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Working Paper Series
2015-07

Fiscal Retrenchment and Sovereign Risk

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Fiscal Retrenchment and Sovereign Risk

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June 5, 2015

Abstract

How does sovereign risk affect the dynamic consequences of identified contractionary fiscal policy shocks? I apply a regime-switching SVAR on Italian data and find that in periods in which government bond yield spreads are high and volatile, fiscal multipliers are smaller than in the calm regime. This empirical finding supports theoretical arguments that associate fiscal distress with low fiscal multipliers.

1 Introduction

In the recent years, sovereign bond yields have spiked in several countries in the eurozone, signaling the risk of impending sovereign defaults. As a reaction, these countries are running programs of fiscal retrenchment with the goal to consolidate their public finances. The effects of fiscal policy depend on the economic conditions under which it is conducted. As turmoil in the sovereign bond markets has been an important feature of the economic environment in the eurozone, a natural question to ask is: How does the presence of sovereign risk affect the dynamic consequences of fiscal policy shocks?

This paper identifies empirical fiscal shocks applying the regime-switching STVAR approach, developed by Auerbach and Gorodnichenko (2012). This technique allows for differences in the impulse responses to identified fiscal shocks across a crisis and a calm regime, focussing on the interaction of the spread, public debt and output. In the sovereign risk crisis regime, sovereign bond yields are high and volatile, indicating uncertainty in the financial market. While often sovereign risk is associated with low output growth, which itself has an influence on the effectiveness of fiscal policy[1], in the case of Italy, the volatility measure I apply to separate the regimes is virtually uncorrelated with the growth rate of GDP. This prevents the difference of the fiscal multipliers in the two regimes from being driven by output growth dynamics, and allows me to study in isolation the influence of sovereign risk on fiscal policy as a particular determinant.

In a comparison of the effects across regimes, I find that the dynamic effects of a fiscal shock on output growth, are weaker in a sovereign risk crisis than in the calm regime, providing evidence for a dampening impact of the presence of sovereign risk on the effects of fiscal policy shocks. Impact multipliers, are small in both regimes and all specifications.

The finding of a weaker output response to fiscal retrenchment in times of sovereign risk, presents evidence which is in line with theoretical considerations on fiscal multipliers in the presence of strained public finances. The strongest statement in this regard in the theoretical literature is the expansionary fiscal contraction hypothesis (EFC), which posits the possibility that fiscal multipliers can even be negative. Much of the arguments of the proponents of this hypothesis relies on the idea, that fiscal consolidation may restore the credibility of public the government's commitment for sustainable finances, thus creating a more stable environment for

[1] see e.g. Auerbach and Gorodnichenko (2012), Baum, Polawski-Ribeiro, and Weber (2012) Batini, Callegari, and Melina (2012)

the economy. In such a case a cut of government spending may over-proportionally crowd in private demand (see e.g. Bertola and Drazen (1993), Alesina and Perotti (1997)). Blanchard (1990), Bertola and Drazen (1993) and Sutherland (1997) argue that when agents perceive the current fiscal path to be unsustainable, a pronounced fiscal consolidation may over-proportionally crowd in consumption. Alesina and Perotti (1997) add that fiscal retrenchment can help to lower risk premia and interest rates in the economy, implying small or even negative fiscal multipliers. Other empirical studies, which find evidence supporting these arguments, analyze episodes of fiscal consolidation in the 1980s, mainly with a focus on Denmark (e.g. Giavazzi and Pagano (1990), Alesina and Perotti (1997), Alesina and Ardagna (2010), Bergman and Hutchison (2010)). In these episodes, they find evidence for a stimulating effect of fiscal retrenchment. Alesina and Perotti (1997) reach the similar conclusion for a panel of OECD countries. More recently, some studies have cast some doubt on these empirical results. Perotti (2011) discusses expansionary effects of fiscal consolidation for episodes in Denmark, Ireland, Sweden and Finland, and finds that only in the first case domestic demand was stimulated, while in the other three increased exports were driving output growth. In a panel of OECD countries Guajardo, Leigh, and Pescatori (2011) do not find evidence which would support the EFC.
More recently and motivated by the crisis in the Eurozone, Corsetti, Kuester, Meier, and Müller (2013), focus on the effect of fiscal retrenchment in the presence of sovereign risk. In the context of a New Keynesian model with financial frictions they find that to the extent, that a fiscal contraction decreases risk premia on public debt, it facilitates financial intermediation and thus stimulates lending and investment, thereby dampening the contractive effects of fiscal consolidations.[2]
While I do not find not find negative fiscal multipliers, my findings are consistent with the general notion, that the presence of fiscal stress attenuates the effects of fiscal retrenchment.

