness of automatic stabilizers (Fatás and Mihov, 2003a, 2003b and 2009; Tsuri, 2005; Ciro and de Mendonça, 2016). Therefore, higher discretion in fiscal policy can lead to higher public debt and more substantial budget imbalances, resulting in increases in the risk perception related to government capacity to repay its sovereign debt.

Both budget balance and public debt management have straight relations with government default probability, and, as a consequence, with movements in the Credit Default Swaps (CDS) market, which in turn is a proxy for sovereign risk. Once the CDS reflects the uncertainties related to government solvency, the idea of the present study is to verify whether these uncertainties are amplified by discretionary fiscal policy (i.e., by the fiscal impulse). Therefore, in this paper, we investigate the effect that discretionary fiscal policy exerts on sovereign credit risk in one of the most important emerging countries of the world – Brazil. In particular, the paper analyzes whether discretionary fiscal policy affects the Credit Default Swaps (CDS) and the country risk measured by JP Morgan "Emerging Markets Bond Index Global" (EMBI) for Brazil. As a novelty, our study is the first to investigate whether discretionary fiscal policy – measured by the fiscal impulse – represents a source of uncertainty related to fiscal variables, which brings consequences to the sovereign risk perceived towards emerging countries.

Brazil is an interesting case study once it presents serious problems of public accounts deterioration. Recently, it had the President of the Republic impeached from its position due to charges of having committed fiscal responsibility crimes (in August 2016). Besides, in Brazil, the financial market is highly responsive to changes in the country risk – Ibovespa's performance is inversely related to country risk behaviour (Montes and Tiberto, 2012). Therefore, periods of increasing sovereign risk leads to downward movements on the stock index and vice-versa. Hence, investigating whether discretionary fiscal policy affects sovereign risk seems to be relevant. Moreover, analyzing this relationship for one of the worlds biggest emerging economies, such as Brazil, is instructive.

The analysis covers the period from March 2004 to December 2016[2], and the estimates are made through different econometric techniques – ordinary least squares (OLS), one-step generalized method of moments (GMM) and two-step generalized method of moments (GMM-2). The results suggest the adoption of discretionary fiscal policies affects the sovereign credit risk. Therefore, the study contributes to the literature that addresses the

[1] For more details about the determinants of discretionary fiscal policy, see, for instance, Arsic et al. (2017).
[2] The period is defined based on the availability of the data.

effects of discretionary fiscal policy on the economy, since the findings bring new perspectives on the effects of fiscal policy on financial markets.

Since we are interested in the effects of discretionary fiscal policy on sovereign risk, the next section briefly reviews the literature on the determinants of sovereign risk. Section 3 addresses the effects and measures of discretionary fiscal policies. Section 4 presents the data description and some stylized facts related to fiscal policy in Brazil. Section 5 describes the empirical methodology. Section 6 presents the results of the estimates. The robustness analysis is presented in section 7, and section 8 brings the conclusions.

2. Some evidence on the determinants of sovereign risk

In the aftermath of the Subprime crisis, there was a surge of distrust about the use of Credit Ratings as a reliable proxy for the credit risk of a sovereign entity. Consequently, investors search for a new proxy that would be able to adjust more accurately to the movements of the market perception of the credit risk of a sovereign entity (Mora, 2006). The use of Credit Default Swaps (CDS) – one of the most popular derivatives in the world – emerges as such proxy, once it is a contract that provides insurance against the risk of a default by a sovereign entity.[3]

Once CDS spreads respond faster to changes in sovereign risk perception than the credit ratings (Flannery et al., 2010), a large body of research addressing sovereign risks shows interest in the informational role of the CDS market. Some works show that sovereign CDS spreads dominate sovereign bonds yields in the price discovery process (e.g., Aktug et al., 2012; Delatte et al., 2012; Peat et al., 2015). This group of studies emphasizes the relationship between bond spreads, CDS premiums, stock prices or stock market indices and the ratings assigned by major agencies such as S&P, Moody's and Fitch. The studies of Hull et al. (2004) and Ismailescu and Kazemi (2010) report that credit rating announcements are anticipated by the CDS market. Longstaff et al. (2005), Norden and Weber (2004) and Blanco et al. (2005) show that the CDS market takes a lead role in debt market price discovery relative to investment-grade, corporate bonds. Furthermore, Acharya and Johnson (2007) find that information (exclusively negative news) flows from the CDS market to the stock market for entities that have high CDS premiums. In turn, Forte and Pena (2009), based on a proprietary sample of North American and European firms, indicate that stocks lead CDS and bonds more frequently than the other way round. A country's CDS spread usually is taken as an indicator of that country's sovereign credit risk (OECD, 2012; Blommestein et al., 2016).

On the other hand, another body of literature examines the determinants of sovereign risk. On this regard, several studies find evidence that macroeconomic and financial factors, as well as external factors, can be the determinants of both sovereign bond spreads and CDS spreads of a sovereign entity (e.g., Attinasi et al., 2009; Longstaff et al., 2011; Csonto and Ivaschenko, 2013; Peat et al., 2015; Kocsis and Monostori, 2016). The work of Augustin et al. (2014) provides a broad survey regarding CDS in many aspects, including sovereign CDS spread determinants.

More recently, Blommestein et al. (2016) analyze the determinants of sovereign CDS spreads of five Euro Area countries (Greece, Ireland, Italy, Portugal, and Spain) after the collapse of Lehman Brothers. They find that global and/or European Monetary Union-wide factors are among the primary drivers of changes in the sovereign CDS spreads, but the impacts of those factors change depending on the degree of market uncertainty. Kocsis and Monostori (2016) investigate the determinants of sovereign CDS spreads on a sample of

[3] The CDS spread represents the extra premium that investors are asking for investing in a more risky asset. Therefore, it indicates the credit risk of a sovereign entity. There are also CDSs for private entities but they are not in the scope of this paper.

Eastern European data (Bulgaria, Czech Republic, Croatia, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Russia, Slovakia, Turkey and Ukraine) with the sample beginning in December 2008 and ending in December 2014. They use 5-year CDS spreads to proxy sovereign credit risk. The authors stress that CDS spreads have several advantages compared to bond spreads over the risk free rate, the main alternative measure of sovereign risk, and emphasize that several studies showed that CDS spreads tend to lead bond spreads in price discovery (e.g., Alper et al., 2013, Gyntelberg et al., 2013). Regressions of CDS spreads on fundamental factors forecasts suggest that local fundamentals are more important in explaining CDS spreads than are global factors.

In turn, based on a sample of 12 emerging market borrowers (Bulgaria, Russia, Turkey, Brazil, Colombia, Peru, Venezuela, China, Malaysia, the Philippines, Thailand, and South Africa), Fender et al. (2012) study the determinants of daily spreads for emerging market sovereign credit default swaps (CDSs) over the period April 2002–December 2011. Using GARCH models, they find that daily CDS spreads for emerging market sovereigns are more related to global and regional risk premia than to country-specific risk factors. This result is particularly evident during the second period subsample (August 2007–December 2011), where neither macroeconomic variables nor country ratings significantly explain CDS spread changes. Moreover, they also find that measures of US bond, equity, and CDX High Yield returns, as well as emerging market credit returns, are the most dominant drivers of CDS spread changes, and, CDS spreads are more strongly influenced by international spillover effects during periods of market stress than during normal times.

Because the CDS spreads reflect the uncertainties related to government solvency, the central goal of this study is to verify whether these uncertainties are amplified by the use of discretionary fiscal policies.

3. Discretionary fiscal policies: effects and measures

The literature addressing the discretionary fiscal policy is divided in different aspects. There are studies, for example, concerned with the development of measures able to capture the discretionary fiscal policy (e.g., Agnello et al., 2013; Attinasi and Klemm, 2016). There exist studies seeking to understand the determinants (or the causes) of discretionary fiscal policy and, as a consequence, seeking to develop mechanisms to mitigate such discretionary policies (e.g., Buti and Noord, 2004; Agnello and Souza, 2014; Ciro and de Mendonça, 2016). On the other hand, there are studies addressing the effects of discretionary fiscal policy on the economy (e.g., Fatás and Mihov, 2003b; Attinasi and Klemm, 2016).

3.1 Measures of discretionary fiscal policy

According to Attinasi and Klemm (2016), a vital issue in any empirical study on the economic effects of fiscal consolidations is to have a reliable measure of discretionary fiscal policy actions. Most of the existing studies use the change in the cyclically-adjusted primary budget balance as a measure of discretionary changes in the fiscal policy stance. However, this measure suffered critics for being inaccurate as the cyclical adjustment methodology may be affected by severe limitations (Attinasi and Klemm, 2016). For instance, estimates of potential GDP become erratic when extreme declines are added, elasticities are likely to change in profound recessions (e.g. corporate income tax revenues will behave non-linearly and collapse rather than fall in line with GDP or profits); mandatory spending on social insurance and social welfare payments may rise by more than is common when the unemployment rate jumps up, and; the cyclical adjustment methodology fails to account for a

missing link between the budget balances and the economic cycle, namely the role of asset prices on revenues (Attinasi and Klemm, 2016).

On the other hand, Romer and Romer (2010) adopt a more narrative method to identify legislative tax changes in the US. They rely on historical information about the size, timing and motivation of the fiscal policy actions of the government. Similarly, Devries et al. (2011) have constructed an action-based dataset of fiscal consolidations for a sample of 17 OECD countries. The dataset developed by Devries et al. (2011) is based on information from contemporaneous budget documents and budget speeches to identify the size and the timing of discretionary changes in taxes and government spending motivated by the aim to reduce the budget deficit and not in response to prospective macroeconomic conditions. According to Attinasi and Klemm (2016), this approach allows to separate legislated fiscal policy measures into those that are motivated by the aim to improve fiscal sustainability from those taken in response to expected macroeconomic developments. However, Attinasi and Klemm (2016) stress that this measure also has its cons: (i) it is questionable that motivations as described in public documents are true, and sometimes they may also be hard to distinguish; (ii) it is not entirely clear why motivations should matter. Any fiscal policy choice that affects revenue policy or spending will have an impact on aggregate demand, and; (iii) the costing of the measures, if taken from government documents, may be biased, if not checked by an independent third party.