The empirical literature on state-dependent multipliers has been growing in the last years. Closest to my paper in their motivation are Perotti (1999), Corsetti, Meier, and Müller (2012) and Ilzetzki, Mendoza, and Végh (2013), who investigate on the difference of fiscal multipliers in times of high and low fiscal stress in a panel of countries. Unanimously they find that the multipliers are lower, when the fiscal stress is high. Thus, my finding is in line with this literature. However, the designs of this papers differ from these studies, which use the debt-to-GDP ratio or the public

[2]In the model by Corsetti, Kuester, Meier, and Müller (2013) a prerequisite for the relation between the fiscal multiplier and sovereign risk is that monetary policy does not act to no neutralize the effects of risk premia on lending condition. The authors model monetary policy to be at the zero lower bound. In most of my sample, monetary policy is not constrained. However, in those periods in my sample, in which the volatility of bond yields is most pronounced, the central bank either does not lower the policy rates, or the policy rate is very close to the ZLB such that monetary policy does not have much leeway.

deficit as indicators of fiscal stress. Debt measures can only be imperfect proxies to sovereign risk. Ilzetzki, Mendoza, and Végh (2013), for instance, sort all countries with a debt-to-GDP ratio higher than sixty percent in the high-debt-category, including countries for which a sovereign risk narrative is not very plausible, such as the USA or Germany. Corsetti, Meier, and Müller (2012), in turn, categorize all countries with a debt-to-GDP ratio higher than 1 or with a public net lending higher than 6 percent of GDP as being in fiscal distress. Hence, in their sample, which extends from 1978 to 2008, Italy is in fiscal distress in each period. In contrast to this assumption, risk spreads on Italian government bonds have been low for a good fraction of this time. Naturally, the sustainability of public finances does not rely on the public debt measure alone, but also on factors such as, for example, the monetary policy regime, the exchange rate regime, output growth, political risk, and non-fundamental factors. Exploiting the sovereign bond yield has the advantage that, in principle, it should reflect the expectations of market participants about all relevant factors, making it a more comprehensive measure of sovereign risk.

The approach of this paper differs from these studies in other aspects as well. First, they analyze panels of countries pooling, whereas I focus on the case of a specific country, namely Italy. As the literature shows, the heterogeneity of fiscal multipliers across countries is substantial. Thus, the focus on a specific country is likely to add information to the pooled results of a panel analysis. Second, the econometric analysis is different. Perotti (1999) and Corsetti, Meier, and Müller (2012) use panel data analysis. To distinguish cases of high or low fiscal distress, they rely on a dummy variable approach. Ilzetzki, Mendoza, and Végh (2013) apply a panel SVAR, and split their sample in high debt and low debt cases. In contrast, the STVAR approach, which I apply, interprets the continuous variation in the volatility of the sovereign bond yield as probability of being in a particular regime. Thus, I do not need to rely on a threshold value or to split the sample. Instead, all observations are exploited in the estimation of each regime. Thirdly the above studies analyze the effects of government spending shocks. Due to data limitations they have to omit data on taxes, potentially introducing a bias in their result. It is reasonable to assume that often changes in government spending a accompanied by changes in the tax revenue, which in turn affect the dynamics of output. Instead, I study the effect of an innovation in the growth of public debt. On the one hand, this gives a more complete picture of the expansionary or contractionary fiscal impulse. On the other hand, it reduces the comparability to other studies, as the literature usually finds different effects for different types of fiscal shocks.

Corsetti, Meier, and Müller (2012) find the differences between the multipliers in the regime to be rather small, whereas Perotti (1999) finds it to be sizable. Ilzetzki, Mendoza, and Végh (2013) even find strong evidence for negative long-run fiscal multipliers in their group of high debt countries.

On the other side of the spectrum of the size of fiscal multipliers, theoretical explanations for large multipliers in recessions are provided by Christiano, Eichenbaum, and Rebelo (2011) and Eggertson and Krugman (2012) in models in which the zero lower bound binds for the monetary policy rate. Some studies, which are in their design closest to this paper as they use the same econometric technique, find empirical evidence for particularly high fiscal multiplier in recession periods (see Auerbach and Gorodnichenko (2012), Baum, Polawski-Ribeiro, and Weber (2012) and Batini, Callegari, and Melina (2012)). Referring to these studies , Blanchard and Leigh (2013) state that "conditions for larger-than-normal multipliers were ripe" in Europe, and suggest that the fiscal impact multipliers during the Eurozone crisis were potentially far higher than 1.0. In contrast to these studies, I focus on sovereign risk instead of output growth dynamics, and choose the regimes in my econometric framework accordingly. Thus, the low fiscal multipliers that I find in the sovereign risk regime do not contradict the results of the studies that focus on the effect of fiscal policy in recessions. However, they cast a very different light on the effects of fiscal policy in the eurozone crisis.

Batini, Callegari, and Melina (2012) also present results for Italy. They find impact multipliers for government spending shocks between 1.42 in recessions and 0.25 in expansions. Their findings for the multipliers for tax shocks are considerably smaller: 0.12 in recessions and 0.07 in expansions. However, their study differs from mine not only by the different choice of regimes. Another difference is that they use figures for government spending and taxes that are constructed by Basile, Chiarini, and Marzano (2014) on accrual basis for the years 1981-2007 [3], whereas I focus on public debt data, which is readily available, and choose the sample such that it captures the effects of fiscal policy in the recent sovereign risk crisis, and excludes the 80s and the first years of the 1990s for reasons discussed in the next section.
Other fiscal SVARs on Italian data generally find small multipliers. In the context of a linear SVAR, Giordano, Momigliano, Neri, and Perotti (2005) find small and insignificant effects of government spending shocks, tax shocks, and shocks to public sector wages in Italy. For a DSGE model calibrated to Italian data, Locarno, Notarpietro, and Pisani (2013) find that fiscal multipliers larger than one can only be obtained for extreme assumptions about monetary and fiscal policy. Thus, overall my estimates of rather low multipliers are in line with what other studies have found in other contexts for the case of Italy.[4]

[3] Quarterly national accounts data for fiscal variables are not available for a long time horizon in Italy.

[4] The finding of very low and insignificant multipliers in SVAR studies is not unique to the case of Italy. Other examples include the UK and Japan (e.g. see: Cimadomo and Bénassy-Quére (2012), Auerbach and Gorodnichenko (2014)), and the low or even negative multipliers found by Ilzetzki, Mendoza, and

The remainder of the paper is structured as follows: section two discusses the choices of the sovereign risk indicators as well as the sample period with regard to fiscal developments in Italy. Section three outlines the econometric methodology. The fourth section presents the results of the analysis. Section five concludes.

2 Sovereign risk and the case of Italy

The case of Italy provides an ideal case for the analysis of sovereign risk for several reasons. Italy has had a long history of high sovereign debt. As can be seen in the lower panel of figure (1), its debt-to-GDP ratio has been higher than 100 percent for two decades, and it experienced several periods of high and volatile risk spreads. Nonetheless, it did not experience a default event that would have resulted in a structural break in the pricing of default risk. Thus, Italy represents the rare case for which time-series data of sufficient length is available to analyze sovereign risk in conjunction with macroeconomic dynamics. In the empirical analysis I use quarterly data for the period 1993Q3-2013Q2. Sovereign risk enters the study in two ways. First, the sovereign risk indicator used as a variable in the VAR is the real interest rate spread of Italian government securities with a five-year term over German Bunds with the same term. Secondly, the within-quarter volatility of the interest rates on Italian bonds with a term of five years is used to distinguish two regimes. The regime with high and low interest rate volatility are labeled crisis regime and calm regime, respectively. These choices are discussed below.
The sample starts in 1993Q3. Data on Italian sovereign bond yields is available as of 1978. However, at that time the secondary market for Italian Treasury bills was very tightly regulated (see Frattiani and Spinelli (1997), Vercelli and Fiordoni (2003)) and the bond yields were managed by the fiscal and monetary policy makers. The central bank actively participated in government bond auctions. Banks were required to hold a fixed percentage of their new flow of deposits in government bonds, which was regularly adjusted by the authorities. Strict capital controls were in place, and the discount rate was set by the Treasury instead by the Italian central bank. During the 1980s and until the beginning of the 1990s, the Italian policy mix shifted considerably from fiscal dominance towards an empowerment of the central bank, and the financial sector underwent a step-wise liberalization. Portfolio restriction for banks disappeared in 1987. Capital and exchange rate controls were fully abolished in May 1990 (Frattiani and Spinelli (1997)). In 1992, the central bank was granted the right to set the discount rate. The shift in the Italian monetary policy regime was part of the plan to join the

Végh (2013) for subgroups of their sample.