As highlighted by Fatás and Mihov (2003b), there is no consensus in the literature on the appropriate methodology for building a cyclically adjusted measure of fiscal policy. The main reason for this difficulty is the simultaneity in the determination of output and the budget. The government spending is used in the literature once it is less subject to endogeneity problems.

Fatás and Mihov (2003b) focus on government spending as opposed to the budget deficit. Their choice is driven both by theoretical arguments that the political process in most countries does not allow for swift changes in discretionary spending, as well as by empirical estimates showing that spending does not react much to the cycle. Fatás and Mihov (2003b) estimate an equation for the government spending and use the error term of this equation as a quantitative estimate of discretionary policy. This approach is not perfect either, as it depends on the accurate direct quantification of measures (for instance, GDP), but at least the discretionary component captures exactly the discretionary policy that is implemented for reasons other than current macroeconomic conditions.

Thus, following Fatás and Mihov (2003b) and Ciro and de Mendonça (2016), we use the term discretionary fiscal policy to refer to changes in fiscal policy that do not represent reaction to economic conditions. According to Fatás and Mihov (2003b), in theory, it is useful to think about fiscal policy as consisting of three components: (1) automatic stabilizers, (2) discretionary fiscal policy that reacts to the state of the economy, and (3) discretionary policy that is implemented for reasons other than current macroeconomic conditions. In this paper, we focus only on the last component of fiscal policy.

3.2 Effects of discretionary fiscal policy

The theoretical and empirical literature on the effect of government spending on economic activity is vast, and it has provided extensive analysis. However, there is no consensus on the effects of government spending on several aggregates, such as consumption and investment, neither from a theoretical nor from an empirical point of view. Some studies suggest that fiscal stimulus can lead to business cycle desynchronization (Mallick and Mohsin, 2010; Rafiq and Mallick, 2008), and other studies indicate that it affect the relationship between monetary and financial stability (Granville and Mallick, 2009; Sousa,

2014). In addition, from a theoretical perspective, the effect of an increase of government spending on private consumption and investment can be of both signs. Keynesian models suggest that consumption should rise and investment should decline in response to a positive government spending shock (Blanchard, 2003). In a seminal paper about the dynamic effects of shocks in government spending and taxes on US activity in the postwar period, Blanchard and Perotti (2002) find that positive government spending shocks have a positive effect on output, and positive tax shocks have a negative effect. However, in the case of positive spending shocks, there are opposite effects on the different components of the output: while private consumption increases after positive spending shocks and private investment rise, exports and imports fall. The authors also find evidence that increases in both government spending and taxes have a strong negative effect on investment spending.

Real Business Cycle models suggest that a decline in private consumption and an increase in private investment occur in response to a rise in government spending (Aiyagari et al., 1990; Baxter and King, 1993; Christiano and Eichenbaum, 1992). In turn, regarding the effects of fiscal policy at the zero lower bound, several studies indicate that fiscal multipliers are larger in a liquidity trap scenario. Woodford (2011) and Christiano et al. (2011) find that in a liquidity trap, when the nominal interest rate is at zero, the increase in inflation that follows the rise in government spending reduces the real interest rate and stimulates private consumption.

According to Agnello and Sousa (2014), "*while fiscal policy can help to dampen business-cycle fluctuations, many economists generally recognise that tying governments' hands can eliminate undesirable uncertainty and, as a result, there is a case for restricting the discretionary component of fiscal policy. In fact, as the first signs of stabilisation started to materialise, the need to adopt fiscal consolidation measures was soon advocated by many policymakers*". Although there exists a consensual view on the need to withdraw such fiscal stimulus as the economic recovery takes place, there is also substantial uncertainty about the macroeconomic impact of fiscal retrenchments (Giavazzi and Pagano, 1990; Alesina and Ardagna, 2010; Agnello et al., 2013).

Hebous (2011) presents a survey of theoretical and empirical studies related to the effects of fiscal policy shocks on macroeconomic aggregates. The author argues that the literature addressing the effects of fiscal policy on the economy is broad, and it goes through a series of issues whose conclusions are both controversial and far from definitive – such as, Ricardian equivalence, fiscal multipliers, automatic stabilizers, fiscal policy sustainability and discretionary fiscal policy effects. In addition, Attinasi and Klemm (2016) present a detailed and extensive review of the literature that addresses the effects of fiscal shocks on the economy and fiscal multipliers.

Fatás and Mihov (2003b) analyze the effects of discretionary fiscal policies on output volatility and economic growth for 91 countries. They find evidence that governments that use fiscal policy aggressively through discretionary fiscal policies induce the economy to instability, increasing output volatility and reducing economic growth. According to Fatás and Mihov (2003b), the evidence supports arguments for constraining discretion by imposing institutional restrictions on governments as a way to reduce macroeconomic instability and thus to reduce output volatility and increase economic growth.

Using a sample of 20 OECD countries, Badinger (2009) analyzes whether discretionary fiscal policy induces macroeconomic instability in terms of higher output and inflation volatility. Based on cross-section and panel data estimates, the findings suggest discretionary fiscal policy has a significant and sizeable effect on the volatility of GDP (per capita). Besides, the estimates reveal that there is no direct effect of discretionary fiscal policy on inflation volatility. Nevertheless, since output volatility is an important determinant of inflation volatility, discretionary fiscal policy indirectly affects inflation volatility. Comparing

the volatility of discretionary fiscal policy in OECD countries before and after the introduction of fiscal rules, Badinger (2009) finds that the use of discretionary fiscal policy was reduced in most countries.

Beetsma and Giuliodori (2010) review the theoretical and empirical literatures on the consequences of discretionary fiscal policy changes, and then they provide their estimates for the European Union. Using panel VARs the authors present evidence on the consequences of a discretionary increase in government purchases. They found a positive effect on output, the real exchange rate appreciates and the public budget deteriorates.

Bank (2011) investigates the effects of discretionary fiscal policy by presenting new empirical evidence for Germany within a structural vector autoregression (SVAR) framework. The author does not find convincing evidence on the effectiveness of the discretionary fiscal policy. The findings for their base model indicate that cutting taxes does not tend to stabilize the business cycle. They also show that increasing government expenditure has an ambiguous effect on GDP. However, by controlling for the influence of inflation, higher government expenditure neither tend to stabilize economic activity. The study questions whether policymakers should adopt active fiscal policies. In particular, the author points out that the government must be careful when adopting a discretionary fiscal policy, since this policy leads to a larger public debt in the medium and long term, thus restricting government actions in the future when necessary.

Attinasi and Klemm (2016) analyze the impact of discretionary fiscal policy on economic growth for a sample of 18 European Union countries over the period 1998–2011. Based on panel data estimates, the authors find evidence that fiscal consolidation, in general, has a negative short-run impact on growth. However, some specific budget categories are not found to be statistically significant. The authors also find that expenditure-based measures have a slightly lower detrimental effect on growth compared to revenue measures, although the difference is not statistically significant. Among expenditure cuts, they find evidence that reductions in government investment and consumption reduce growth. Among revenues, the evidence suggests indirect tax increases have a substantial adverse impact.

As far as we know, there are no studies addressing the effect of discretionary fiscal policy on sovereign risks in emerging economies. Thus, our paper is the first to fill this gap.

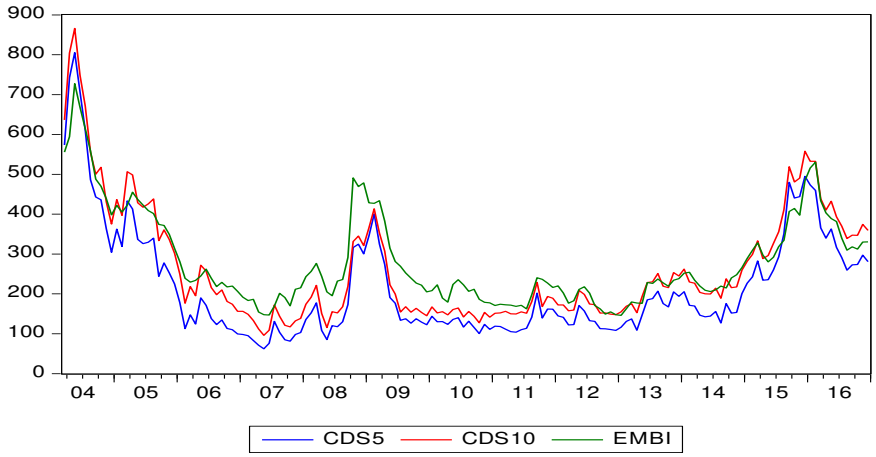
4. Data description and stylized facts

The database used in the study covers the period from March 2004 to December 2016 (154 observations). To investigate the effect of discretionary fiscal policy on sovereign risk, we use three proxies for sovereign risk: five-year Credit Default Swaps (CDS5), ten-year Credit Default Swaps (CDS10) and Emerging Markets Bonds Index Global (EMBI). CDS is a derivative which the core objective is the transfer of risk between two counterparts. For instance, one who buys Brazilian five-year CDS wants to hedge against a Brazilian default during the next five years, paying a premium (CDS spread) for the seller in semi-annual instalments. In the case of a default event, as determined by the International Swaps and Derivatives Association (ISDA), the buyer of the CDS receives the face amount he hedged minus the recoverable amount. As we can see, CDS spreads are closely related to the credit risk perception that agents have towards some counterpart and CDS spreads tend to respond appropriately to changes in this perception. In this paper we use five and ten year Brazilian CDS spreads to see how different can be the impact of discretionary fiscal policy when we look at different time horizons, i.e., the idea is to check whether the use of discretionary fiscal policy affects sovereign default probabilities related to different debt maturities (captured by CDS5 and CDS10). Although some works have utilized the EMBI as a proxy for sovereign risk, it is regarded by some authors as a worse sovereign credit risk measure when compared

to CDS, as EMBI may be responding to portfolio movements, liquidity conditions and other factors not directly associated with credit risk, as indicated by Wang et al. (2013). Nevertheless, in the present study, we also use the EMBI to check robustness. Figure 1 below shows the graphs with the behavior of the dependent variables over time.