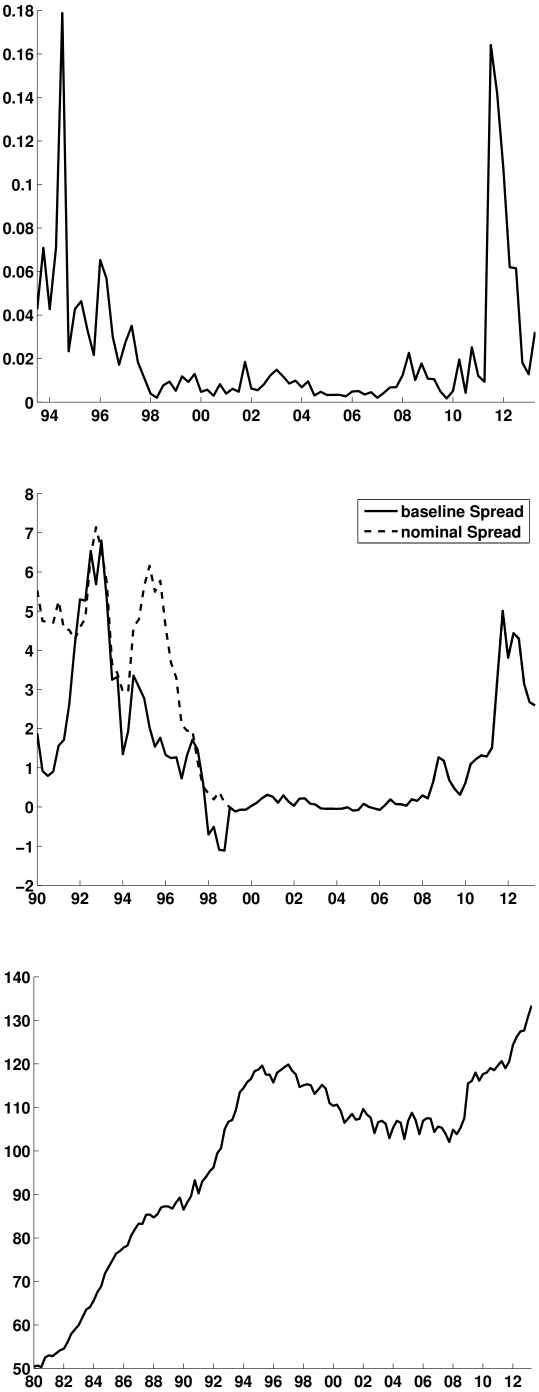

Figure 1: Volatility of real interest rates of 5-year Italian government bonds, the real and nominal interest rate spreads of 5-year Italian government bonds over German bonds, and the debt-to-GDP ratio

European Exchange Rate Mechanism (ERM), and, eventually, to introduce the Euro. Yet, as monetary policy became more restrictive, fiscal policy was slow to adjust, and kept running large deficits. The stock of public debt, which grew rapidly in the 1980s, exceeded the Italian GDP for the first time in 1992. Throughout the whole sample period, the Italian debt-to-GDP ratio is above 100 percent. Thus, Italy represents a country, which is being confronted with fiscal vulnerability for more than two decades. Small changes in the interest rate of government yields have a sizable effect on the debt service of Italy. In the view of this situation, explaining the periods of high and volatile bond yield spreads with sovereign default risk is plausible, and excluding the 80s and first years of the 90s, ensures that the bond yields are not distorted by active management by policy makers.

An additional distortion to the bond yield as a sovereign risk measure is the influence of exchange rate risk. In 1992, speculative attacks forced several countries to depreciate their currencies below the narrow bands around the Deutsche Mark that were instituted in the ERM. While the interest rate differentials between most European sovereign bonds and German Bunds increased, the Italian-German interest rate differential spiked higher than most others. It then decreased again in the beginning of 1993 after the lira had depreciated against the Deutsche Mark by roughly 25 percent. The high bond spreads in Europe at that time are typically explained with exchange rate risk instead with sovereign risk. Hence, I discard the observations before 1993Q3 from the benchmark sample, to ensure that the risk drives Italian bond yields is mainly credit risk. However, also for the other years prior to 1999, fluctuations in yield are affected by exchange rate movements.