Figure 1

Behaviors of CDS5, CDS10 and EMBI over time (2004M03 – 2016M12)



Since the central explanatory variable of the study is the discretionary fiscal policy, and due to the fact that this is not an observable variable, we must calculate it. Thus, in order to obtain the indicator of discretionary fiscal policy, we follow Fatás and Mihov (2003b), Afonso et al. (2010) and Ciro and de Mendonça (2016). As a proxy for the discretionary fiscal policy, we build an indicator of fiscal impulse (FI) – the next section presents the methodology to obtain the indicator.

In turn, the control variables used to explain the sovereign risk are:

- Political and Institutional Risk (PRSK): this variable is represented by an index which captures political and institutional instabilities that may affect sovereign risk. The index is calculated by The Economist Intelligence Unit. It comprises institutional well-functioning, financial system reliability, the prospect of war, civil unrest and other aspects. The index varies from 0 to 100, and the higher is the index the more institutionally unstable is the country.
- Economic Activity Index (IBC-Br): previous studies have pointed out that CDS spreads are sensitive to macroeconomic fundamentals and to global factors. Kocsis and Monostori (2016) found evidence that country-specific fundamentals may have higher influence than global factors on credit risk. One of these fundamentals is the level of economic activity. In this sense, we use the index of economic activity provided the Central Bank of Brazil (CBB).
- Bid Ask Spread (BID_ASK): when dealing with globally negotiated financial assets or derivatives, it is a good practice to take into account liquidity effects. Therefore, to control for changes in market-specific liquidity conditions, we include the difference between CDS ask prices and CDS bid prices. The higher this value is, the more iliquid is the market, which leads to rising CDS spreads.
- International Reserves (IRES): changes in international reserves affect the government's ability to honor its commitments to international creditors. Several authors use international reserves in their estimates related to both country and sovereign risks (e.g., Montes and Tiberto, 2012). The series of international reserves is obtained from the CBB.
- Gross Domestic Public Debt (PDEBT): According to Montes and Tiberto (2012), this variable is often used as an indicator of fiscal performance. The higher the debt stock, the greater the difficulty of the public sector in meeting its debt service, thus increasing the risk of

insolvency or default. Arellano and Kocherlakota (2014) argue that domestic default often causes sovereign defaults. In this sense, we include the Gross Domestic Public Debt measured as % of GDP.

- Real Interest Rate (RIR): national government interest rates are widely accepted as a measure of overall country's risk premium. In this paper, we consider the difference between the monetary policy interest rate and inflation measured by the Consumer Price Index to take into account the effects that inflation may have on the determination of interest rates. It is important to point out that as per Brazilian law, only the central government is authorized to issue sovereign debt, as a consequence, this interest rate reflects the credit risk premium of the same agent that issued the sovereign debt; where higher premiums should lead to changes in the sovereign risk perception due to uncertainties regarding the government payment capacity.
- International Interest Rate (LIBOR): international interest rates are an important factor in the determination of risk premium. We expect to see capital flying from emerging, riskier, economies to safer markets when international interest rates rise. It is certainly followed by price adjustments in sovereign bonds which in turn reflects on sovereign credit risk premium. The importance of global fundamentals in determining sovereign bond spreads is highlighted, among others, by Longstaff et al. (2011). To the purpose of this work, we use three month London Interbank Offered Rate (LIBOR) as international interest rate taking into account that it is the rate that works as floating component to plenty of sovereign bond issuances.
- Global Liquidity Conditions (TED): Treasury-Eurodollar spread is calculated as the difference between three months LIBOR and U.S T-Bill rates. It is understood as a short-term measure of tightening lending conditions in the interbank market and so a proxy for global liquidity. Hilscher and Nosbusch (2010) used TED as one of the determinants of sovereign bond spreads.
- Global Risk Aversion (VIX): the Chicago Board Options Exchange Volatility Index (VIX) is a well-known measure of future prospects regarding global risk. As it is the implied volatility on actually negotiated options, it conveys the general mood of the market concerning appetite for riskier assets, as high yield bonds for instance. VIX should have a positive relationship with sovereign credit risk spreads and so with CDS. According to Kodres at al. (2008), emerging markets bond yield spreads are strongly dependent on VIX.

Figure 2 below presents the behavior of all variables utilized in the study, and table 1 shows the correlations between the variables. One can see that the extreme events that impacted CDS and EMBI are also, to some extent, visible on the behavior of the variable of interest as well as perceived in the control variables. The financial crisis of 2008 leads to a sharp and fast spike in the Brazilian sovereign risk, as we can depict from Figure 1 above. As we might expect, the activity index IBC-Br declined considerably, and the public debt (PDEBT) rose, as it is measured as a percentage of the GDP and is directly affected by the increase in the domestic interest rate (RIR) in the periods immediately after the crisis onset. It is also interesting to note that, following the same event, there is a sharp increase in the bid-ask spread for the ten year CDS, however, the same is not true for the five year CDS. It is a direct result of the lower liquidity we see in the ten year CDS market. TED and VIX respond as expected to the crisis starting point, with a sharp rise followed by a smooth decline.

A feature that deserves attention is the close relationship between the fiscal deterioration Brazil is experiencing since the year 2013 and the CDS hiking movement we see from the same year onwards. This movement can be observed by the correlation between public debt and CDS (table 1), irrespective of the maturity considered if five or ten years, and EMBI. It is also interesting to note that the Fiscal Impulse (FI) reaches its higher levels precisely during the period of fiscal deterioration.

Analyzing the correlations, one can see that global factors (LIBOR, TED and VIX) present low correlations with both CDS5 and CDS10. In turn, the higher correlations are

associated to liquidity conditions (BID_ASK5 and BID_ASK10). Besides, internal economic factors (such as public debt (PDEBT), real interest rate (RIR), international reserves (IRES) and the fiscal impulse variable (FI)) present the expected signals (according to economic theory) and the correlations are not negligible.

Figure 2

Behaviors of the variables utilized in the study (2004M03 – 2016M12)

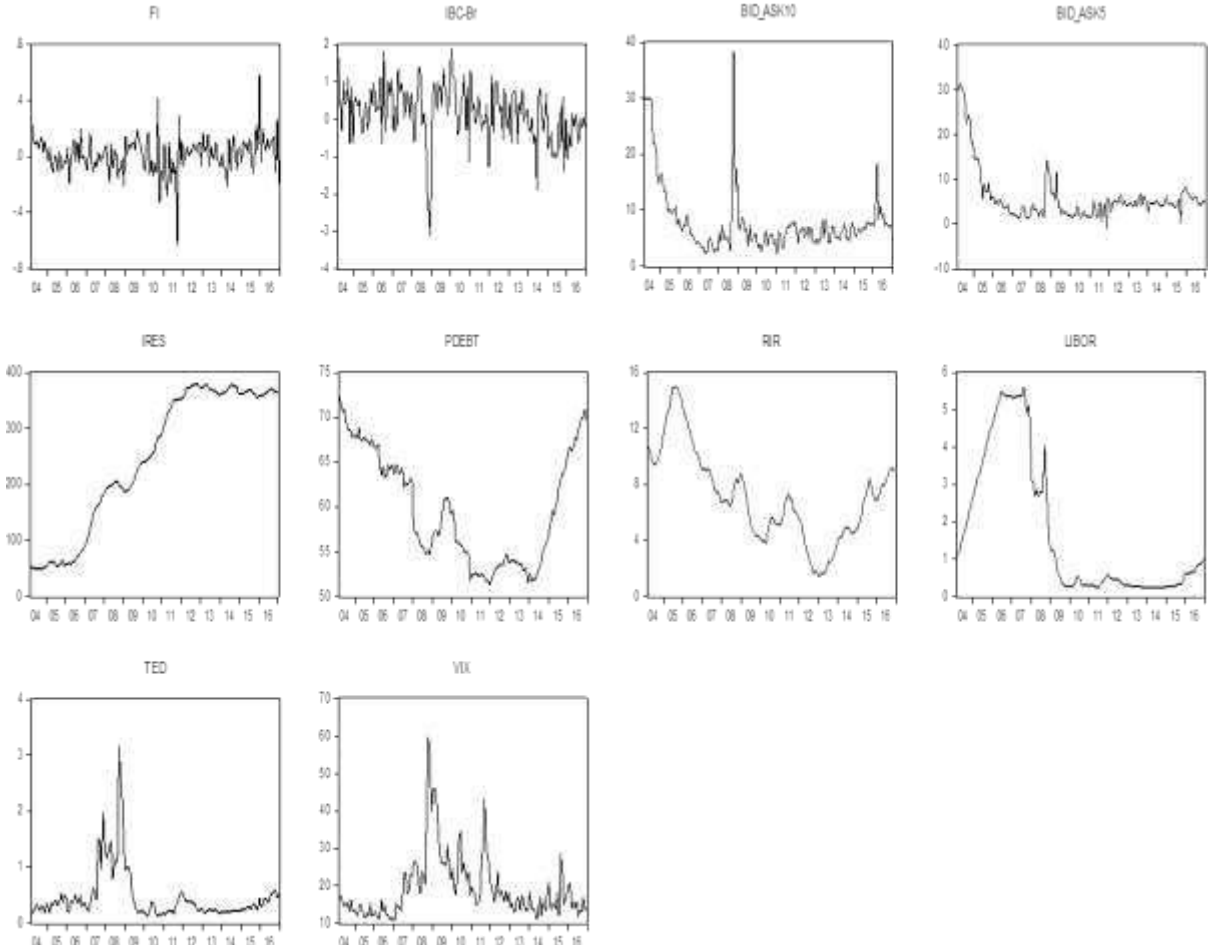


Table 1

Correlations

Variables	CDS5	CDS10	EMBI
CDS5	1.00	0.99	0.95
CDS10	0.99	1.00	0.95
EMBI	0.95	0.95	1.00
FI	0.20	0.20	0.21
PRSK	0.40	0.41	0.45
PDEBT	0.59	0.64	0.62
IBC_BR	-0.15	-0.15	-0.19
BID_ASK5	0.83	0.82	-
BID_ASK10	0.80	0.79	-
IRES	-0.27	-0.30	-0.37
RIR	0.42	0.49	0.52
LIBOR	-0.10	-0.04	0.01
TED	-0.04	-0.07	0.11
VIX	0.01	-0.08	0.11