I include a real interest rate spread of Italian over German bonds in the VAR, to capture sovereign risk. High-frequency fluctuations of the exchange rate are not likely to affect this sovereign risk indicator for two reasons: First, in the empirical analysis quarterly averages of the interest rate spreads are used. Second, I focus on bonds with a five-year term, as long-term securities are less sensitive to exchange rate fluctuations than short term bonds.[5] Instead, exchange rate low-frequency movements of the exchange rate, which reflect the devaluation risk of the lira through higher expected inflation, are more likely to affect the spread. Regarding the high nominal yield spreads in the 90s of the European countries, cases have been made for sovereign credit risk, as well as devaluation risk as drivers of the bond yield spreads as main drivers (see Wright (2014)). However, in a study of asset swap data of these countries, Codogno, Favero, Missale, Portes, and Thum (2003) find that security yield spreads of Italy and Spain stand out, insofar as they were driven almost entirely by the underlying default risk. To remove the inflation risk from the spread and to focus

[5]While this is the reason for preferring bonds with a 5-year term over bonds with a shorter maturity, 5-year bonds are preferred to bonds with a longer maturity, as data for yields of 10-year or 30-year bonds is not available for the extended sample period, starting in 1990.

on the default risk, I subtract the inflation-differential between Italy and Germany from the nominal bond spreads, and study the ex-post real interest rate spreads. The middle panel in figure (1) shows the difference between the spread used in this study, and the nominal spread. Between 1993Q3 and 1998Q4 the real interest rate spread is consistently lower than the nominal spread. After the accession to the Euro, the exchange rate risk is eliminates, the inflation risk becomes irrelevant, and the real spread and the nominal spread coincide. [6]

The second sovereign risk indicator in this study, the volatility of Italian bond yields, determines the choice of the regime. Using the volatility of a financial variable to proxy uncertainty in a certain market or on the aggregate level is standard in the finance and macroeconomic literature (see Schiller (1981), Bloom (2009)). In this vein, the interest rate volatility of the sovereign bond yields captures the inquietud in the Italian sovereign bond markets and is used as a crisis indicator.[7] Figure (1) shows the within-quarter volatility of the Italian real interest rate together with the nominal and the real bond yield spread, as well as with the debt-to-GDP ratio. As one can see periods with a high volatility in the interest rate roughly coincide with the periods of high levels of the spreads. This co-movement holds in particular with the real yield spread[8], which is cleaned of the inflation differential. This strenghtens the assumptions that the crisis indicator captures mainly sovereign risk. In the estimation, I choose the three quarter moving average of the volatility to limit outlier effects of observations with particularly high volatility, and to smooth the dynamics of the states and make the estimation feasible.

Two periods in the sample feature particularly volatile bond yields. The first one is in 1994, shortly before the still growth of public debt halted and the Italian debt-to-GDP ratio reached its maximum (see figure (1)). In this year the non-partisan government led by Carlo Azeglio Ciampo, who, as the former governor of the central bank had led the period of disinflation in the 80s, and was regarded as committed to fiscal consolidation, was replaced in the elections. The new government coalition led by Silvio Berlusconi only lasted for a few months and collapsed in December 1994.

[6]Yang (2007) finds that the inclusion of forward looking variables into a fiscal SVAR with the Blanchard-Perotti identification scheme, reduces the size of the multiplier. She interprets this as tentative evidence for fiscal foresight. This paper does not address the invertibility problem, that comes along with fiscal foresight and which is carefully explained by Leeper, Walker, and Yang (2008). However, the inclusion of the forward looking spread, should to some degree mitigate this problem (see Sims and Zha (2006)), while partly accounting for the low fiscal multipliers that I find.

[7]As daily data on German government bond yields is not available for the entire sample period, I am limited to exploiting Italian sovereign bond yields instead of the corresponding spread.

[8]The correlation of the crisis indicator with the risk spread over the sample period is 0.834.

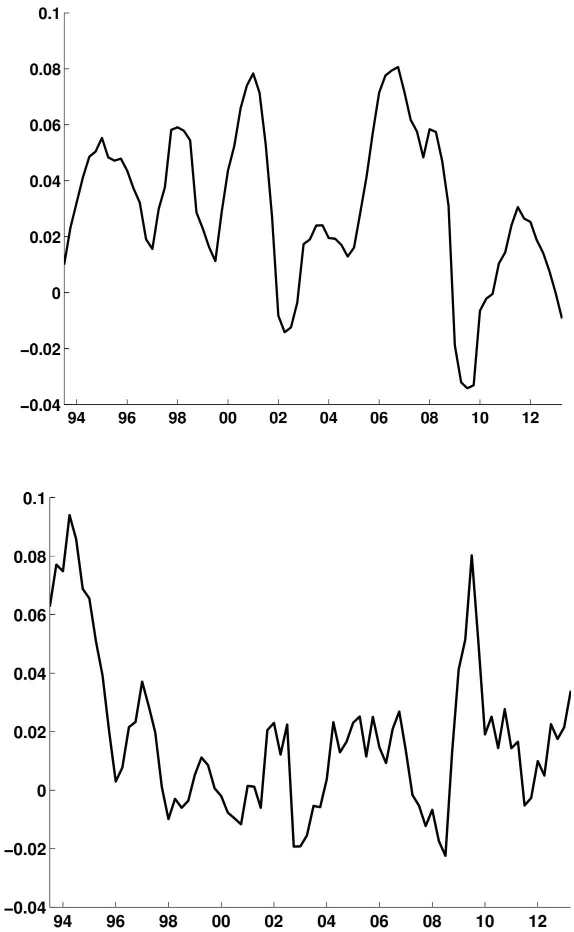

Figure 2: Annualized year-on-year growth rates of real GDP (upper panel) and the real debt of the general government (lower panel)

Additional to this political instability, which threatened to undermine fiscal consolidation, Borio and McCauley (1998) ascribe the increased volatility in the Italian bond markets to a the experience of the Mexican peso crisis, which made investors unwilling to finance potentially unsustainable public debt.[9] A smaller peak of the volatility and the spread can be observed in 1997, before it became clear that the government would be accepted in the first round of accession to the Euro area. In this year, the Italian Treasury announced a seven percent primary surplus and, thus, demonstrated a commitment to decrease the public debt. The second period with particularly high volatile bonds represents the high-time of the recent eurozone crisis, around 2012. This period was preceded by a financial crisis in several countries and

[9] Borio and McCauley (1998)

a slump of the world economy in 2009. The risk of an impending sovereign default in Greece quickly spilled over to other European countries, including Italy, where the debt-to GDP ratio was rising again. While other countries in Europe suffered from bursting housing bubbles or collapses of major banks, the banking system was relatively stable in Italy. Hence, while bank rescue measures heavily contributed to the public debt in other countries in Europe, Italy spent only small amounts on bank aid in crisis times. The contribution of bank rescue measures to official public debt in Italy have only been roughly 4bn Euro.[10] Thus, in this specific crisis period, the nature of the shocks to public debt growth is not distorted by large-scale bank rescue measures, and the dynamic effects of these shocks to debt growth can be compared across regimes.

The first panel of figure (2) depicts the growth rate of real GDP. The deepest recessions in the sample period are in 2009, in the aftermath of the subprime crisis in the US, and in 2002 after the dot-com bubble. Notably, periods of higher volatility do not necessarily coincide with periods lower output growth. More importantly, as mentioned above, output growth and sovereign risk are virtually uncorrelated. In the sample, the crisis indicator and the growth rate of output are virtually uncorrelated. The correlation is -0.017 and is statistically insignificant. Hence, the difference between my results in the crisis and in the calm regime will not be driven by underlying business cycle movements.

3 Econometric Methodology

The three variables used in the VAR are the gross debt of the general government, GDP and the bond yield spread, discussed above, in the quarters 1993Q3-2013Q2. The nominal series for public debt and GDP are deflated using the GDP deflator. [11] As the augmented Dickey Fuller test does not reject the presence of unit roots in the time series for real gross debt of the general government and real GDP on standard significance levels, and no cointegration relation could be established, I take fourth differences of the series to obtain stationarity and remove seasonal effects. All variables

[10] Financial guarantees to the financial sector, which, did not affect the debt of the general government were larger, yet, measured in percentage of GDP, still small in comparison to other cases in Southern Europe. (see: http://ec.europa.eu/eurostat/web/government-finance-statistics/excessive-deficit/supplemtary-tables-financial-crisis)

[11] The series for nominal public debt stems from the Banco di Italia database. (Data series: FPI_FP.M.IT.S13.MGD.SBI3.101.112.FAV.EUR.EDP), the series for nominal GDP and the GDP deflator are from stats.OECD (Series: B1_GE, Measures CARSA and DOBSA), the series for the Italian interest rate for government bonds with a five-year term stem from the Banca di Italia (Series: MFN_BMK.D.020.922.0.EUR.205), and their German counterpart stems from the Bundesbank (Series: BBK01.WZ9816)