4.1 Fiscal policy in Brazil: some stylized facts

The central aspects of macroeconomic policy during the first years of the Lula administration were a continuation of the previous administration of Fernando Henrique

Cardoso. The so-called 'macroeconomic tripod', whose pillars are a primary surplus target, an inflation target and a flexible exchange rate (dirty float), was kept intact during Lula's administration. Regarding fiscal policy, the first three years of his administration were similar to Fernando Henrique Cardoso's, not only in their basic goal of fiscal consolidation but also in the two main instruments used to achieve fiscal balance: an increased tax burden and cuts in public investments.

Until 2005, the Lula administration is marked by a phase of fiscal consolidation. During the consolidation period, fiscal targets were progressively increased. This fiscal adjustment was based on an increase in the tax burden of 6.6 percentage points of GDP and a reduction of 1.3 percentage points in public capital investments as a percentage of GDP, which allowed expenditures on social benefits to increase, despite a consolidation effort.

It was only during late 2005 that the Lula administration started to promote incremental changes in the fiscal regime, aiming at recouping public investments and marking a shift from a period of fiscal consolidation to a phase of fiscal expansion (2005–2014), which was underway when the global financial crisis occurred.

It is possible to describe Brazil's fiscal policy between 2005 and 2014 as an expansionary period, during which budgetary targets and primary results were gradually reduced, and the tax burden was kept relatively stable. However, during the first period of fiscal expansion (2005–2010), tax revenue kept up with the accelerated pace of GDP growth, not only absorbing the pressures of social spending but also expanding the degrees of freedom in fiscal policy.

When the global financial crisis hit the country, the government opted to maintain an expansionary fiscal policy through public investments, redistributive transfers and an emergency package of tax and credit stimuli. The fiscal expansion of 2005–2010 favored the expenditure categories associated with higher multipliers, which helps explain both Brazil's economic performance during the period and the quick recovery in 2010 after the outbreak of the global financial crisis.

Regarding the results for the behavior of the public debt and the primary surplus, we can observe (Figure 3 below) that the two mandates of President Lula are marked by the reduction of public debt. In March 2004, the gross public debt as a percentage of GDP was 72.2, while in December 2010, it was 51.8. However, in relation to the primary result, in Lula's first term, the primary surplus as a percentage of GDP closed at 3.3, but in Lula's second term, we observed the deterioration of the primary result, closing with a primary surplus as a percentage of GDP of 2.6. Due to the global financial crisis, the primary surplus as a proportion of GDP reached 0.9 in October 2009, the worst result of Lula's government.

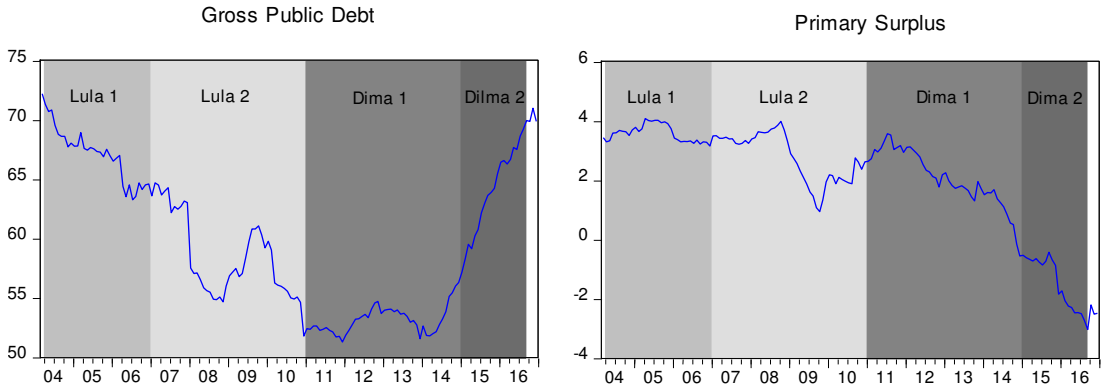
In turn, during most of President Dilma Rousseff first term (which starts in January 2011), she kept the expansionary orientation of fiscal policy; however, not through public investment, but mainly through tax cuts and credit subsidies. In 2012 the government decided to reinforce the anti-cyclical policy through the expansion of tax cuts and subsidised credit, in addition to a reduction in electricity tariffs and a plan for concessions in infrastructure. The increase in subsidies was driven by programmes that had high electoral visibility (for instance, popular housing and student financing for private universities), which, even though relevant in their own way, increased exponentially and totally out of pace with the tax revenues. However, the fiscal cost of tax and credit incentives was high. Tax cuts went from R$ 43 billion in 2010 to R$ 122 billion in 2014, and subsidies went from R$ 31.3 billion to R$ 73.5 billion.

The anti-cyclical policy was not able to keep the Brazilian economy from suffering a downturn during 2011–2014. Tax revenue slowed down in tandem with the economic activity and as a result of rising tax cuts. Under this scenario, with lower revenue growth, while a significant portion of expenditures maintained their previous growth rates or were even

strongly accelerated, fiscal policy has faced a dilemma. The fiscal space was severely reduced, while the government was reluctant to change its fiscal target. In order to solve this dilemma, the solution found by the government was based on two aspects: 1) stronger budget 'locks' (budget contingency) on a small portion of discretionary expenses, liable to be compressed in the short term; and 2) the use of nonrecurring measures to artificially inflate fiscal results (such as one-off revenues, creative accounting, fiscal gimmicks such as the rollover of payments to public banks - known as 'fiscal pedaling' - and etc.) and increase the deduction margin of the target. In 2012–2014, the fiscal target was formally achieved, through successive alterations in legislation, and a mixture of the two aspects described above.

A change in the composition of fiscal policy was consolidated with the shift from a first, expansionary period, whose fiscal space was channeled mainly towards public investment (2006–2010), to a second period when subsidies and tax cuts played a central role in the fiscal expansion and public investment was practically stagnant (2011–2014). These findings are important, because they provide us with some perspective that the government had conducted the fiscal policy in a loose way during 2011–2014 with its expansionary policy through public expenditure. The reflection of this irresponsibility can be seen in the results for the public debt and the primary surplus in the period comprising the administration of President Dilma Rousseff (see Figure 3 below). It is possible to observe the abrupt rise of public debt and the deterioration of the primary surplus that occurred during the administration of President Dima.

Figure 3
Gross public debt and primary surplus in Brazil



5. Empirical methodology

The indicator of fiscal impulse (FI) captures the discretionary change in fiscal policy and it is inspired in the methodology of Ciro and de Mendonça (2016). The indicator is built in two stages and, for the purpose of this work and due to data availability, we considered the period going from March 2004 to December 2016.

First, we estimate the elasticities of government spending in relation to the main macroeconomic variables that determine public spending. Thus, for analyzing fiscal policy in Brazil and taking into account the components of responsiveness, persistence, and discretion in government spending, we estimate equation (1). Based on equation (1), it is possible to remove the influence of the economic environment over the indicator, leaving only the term associated to the discretionary posture of the government (Ciro and de Mendonça, 2016). Thus, the equation (1) is defined as:

$$G_t = \alpha_0 + \alpha_1 G_{t-1} + \alpha_2 r_{t-1} + \alpha_3 Y_{t-1} + \alpha_4 INF_{t-1} + \varepsilon_t \qquad (1)$$

where G is the log of the government spending, G_{t-1} represents the persistence of the fiscal policy, r is the real short-term interest rate, Y is the log of real GDP seasonally adjusted, INF is the inflation rate, and ε_t is the random error term.[4] The variables Y, INF and r capture the responsiveness of fiscal policy to the state of the economy.[5] The discretionary fiscal policy is captured through the residual denoted by ε, and thus, it does not represent a reaction to economic conditions. Since, we are using a database on a monthly basis, and once fiscal policy does not respond instantaneously to the variables related to the business cycle, we follow Ciro and de Mendonça (2016) and the variables associated with the business cycle were lagged one period.

After estimation of equation (1), the residual is used to observe the changes in the discretionary fiscal policy, i.e., the fiscal impulse (FI). Hence, based on Ciro and de Mendonça (2016), equation (2) gives the indicator of fiscal impulse (FI)[6]:

$$FI_t = \varepsilon_t - \varepsilon_{t-12} \qquad (2)$$

In order to calculate the discretionary fiscal policy component, equation (1) is estimated through different methods: ordinary least squares (OLS), one-step generalized method of moments (GMM) and two-step generalized method of moments (GMM-2). Both OLS and one-step GMM estimates use the Newey-West (HAC) matrix (Newey and West, 1987) to deal with heteroskedasticity and autocorrelation problems that we identified. The two-step GMM (GMM-2S) estimation uses Windmeijer (2005) correction to address small-sample downward biases on standard errors. GMM is used to deal with endogeneity and identification issues (Wooldridge, 2001; Hall, 2005). Besides, GMM presents robust estimators even in the presence of serial autocorrelation and heteroskedasticity of unknown form, or non-linearity, which is typical in macroeconomic time series models (Hansen, 1982).[7] We follow the methodology of Johnston (1984) to select the instruments on GMM estimation, i.e., the instruments were dated to the period t-1 or earlier to assure the exogeneity. Cragg (1983) points out that overidentification has an essential role in the selection of instrumental variables to improve the efficiency of the estimators. Hence, a standard J-test was performed

[4] The series of government spending (G) was obtained from the Central Bank of Brazil (CBB) - series number 7547 (Primary Result of the Central Government - Total Expenditure). The real interest rate is obtained through the difference between the nominal interest rate (Selic) obtained from the CBB (series number 4189) and the inflation rate obtained from the Consumer Price Index (IPCA) (series number 13522). Real GDP was obtained from the series of GDP accumulated in the last 12 months - current prices (R$ million) – made available by the CBB (series number 4382), deflated by the Consumer Price Index (IPCA) (series number 13522) and seasonally adjusted.

[5] Both economic growth (captured through the log of real GDP seasonally adjusted) and inflation determine the adoption of stabilization policies, and the real interest rate affects the decision to invest in public infrastructure. In short, these variables define the procyclicality or countercyclicality of the fiscal policy. Different from Ciro and de Mendonça (2016), we use the inflation rate instead of oil prices. Ciro and Mendonça (2016) study the Colombian case, where oil prices affect the state of the economy and contribute significantly to total revenue. In the case of the Colombian economy, exportation depends on large measure of the primary sector in which oil represents 50% of the total. A major source of national government revenue of Colombia is the state-owned oil company (Ecopetrol accounts for approximately 30% of income tax), and the government budget is set based on the oil price in the futures market. In our paper, since we study the Brazilian case, and Brazil presented several episodes of high inflation rates, we include inflation to ensure that our results are not driven by inflation episodes. The inclusion of the inflation rate in this sort of equation was also adopted by Fatás and Mihov (2003b) and Afonso et al. (2010).

[6] Such as Ciro and de Mendonça (2016) did, we use a lag of 12 months because it is long enough to measure important changes in the fiscal position.

[7] As Wooldridge (2001, p.95) points out: "*to obtain a more efficient estimator than two-stage least squares (or ordinary least squares), one must have overriding restrictions*".

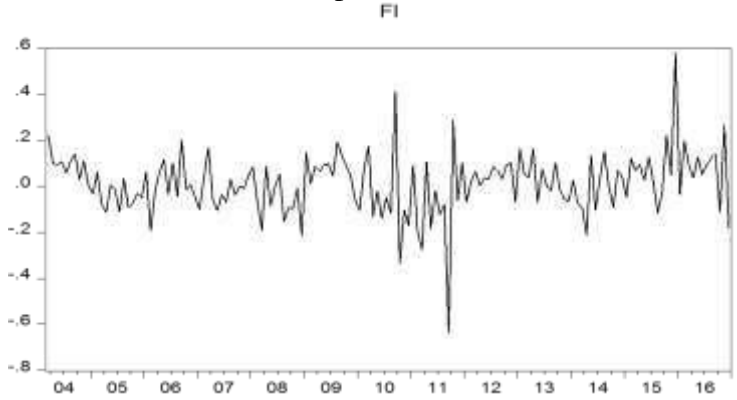
with the objective of testing this property for the validity of the overidentifying restrictions, i.e., the J-statistic indicates whether the orthogonality condition is satisfied. Besides, to eliminate any possibility of distortion in the results, the ratio between the number of instruments and the number of observations is reported. Moreover, we perform the Durbin–Wu–Hausman test to analyze the endogeneity of the equation regressors.

As usual, the use of time series data in estimations entails checking whether the series have a unit root (non-stationary data series) to avoid the possibility of spurious regression. In this sense, before proceeding with the estimates, we made the following unit root tests: Augmented Dickey-Fuller (ADF), Phillips-Perron (PP) and Kwiatkowski-Phillips-Schmidt-Shin (KPSS). The results denote that all series are I(1) (see Table A.1 in the Appendix). However, if the residuals of the regression are stationary, it is possible to use the series in level in the model without the risk of incurring in spurious regression problem (Greene, 1993; Granger, 2004). Thus, we perform ADF, PP and KPSS tests in the residuals of equation (1). The results suggest the residuals are stationary (see Table A.2 in the Appendix). In this sense, we use all series in level in the regressions of equation (1).

Estimates for equation (1) are in the Appendix (Table A.3). The results of the estimates indicate that the parameter of fiscal persistence is positive and significant. Another finding of this estimation is the positive and significant parameters estimated for economic growth, real interest rate and the inflation rate, indicating that fiscal policy did not act countercyclically in the period.

To calculate the fiscal impulse (FI), we follow Agnello et al. (2013) and Ciro and de Mendonça (2016), and we use the residual series obtained from the estimation of equation (1) through OLS.[8] Then, the residual series is used in equation (2) to obtain the fiscal impulse (FI). Figure 4 presents the fiscal impulse in Brazil. Once the mean of the fiscal impulse in Brazil corresponds to 0.012, it means that, for the period analyzed, the resulting fiscal impulse was on average more expansionary than contractionary. In addition, the observed peaks around 2010, 2011 and 2015 reinforce the idea that during most of President Dilma Rousseff mandate, she kept the expansionary orientation of fiscal policy.

Figure 4
Fiscal Impulse in Brazil



In order to check whether discretionary fiscal policy (measured by the indicator of fiscal impulse – FI) affects the sovereign risk (measured by the CDS), we present equation 3 below.

[8] We decided to use the residuals of OLS to calculate the fiscal impulse since this series is longer than the other series obtained through GMM. Moreover, the correlations between the series are very high. We also run estimates using the Fiscal Impulse series obtained through residuals of GMM and GMM-2S, and the results remain the same (the results are available upon request).

$$CDS_{i,t} = \alpha + \beta X + \gamma FI_t + \xi_t \quad (3)$$

Where the subscript i represents the five-year CDS (CDS_5) or the ten-year CDS (CDS_{10}). In turn, α is the intercept, β is a vector of parameters, X is a vector of control variables that we describe below, and ξ is the error term. The control variables utilized in the estimates were chosen based on previous studies addressing the determinants of sovereign risks.

The set of control variables X is (PRSK, IBC_Br, BID_ASK, IRES, PDEBT, RIR, LIBOR, TED and VIX). In the regressions the variables IRES, PDEBT, RIR and LIBOR are used in the first difference once the unit root tests indicate that these series are non-stationary (see Table A.1 in the Appendix). The lags of the variables were determined empirically, following the general-to-specific method, observing the statistical significance of the coefficients and the principle of parsimony (Hendry, 2001). We performed estimations of equation 3 for both CDS5 and CDS10 as dependent variables using OLS, GMM and two-step GMM. Both OLS and GMM estimates use the Newey-West (HAC) matrix, while GMM-2S uses Windmeijer matrix. Once again, GMM is used to deal with endogeneity and identification problems.

6. Results

Table 2 below presents the results of the estimates related to equation 3. It is important to note that all GMM estimations are valid (J statistics and D-W-H test).

Regarding the effects of the discretionary fiscal policy, the results denote that the FI has a positive and significant effect on both CDS5 and CDS10. Thus, the findings suggest discretionary public spending may increase the perceived sovereign risk. The magnitudes of the estimated coefficients obtained for FI are larger in the estimates for the CDS10 (except through GMM-2S). However, when we perform the Wald test (see Table A.4 in the Appendix), the results indicate that we cannot reject the hypothesis that the coefficients are equal. Thus, although the point estimates obtained for the FI variable are different, in statistical terms, we cannot say that the effects are different.

The institutional and political risk (PRSK) is also a factor influencing sovereign risk. All estimated coefficients are positive and present statistical significance. With respect to the effects of economic activity (IBC_Br), the findings reveal negative and significant coefficients in all estimates. In turn, the estimates for the effect of the BID_ASK reveal that when liquidity conditions deteriorate (i.e., BID_ASK increases), the CDS also increases. Analyzing the results obtained to D(IRES) – variations on the level of international reserves as % of GDP – all coefficients present negative signals, and most coefficients are significant (except the coefficients obtained through GMM and GMM-2S for the CDS10). The results for the effect of public debt variations suggest that D(PDEBT) impacts the CDS5, but considering CDS10, it seems to lose its explanatory power. In turn, the findings for the effect of real interest rate variations, D(RIR), reveal positive and significant coefficients.

Another important finding is that, in the case of Brazil, global factors have no statistical effect on CDS spreads, considering our sample from 2004M3 to 2016M12. Therefore, the improvement on the risk perception about Brazil, culminating on the elevation of the sovereign bonds of the country to the condition of Investment Grade, in 2008, and recently the deterioration of the risk attributed to Brazilian bonds and the consequent loss of the Investment Grade are more closely related to internal factors than to global crisis and international markets movements. Coefficients for LIBOR, VIX and TED have shown no statistical significance in the majority of the estimations, except in the case of OLS and GMM estimations for ten year CDS, where LIBOR has shown positive and significant effect.

We also tested the specifications with the lagged dependent variables as regressors (i.e., $CDS5_{-1}$ and $CDS10_{-1}$). To deal with endogeneity problems, we use the Generalized Method of Moments to estimate these specifications. We report the results in the Appendix (Table A.5). As one can see, the results for the effect of discretionary fiscal policy (FI) on CDS5 and CDS10 remain the same.