are demeaned.
As an econometric framework, I employ the smooth transition vector autoregression method (STVAR) developed by Auerbach and Gorodnichenko (2012). This method models the economy as fluctuating between two states, which in this application are simply labelled "crisis regime" and "calm regime". Each period the economy is to a certain degree (or probability) in one state and to a degree in the other.[12] The degree to which the economy is in a crisis or in a calm regime is determined by an underlying state variable.[13] This approach has the advantage that in the estimation for each regime it exploits all observations. The estimation and inference results are thus more stable than SVARs estimated separately for each state which - in the study at hand - would be based on relatively few observations in each state. The STVAR approach allows for the contemporaneous responses to structural shocks and for the dynamic responses to differ across states. As discussed, the state variable which determines, in to what degree the economy is in which state, will be three-quarter moving average of the intra-quarter volatility of the yield of Italian government bonds with a five-year term.
The econometric specification reads:

$$X_t = (1-F(z_t))A_{CA}(L)X_{t-1} + F(z_t)A_{CR}(L)X_{t-1} + u_t \quad (1)$$

$$u_t \sim N(0,\Omega_t) \quad (2)$$

$$\Omega_t = \Omega_{CA}(1-F(z_t)) + \Omega_{CR}F(z_t) \quad (3)$$

$$F(z_t) = \frac{exp(-\gamma z_t)}{1+exp(-\gamma z_t)}, \quad \gamma > 0 \quad (4)$$

$$var(z_t) = 1; \qquad E(z_t) = 0, \quad (5)$$

where $X_t = [D_t, Y_t, S_t]'$, and D_t, Y_t and S_t are the measures for debt, GDP and the spread, as discussed above. The lag polynomial in (1) is a weighted average of the lag polynomials in the calm and in the crisis state ($A_{CA}(L)$ and $A_{CR}(L)$, respectively). The VAR is estimated with two lags.[14] The weights are determined by the function

[12] In this aspect it differs from the threshold VAR (TVAR) approach, which assigns to each observation a regime, based on an estimation of the threshold, which separates the different regimes. While the TVAR is an interesting alternative, I prefer to take a more moderate stand on whether particular observations belong to the calm or the crisis regime.

[13] For the question at hand, this is an advantage over time-varying coefficient models (TVC), as in the latter approach the variation of the coefficients is unrelated to the state of the economy (see Auerbach and Gorodnichenko (2012)).

[14] This corresponds to the maximum number of lags feasible in the estimation of the regime-switching VAR. As shown in Figure (7) AIC, HQC and SIC criterion for the non-linear VAR all favor five lags, but the likelihood function is rather flat for one to five lags.

$F(z_t)$, depending on the state variable, denoted by z_t, and the parameter γ. Ω_t is the covariance matrix of the residual vector, u_t, and is also a state weighted average of its state dependent counterparts. The functional form of $F(z_t)$ is chosen such its values are bounded between 0 and 1. Thus, the weighted sum spans a continuum of states between the calm state and the crisis state as extremes with the function values $F(z_t) \approx 0$ and $F(z_t) \approx 1$, respectively. The state variable, z_t is demeaned and its variance is normalized to 1. Figure (3) shows the crisis weights in the sample period. Auerbach and Gorodnichenko (2012) point out that, although, in principle, it is possible to estimate $\{\gamma, A_{CA}(L), A_{CR}(L), \Omega_{CA}, \Omega_{CR}\}$ simultaneously, such a identification of γ is not reliable as the value of the parameter depends on non-linear moments and may hence be sensitive to few observations.[15] This is particularly relevant for this study, as the sample period is quite short. Accordingly, I search a grid of different fixed values for γ, and estimate $\{A_{CA}(L), A_{CR}(L), \Omega_{CA}, \Omega_{CR}\}$ conditional on γ. The larger the value of γ, the more pronounced the weight differences between calm and crisis times. For low values the results are very sensitive to changes in the parameter value. For values smaller than 3, the dynamics after a fiscal shock are explosive. For values above 3, the dynamics are stationary, and sign and size of the median responses to shocks are robust to changes in the parameter value, and only the size of the confidence intervals changes. In the baseline calibration I use $\gamma = 4$.[16]