Table 2

Estimates for the effect of discretionary fiscal policy (FI) on CDS5 and CDS10

	CDS 5			CDS 10		
Estimator	OLS	GMM	GMM-2S	OLS	GMM	GMM-2S
Variables						
FI	90.155**	113.929*	152.594*	114.006**	139.888**	117.482*
	(2.454)	(1.802)	(1.720)	(2.556)	(1.995)	(1.697)
PRSK	6.767***	8.732***	8.707***	8.050***	10.133***	9.255***
	(2.705)	(4.612)	(3.337)	(2.731)	(5.683)	(3.297)
IBC_Br_{-5}	-24.958***	-51.853***	-52.450***	-32.682***	-74.276***	-61.443***
	(-2.755)	(-6.225)	(-2.767)	(-3.817)	(-5.729)	(-3.869)
BID_ASK	13.532***	12.186***	13.026***	14.223***	16.264***	17.220***
	(9.530)	(7.351)	(4.386)	(4.995)	(7.682)	(5.506)
D(IRES)	-5.272***	-9.200***	-7.143***	-5.327***	-4.616	-5.262
	(-3.013)	(-4.918)	(-2.816215)	(-3.087)	(-1.476)	(-1.552)
$D(PDEBT)_{-3}$	16.149***	19.510***	11.683	11.633**	-9.013	1.615
	(3.364)	(3.073)	(1.164)	(2.448)	(-0.550)	(0.099)
$D(RIR)_{-1}$	53.799***	71.171***	42.965*	46.710***	54.923**	51.081*
	(3.354)	(4.010)	(1.700)	(2.984)	(2.514)	(1.817)
D(LIBOR)	12.360	-11.457	-6.249	55.315*	145.365**	144.549
	(0.616)	(-0.408)	(-0.132)	(1.863)	(2.192)	(1.615)
TED	-25.468	-7.270	-0.510	-26.468	29.360	46.305
	(-1.645)	(-0.463)	(-0.022)	(-1.334)	(1.259)	(1.570)
VIX	1.795**	0.909	0.854	-0.876	-1.353	-1.288
	(2.478)	(1.127)	(0.692)	(-0.672)	(-1.531)	(-1.261)
Adj.R2	0.652	0.468	0.513	0.631	0.378	0.411
F-Stat	27.982			25.724		
Prob F-Stat	0.000			0.000		
LM Test	56.576			38.901		
Prob LM	0.000			0.000		
ARCH Test	78.973			30.218		
Prob ARCH	0.000			0.000		
J-Stat		11.994	18.000		11.749	13.841
Prob J-Stat		0.679	0.587		0.761	0.678
D-W-H Test		8.237	5.722		9.419	9.637
Prob D-W-H		0.605	0.838		0.492	0.472
Nº Inst./Nº Obs		0.195	0.230		0.203	0.207

Note: Marginal Significance Levels: *** denotes 0.01, ** denotes 0.05 and *10%. Standard errors are in parentheses. "Prob F-Stat" reports the respective p-value of the F-test. "Prob J-Stat" reports the respective p-value of the J-test. "Prob LM" reports the respective p-value of the LM-test to detect serial autocorrelation. "Prob ARCH" reports the respective p-value of the ARCH-test to detect heteroskedasticity. D-W-H test is the Durbin-Wu-Hausman test (difference in J-stats) and null hypothesis is that the regressors are exogenous. "Prob D-W-H" reports the respective p-value of the D-W-H-test. Intercepts are omitted for convenience.

Table 3 summarizes the results in terms of shocks of one S.D. (standard deviation) in the main explanatory variable (FI) and the impacts on both CDS5 and CDS10. One can observe that a one S.D. positive shock in the FI variable causes, on average, an increase of 15.72 % and 16.33 % on the CDS5 and CDS10, respectively.

Table 3

Response of CDS5 and CDS10 to one S.D. positive shock in the FI variable

Dependent	Variable	Stand. Dev. (FI)	Coefficient (OLS)	Effect (b.p.)	Effect (%)	Coefficient (GMM)	Effect (b.p.)	Effect (%)	Coefficient (GMM-2S)	Effect (b.p.)	Effect (%)	Average Effect (%)
CDS5	**FI**	0.132	90.155	1192.03	11.92	113.929	1506.37	15.06	152.594	2017.60	20.17	**15.72**
CDS10	**FI**	0.132	114.006	1504.88	15.04	139.888	1846.52	18.46	117.482	1550.76	15.50	**16.33**

7. Robustness analysis

To provide robust results, we estimate equation (4) below, where the dependent variable is the EMBI.

$$EMBI_t = \delta + \varphi Z + \theta FI_t + \zeta_t \qquad (4)$$

Where, δ is the intercept, φ is a vector of parameters, Z is a vctor of control variables that we describe below, and ζ is the error term. The control variables utilized in the estimates were chosen based on previous studies addressing the determinants of country risk. Thus, the set of control variables Z is (PRSK, IBC_BR, IRES, PDEBT, RIR, LIBOR, TED and VIX). Once again, the variables IRES, PDEBT, RIR and LIBOR are used in the first difference since they are non-stationary. In addition, the lags of the variables were determined empirically, following the general-to-specific method, observing the statistical significance of the coefficients and the principle of parsimony. We performed estimations of equation 4 using OLS, GMM and GMM-2S. Table 4 below presents the results of our estimates related to equation 4.

Table 4

Estimates for the effect of discretionary fiscal policy (FI) on EMBI

	EMBI		
Estimator	OLS	GMM	GMM-2S
Variables			
FI	153.182**	179.070***	193.216**
	(2.548)	(2.642)	(2.024)
PRSK	14.030**	13.670***	14.451***
	(2.383)	(5.375)	(4.057)
IBC_Br $_{-3}$	-15.329	-23.656**	-28.010*
	(-1.520)	(-2.560)	(-1.891)
D(IRES)	-8.307***	-9.574***	-8.823***
	(-3.599)	(-4.728)	(-3.170)
D(PDEBT)$_{-1}$	1.417	20.744**	19.855
	(0.162)	(2.092)	(1.362)
D(RIR)$_{-1}$	29.988	63.541***	52.014
	(1.080)	(2.935)	(1.473)
D(LIBOR)	27.231	95.740*	57.903
	(0.599)	(1.806)	(0.647)
TED	11.534	54.099*	45.849
	(0.508)	(1.936)	(0.931)
VIX	1.439	1.613	1.877
	(1.306)	(1.626)	(1.484)
Adj.R2	0.324	0.237	0.274
F-Stat	8.785		
Prob F-Stat	0.000		
LM Test	82.380		
Prob LM	0.000		
ARCH Test	96.347		
Prob ARCH	0.000		
J-Stat		14.092	14.738
Prob J-Stat		0.660	0.739
D-W-H Test		4.209	4.334
Prob D-W-H		0.897	0.888
Nº Inst./Nº Obs		0.200	0.215

Note: Marginal Significance Levels: *** denotes 0.01, ** denotes 0.05 and *10%. Standard errors are in parentheses. "Prob F-Stat" reports the respective p-value of the F-test. "Prob J-Stat" reports the respective p-value of the J-test. "Prob LM" reports the respective p-value of the LM-test to detect serial autocorrelation. "Prob ARCH" reports the respective p-value of the ARCH-test to detect heteroskedasticity. D-W-H test is the Durbin-Wu-Hausman test (difference in J-stats) and null hypothesis is that the regressors are exogenous. "Prob D-W-H" reports the respective p-value of the D-W-H-test. Intercepts are omitted for convenience.

In general, the findings corroborate the results previously presented for both CDS5 and CDS10. One can observe positive and significant coefficients for the effect of FI on EMBI. Once again, the political and institutional environment (captured by PRSK) presented positive and significant coefficients. Regarding the effects of economic activity (IBC_Br), the estimates reveal negative coefficients and statistical significance is observed only for GMM and GMM-2S estimates. Moreover, the results obtained to D(IRES) reveal negative and significant coefficients. On the other hand, contrary to what we have seen in the case of the CDS spreads, most of the coefficients obtained for the effect of variations in the real interest rate, D(RIR), does not present statistical significance (except the coefficient obtained through GMM). Last but not least, we confirm the low or no influence of global conditions on sovereign risk.

8. Conclusion

Using Brazil as a case study, our paper sought to answer whether discretionary fiscal policy affects sovereign risk. The analysis of this relationship is paramount, considering that changes in the perception of default probability caused by the use of fiscal policies can affect the performance of the financial markets. Our estimates show that the institutional stability is an important feature when it comes to movements in sovereign risk as well as is the control of public debt. Moreover, the accumulation of international reserves contributes to the reduction in sovereign risk, although it is out of the scope of this work the discussion about the cost incurred to construct and maintain these reserves.

Another central factor considered in the determination of sovereign risk, as we pointed out, is the level of economic activity, with its diverse positive effects on the well functioning of the country economic system.

As sovereign risk measures, and therefore as dependent variables in our estimates, we use CDS contracts for five and ten years, as well as the EMBI. Based on the estimates, the results indicate that when the government makes use of the fiscal impulse, an increase in sovereign risk occurs. Additionally, there is evidence that for the period under analysis, the Brazilian sovereign risk was determined by internal factors and not by global conditions. This result is robust for all the risk measures we use (CDS5, CDS10 and EMBI).

References

Acharya, V., Johnson, T. (2007) “Insider trading in credit derivatives.” *Journal of Financial Economics*, 84 (1), 110-141.

Afonso, A., Agnello, L., Furceri, D. (2010) “Fiscal policy responsiveness, persistence and discretion.” *Public Choice*, 145 (3), 503-530.

Agnello, A., Furceri, D., Sousa, R. (2013) “How best to measure discretionary fiscal policy? Assessing its impact on private spending.” *Economic Modelling*, 34 (C), 15–24.

Agnello, L., Souza, R. (2014) “The determinants of the volatility of fiscal policy discretion.” *Fiscal Studies*, 35 (1), 91-115.

Aktug, R. E., Vasconcellos, G., Bae, Y. (2012) “The dynamics of sovereign credit default swap and bond markets: empirical evidence from the 2001 to 2007 period.” *Applied Economics Letters*, 19, 251–259.

Alesina, A., Ardagna, S. (2010) “Large changes in fiscal policy: taxes versus spending.” In: Brown, J.R. (Ed.), *Tax Policy and the Economy* 24, 35–68.

Alesina, A., Perotti, R. (1995) “Fiscal expansions and adjustments in OECD countries.” *Economic Policy*, 10 (21), 205-248.

Alper, C.E., Forni, L., Gerard, M., (2013) "Pricing of sovereign credit risk: evidence from advanced economies during the financial crisis." International Finance, 16 (2), 161–188.
Arellano, C., Kocherlakota, N. R. (2014) "Internal debt crises and sovereign defaults." *Journal of Monetary Economics*, 68, Supplement, S68-S80.
Arsic, M., Nojkovic, A., Randjelovic, S. (2017) "Determinants of discretionary fiscal policy in Central and Eastern Europe." *Economic Systems*, 41 (3), 367-378.
Attinasi, M.G., Checherita, C., Nickel, C. (2009) "What explains the surge in euro area sovereign spreads during the financial crisis of 2007-09", ECB WP 1131.
Attinasi, M.G., Klemm, A. (2016) "The growth impact of discretionary fiscal policy measures." *Journal of Macroeconomics*, 49, 265-279.
Augustin, P., Subrahmanyam, M.G., Tang, D.Y., Wang, S.Q. (2014) "Credit default swaps: a survey." *Foundations and Trends in Finance*, 9 (1-2), 1-196.
Aiyagari, R., Christiano, L., Eichenbaum, M. (1990) "Output, employment and interest rate effects of government consumption." *Journal of Monetary Economics*, 30, 73–86.
Badinger, H. (2009) "Fiscal rules, discretionary fiscal policy and macroeconomic stability: an empirical assessment for OECD countries." *Applied Economics*, 41 (7), 829-847.
Bank, A. (2011) "Effects of discretionary fiscal policy: new empirical evidence for Germany." Leibniz Universität Hannover, Discussion Paper 470.
Baxter, M., King, R. (1993) "Fiscal policy in general equilibrium." *The American Economic Review*, 83, 315–334.
Beetsma, R., Giuliodori, M. (2010) "Discretionary fiscal policy: Review and estimates for the EU." Cesifo Working Paper 2849.
Blanchard, O. (1990) "Suggestions for a new set of fiscal indicators." Technical report, OECD Economics and Statistics Department.
Blanchard, O. (2003) *Macroeconomics*, 3rd ed. Prentice Hall.
Blanchard, O., Perotti, R. (2002) "An empirical characterization of the dynamic effects of changes in government spending and taxes on output." *The Quarterly Journal of economics*, 117 (4), 1329-1368.
Blanco, R., Brennan, S., Marsh, I. W. (2005) "An empirical analysis of the dynamic relation between investment grade bonds and credit default swaps." *The Journal of Finance*, 60, 2255–81.
Blommestein, H., Eijffinger, S., Qian, Z. (2016) "Regime-dependent determinants of Euro area sovereign CDS spreads." *Journal of Financial Stability*, 22, 10-21.
Buti, M., Noord, P. (2004) "Fiscal discretion and elections in the early years of EMU." *Journal of Common Market Studies*, 42 (4), 737-756.
Christiano, L. , Eichenbaum, M. , Rebelo, S. (2011) "When is the government spending multiplier large?" *Journal Political Economy*, 119 (1), 78–121.
Ciro, J. C. G., de Mendonça, H. F. (2016) "Effect of credibility and reputation on discretionary fiscal policy: empirical evidence from Colombia." *Empirical Economics*, 53 (4), 1529-1552.
Cragg, J. G. (1983) "More efficient estimation in the presence of heteroscedasticity of unknown form." *Econometrica*, 51 (3), 751-763.
Csonto, B., Ivaschenko, I. (2013) "Determinants of sovereign bond spreads in emerging markets: local fundamentals and global factors vs. ever-changing misalignments." IMF Working Paper, WP/13/164.
Delatte, A.L., Gex, M., López-Villavicencio, A. (2012) "Has the CDS market influenced the borrowing cost of European countries during the sovereign crisis?" *Journal of International Money and Finance*, 31 (3), 481–497.
Devries, P., Guajardo, J., Leigh, D., Pescatori, A. (2011) "A new action-based dataset of fiscal consolidation." IMF Working Paper Series , No. 11/128.

Fatás, A., Mihov, I. (2009) "The euro and fiscal policy." NBER Working Papers, 14722.
Fatás, A., Mihov, I. (2003a) "On constraining fiscal policy discretion in EMU." *Oxford Review of Economic Policy*, 19 (1), 112–131.
Fatás, A., Mihov, I. (2003b) "The case for restricting fiscal policy discretion." *The Quarterly Journal of Economics*, 118 (4), 1419-1447.
Fender, I., Hayo, B., Neuenkirch, M. (2012) "Daily pricing of emerging market sovereign CDS before and during the global financial crisis." *Journal of Banking and Finance*, 36 (10), 2786-2794.
Flannery, M., Houston, J., Partnoy, F. (2010) "Credit default swap spreads as viable substitutes for credit ratings." *University of Pennsylvania Law Review*, 158 (7), 2085-2123.
Fontana, G., Pacella, A., Realfonzo, R. (2017) "Does fiscal policy affect the monetary transmission mechanism? A monetary theory of production (MTP) response to the new consensus macroeconomics (NCM) perspective" *Metroeconomica*, 68 (2), 378-395.
Forte, S., Pena, J. I. (2009) "Credit spreads: an empirical analysis on the informational content of stocks, bonds, and CDS." *Journal of Banking and Finance*, 33 (11), 2013–25.
Giavazzi, F., Pagano, M. (1990) "Can severe fiscal contractions be expansionary? Tales of two small European countries." In: Blanchard, O., Fischer, S. (Eds.), NBER Macroeconomics Annual. MIT Press.
Granger, C. W. J. (2004) "Time series analysis, cointegration, and applications." *The American Economic Review*, 94 (3), 421-425.
Granville, B., Mallick, S.K. (2009) "Monetary and financial stability in the euro area: procyclicality versus trade-off." *Journal of International Financial Markets, Institutions and Money*, 19, 662–674.
Greene, W. H. (1993) *Econometric analysis*. 5th ed. Prentice Hall, New Jersey.
Gyntelberg, J., Hrdahl, P., Ters, K., Urban, J., (2013) "Intraday dynamics of euro area sovereign cds and bonds." BIS Working Papers, Bank for International Settlements, n. 423.
Hall, A. R. (2015) "Econometricians have their moments: GMM at 32." *Economic Record*, 91 (S1), 1-24.
Hansen, L. P. (1982) "Large sample properties of generalized method of moments estimators." *Econometrica*, 50, 1029–1054.
Hebous, S. (2011). "The effects of discretionary fiscal policy on macroeconomic aggregates: a reappraisal." *Journal of Economic Surveys*, 25 (4), 674-707.
Hendry, D. F. (2001) "Achievements and challenges in econometric methodology." *Journal of Econometrics*, 100, 7-10.
Hilscher, J., Nosbusch, Y. (2010) "Determinants of sovereign risk: macroeconomic fundamentals and the pricing of sovereign debt." *Review of Finance*, 14 (2), 235–62.
Hull, J. C., Predescu, M., White, A. (2004) "The relationship between credit default swap spreads, bond yields, and credit rating announcements." *Journal of Banking and Finance*, 28 (11), 2789–811.
Ismailescu, I., Kazemi, H. (2010) "The reaction of emerging market credit default swap spreads to sovereign credit rating changes." *Journal of Banking and Finance*, 34 (12), 2861-2873.
Johnston, J. (1984) *Econometric Methods*, 3rd ed., Singapore: McGraw-Hill Book Co.
Kocsis, Z., Monostori, Z. (2016) "The role of country-specific fundamentals in sovereign CDS spreads: Eastern European Experiences." *Emerging Markets Review*, 27 (June), 140-168.
Kodres, L. E., Hartelius, K., Kashiwase, K. (2008) "Emerging market spread compression: is it real or is it liquidity?" *IMF Working Papers* 08/10.

Kuncoro, H. (2017) “Fiscal policy and stock market returns volatility: the case of Indonesia.” *International Journal of Economic Policy in Emerging Economies*, 10 (2), 153-170.

Longstaff, F. A., Mithal, S., Neisl, E. (2005) “Corporate yield spreads: default risk or liquidity? New evidence from the credit default swap market.” *The Journal of Finance*, 60, 2213–53.

Longstaff, F.A, Pan, J., Pedersen, L. H., Singleton, K. J. (2011) “How sovereign is sovereign credit risk?” *The American Economic Journal: Macroeconomics*, 3 (2), 75-103.

Mallick, S.K., Mohsin, M. (2010) “On the real effects of inflation in open economies: theory and empirics.” *Empirical Economics*, 39, 643–673.

Montes, G. C., Tiberto, B. P. (2012) “Macroeconomic environment, country risk and stock market performance: Evidence for Brazil” *Economic Modelling*, 29, 1666-1678.

Mora, N. (2006). “Sovereign credit ratings: Guilty beyond reasonable doubt?” *Journal of Banking and Finance*, 30 (7), 2041-2062.

Newey, W. K., West, K. (1987). “A Simple, positive semi-definite, heteroskedasticity and autocorrelation consistent covariance matrix.” *Econometrica*, 55 (3), 703–708.

Norden, L., Weber, M. (2004) “The comovement of credit default swap, bond and stock markets: an empirical analysis.” Discussion Paper No. 4674, Centre for Economic Policy Research, London.

OECD (2012). “OECD Sovereign Borrowing Outlook 2012.” OECD Publishing.

Peat, M., Svec, J., Wang, J. (2015) “The effects of fiscal opacity on sovereign credit spreads.” *Emerging Markets Review*, 24, 34-45.

Rafiq, M.S., Mallick, S.K. (2008) “The effect of monetary policy on output in EMU3: a sign restriction approach.” *Journal of Macroeconomics*, 30, 1756–1791.

Romer, C. , Romer, D. (2010) “The macroeconomic effects of tax changes: estimates based on a new measure of fiscal shocks.” *The American Economic Review*, 100, 763–801 .

Sousa, R.M. (2014) “Wealth, asset portfolio, money demand and policy rule.” *Bulletin of Economic Research*, 66 (1), 95-111.

Tsuri, M., (2005) “Discretionary deficit and its effects on Japanese economy.” *Applied Economics*, 37 (19), 2239-2249.

Wang, A. T., Yang, S. Y., Yang, N. T. (2013) “Information Transmission between Sovereign Debt CDS and Other Financial Factors - The Case of Latin America.” *North American Journal of Economics and Finance*, 26 (December), 586-601.

Windmeijer, F. (2005) “A finite sample correction for the variance of linear efficient two-step GMM estimators.” *Journal of Econometrics*, 126 (1), 25-51.

Woodford, M. (2011) “Simple analytics of the government expenditure multiplier.” *American Economic Journal: Macroeconomics*, 3 (1), 1–35 .

Wooldridge, J. M. (2001) “Applications of generalized method of moments estimation.” *The Journal of Economic Perspectives*, 15 (4), 87-100.

Appendix

Table A. 1
Unit root tests (ADF, PP and KPS)

		ADF				PP				KPSS			
		Eq	Lag	T-Stat	10%	Eq	Band	T-Stat	10%	Eq	Band	T-Stat	10%
CDS5	Level	I	0	-2.805	-2.577	I	2	-2.872	-2.577	I	9	0.274	0.347
CDS10	Level	I	0	-2.659	-2.577	I	3	-2.712	-2.577	I	9	0.314	0.347
EMBI	Level	I	1	-3.180	-2.577	I	1	-2.629	-2.577	T/I	9	0.237	0.119
FI	Level	N	1	-6.910	-1.615	N	8	-13.896	-1.615	I	8	0.210	0.347
PRSK	Level	I	0	-4.154	-2.577	I	3	-4.301	-2.577	T	7	0.124	0.119
IBC_Br	Level	T/I	1	-6.277	-3.144	T/I	2	-10.144	-3.144	T	4	0.077	0.119
BID_ASK5	Level	I	1	-4.796	-2.577	I	21	-4.817	-2.577	T	9	0.232	0.119
BID_ASK10	Level	N	1	-3.139	-1.615	I	6	-4.837	-2.577	T	9	0.205	0.119
IRES	Level	I	2	-1.491	-2.577	T/I	8	-0.354	-3.144	T/I	10	0.276	0.119
	1st Difference	I	1	-4.777	-2.577	I	6	-7.587	-2.577	T/I	8	0.162	0.119
PDEBT	Level	T/I	0	0.273	-3.144	T/I	5	0.148	-3.144	T/I	10	0.315	0.119
	1st Difference	T/I	0	-11.948	-3.144	T/I	5	-11.999	-3.144	T/I	5	0.086	0.119
RIR	Level	N	1	-0.776	-1.615	N	8	-0.818	-1.615	T/I	10	0.255	0.119
	1st Difference	N	0	-5.832	-1.615	N	6	-5.983	-1.615	T/I	8	0.074	0.119
LIBOR	Level	T/I	1	-1.951	-3.144	T/I	6	-2.031	-3.144	T/I	10	0.158	0.119
	1st Difference	N	0	-9.987	-1.615	N	4	-10.007	-1.615	I	6	0.252	0.347
TED	Level	I	0	-3.611	-2.577	I	8	-3.545	-2.577	T/I	9	0.129	0.119
VIX	Level	I	0	-3.513	-2.577	I	0	-3.513	-2.577	I	9	0.240	0.347
G	Level	N	11	9.150	-1.615	T/I	8	-11.017	-3.144	T/I	7	0.156	0.119
	1st Difference	I	10	-15.032	-2.577	T/I	8	-25.866	-1.615	I	118	0.361	0.347
r	Level	N	1	-0.776	-1.615	N	8	-0.818	-1.615	T/I	10	0.255	0.119
	1st Difference	N	0	-5.832	-1.615	N	6	-5.983	-1.615	T/I	8	0.074	0.119
Y	Level	I	3	-1.956	-2.577	I	14	-1.953	-2.577	T/I	10	0.308	0.119
	1st Difference	T/I	2	-6.751	-3.144	I	1	-16.786	-2.577	T/I	19	0.114	0.119
INF	Level	N	1	-0.464	-1.615	N	6	-0.445	-1.615	T/I	10	0.183	0.119
	1st Difference	N	0	-6.872	-1.615	N	1	-7.032	-1.615	I	6	0.064	0.347

Note: ADF - the final choice of lag was made based on Schwarz information criterion. PP and KPSS tests - Band is the bandwidth truncation chosen for the Bartlett kernel. “I” denotes intercept; “I/T” denotes intercept and trend and; “N” denotes none.

Table A.2
Unit root tests (ADF, PP and KPSS) for the residuals of equation 1

	ADF				PP				KPSS			
Variables	eq.	Lag	test-stat	prob.	eq.	Band	test-stat	prob.	eq.	Band	test-stat	5%
Resid_ols	N	0	-13.378	0.000	N	6	-13.403	0.000	I	5	0.295	0.463
Resid_gmm	N	0	-10.304	0.000	N	6	-10.788	0.000	I	6	0.184	0.463
Resid_gmm2	N	0	-10.530	0.000	N	6	-10.994	0.000	I	6	0.193	0.463

Note: ADF - the final choice of lag was made based on Schwarz information criterion. PP and KPSS tests - Band is the bandwidth truncation chosen for the Bartlett kernel. “I” denotes intercept; “I/T” denotes intercept and trend and; “N” denotes none.

Table A.3

Estimates for equation (1) (government spending)

Estimator	OLS	GMM	GMM-2S
Variables			
G_{t-1}	0.377***	0.240***	0.176*
	(4.051)	(4.400)	(1.794)
r_{t-1}	0.019**	0.024***	0.018
	(2.051)	(2.780)	(0.982)
Y_{t-1}	1.615***	1.873***	1.938***
	(6.208)	(8.318)	(3.912)
INF_{t-1}	0.019	0.032***	0.036**
	(1.358)	(3.583)	(2.072)
Adj.R2	0.876	0.832	0.826
F-Stat	271.073		
Prob F-Stat	0.000		
LM Test	8.964		
Prob LM	0.011		
ARCH Test	0.610		
Prob ARCH	0.434		
J-Stat		20.350	19.914
Prob J-Stat		0.620	0.701
D-W-H Test		1.035	1.357
Prob D-W-H		0.904	0.715
Nº Inst./Nº Obs		0.215	0.216

Note: Marginal Significance Levels: *** denotes 0.01, ** denotes 0.05 and *10%. Standard errors are in parentheses. "Prob F-Stat" reports the respective p-value of the F-test. "Prob J-Stat" reports the respective p-value of the J-test. "Prob LM" reports the respective p-value of the LM-test to detect serial autocorrelation. "Prob ARCH" reports the respective p-value of the ARCH-test to detect heteroskedasticity. D-W-H test is the Durbin-Wu-Hausman test (difference in J-stats) and null hypothesis is that the regressors are exogenous. "Prob D-W-H" reports the respective p-value of the D-W-H-test.

Table A.4

Wald Test

Dependent: CDS5	Wald test (Null): $FI_{CDS5} = FI_{CDS10}$					
		Value	Prob.		Value	Prob.
OLS	F-statistic	0.422	0.517	Chi-square	0.422	0.516
GMM	F-statistic	0.169	0.682	Chi-square	0.169	0.681
GMM-2S	F-statistic	0.157	0.693	Chi-square	0.157	0.692
Dependent: CDS10	Wald test (Null): $FI_{CDS10} = FI_{CDS5}$					
		Value	Prob.		Value	Prob.
OLS	F-statistic	0.286	0.594	Chi-square	0.286	0.593
GMM	F-statistic	0.137	0.712	Chi-square	0.137	0.711
GMM-2S	F-statistic	0.257	0.613	Chi-square	0.257	0.612

Table A.5

Estimates for the effect of discretionary fiscal policy (FI) on CDS5 and CDS10

	CDS 5	CDS 10
Estimator	GMM	GMM
Variables		
CDS_{-1}	**0.654** ***	**0.841** ***
	(0.056)	(0.025)
FI	**65.161** **	**52.316** **
	(27.393)	(25.873)
PRSK	**2.206** **	**-1.109**
	(0.921)	(1.280)
IBC_Br_{-5}	**-9.986** *	**-1.828**
	(5.827)	(4.363)
BID_ASK	**3.477** ***	**1.234** *
	(1.199)	(0.852)
D(IRES)	**-2.493** ***	**-1.424** **
	(0.713)	(0.653)
$D(PDEBT)_{-3}$	**12.1607** ***	**6.751** **
	(4.055)	(3.519)
$D(RIR)_{-1}$	**42.462** ***	**37.704** ***
	(6.272)	(6.994)
D(LIBOR)	**4.857454**	**9.354**
	(16.336)	(12.094)
TED	**8.287947**	**13.736** **
	(6.481)	(5.663)
VIX	**0.706** *	**0.134**
	(0.357)	(0.283)
Adj.R2	0.87	0.91
J-Stat	15.61	17.90
Prob J-Stat	0.68	0.90
D-W-H Test	7.67	3.89
Prob D-W-H	0.74	0.97
Nº Inst./Nº Obs	0.23	0.27

Note: Marginal Significance Levels: *** denotes 0.01, ** denotes 0.05 and *10%. Standard errors are in parentheses. "Prob J-Stat" reports the respective p-value of the J-test. D-W-H test is the Durbin-Wu-Hausman test (difference in J-stats) and null hypothesis is that the regressors are exogenous. "Prob D-W-H" reports the respective p-value of the D-W-H-test. Intercepts are omitted for convenience. CDS_{-1} refers to $CDS5_{-1}$ and $CDS10_{-1}$.