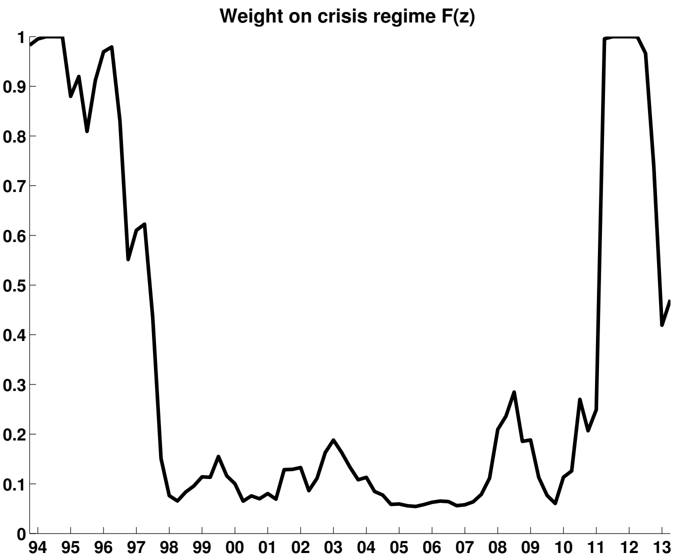

Figure 3: F_z - Weight on the crisis regime

[15] In several trial runs, I found that the mean estimate for γ is sensitive to the initial condition of the parameters and does not converge even in very long chains.

[16] Results for $\gamma \in [3, 6]$ are presented in the Appendix.

The maximum likelihood estimation uses the MCMC approach by Chernozhukov and Hong (2003) for estimation and inference. Since the chains converge only slowly to stationary distributions, I use 500,000 draws for the estimation of the baseline specification and the robustness estimates and discard the first third of the chain.[17] Further details of the estimation method are provided in Auerbach and Gorodnichenko (2012) and Chernozhukov and Hong (2003).

For the impulse responses, I draw the covariance matrices and lag polynomials directly from the simulated chain, taking 1000 draws. To identify the structural shocks in each regime, I place three identifying restrictions on the contemporaneous reaction of the variables to the shocks.

First, I assume that the growth of public debt does not react contemporaneously to changes in sovereign risk. This assumption can be justified by noting that the public debt service, and thus public debt growth, is only affected by the shock to the extent that it changes the coupon or principal of bonds that are issued after the shock. As the average amount of Italian government bonds issued within a quarter is small relative to the existing public debt stock, [18] and most bonds only pay either principal or coupon after three or six months, the effect of a sovereign risk shock on public debt in the same quarter is virtually zero.

Following Blanchard and Perotti (2002), I exploit the fact that the fiscal authorities react to changes in economic conditions such as interest rates and output with a delay. Fiscal policy measures need to be prepared by the executive branch of the government, discussed within the government, the ruling parties, and finally in the parliament. When they are passed by the legislative, it takes additional time to implement these policies. Thus, it is reasonable to assume that any discrete policy measures that are undertaken in response to risk shocks or output shocks are not yet effective in the quarter in which the shock hits. For the contemporaneous reaction of public debt growth to an output shock I therefore follow Blanchard and Perotti (2002), by approximating the contemporaneous reaction of the debt growth to output growth by its average over the sample period.[19]

The third restriction is a zero-restriction on the contemporaneous reaction of output growth to changes in the spread, akin to the zero restriction on the reaction of

[17] Figure (5) depicts the chains for the parameter estimates and the distribution of the draws.

[18] The average maturity of Italian government bonds in the sample period is roughly 5 years.

[19] Blanchard and Perotti (2002) specify their VAR in log-levels, and use the average elasticity of taxes to output to proxy the contemporaneous reaction of taxes to changes in output. As I specify my VAR in growth rates, I take the average reaction of debt growth to output growth, -0.257.

output to the monetary policy rate often applied in SVAR studies.[20]

4 Results

Figure (4) shows the impulse responses to a contractionary fiscal shock in the form of a shock to the growth rate of public debt. The shock has the magnitude of 1 percentage point. The median responses are plotted as solid lines, and the dashed lines show the 90% confidence intervals for the horizon of 20 quarters after the shocks. Note, that while the crisis weights for the Italian economy vary over the sample period, impulse response functions are simulated for the illustrative extreme cases of the crisis regime $F(z_t) = 1$ and the calm regime $F(z_t) = 0$. Responses are plotted in blue for the calm regime and in red for the crisis regime. The differences in the responses to shocks across the regimes is quantitatively and qualitatively important, throughout all the presented shocks and specifications.

The second row of figure (4) shows the responses of output growth. Output growth reacts stronger to the fiscal shock in the calm regime than in the crisis regime. The maximum drop of median output growth is reached at the fifth quarter at -0.966%. The response in the crisis regime is markedly different. Here median output growth reaches its trough at -0.321%. Interestingly, in the calm regime, the initial response of output to the contractionary fiscal shock is a slight increase (by 0.136%), and is thus in favor of the expansionary contraction hypothesis. However, this result is not statistically significant and short-lived, as the median response turns negative after the second quarter. Table (1) shows the fiscal impact multipliers and the cumulative multipliers for the horizon of one, two and three years, measured as change in output in Euro per change in debt in Euro. The impact multipliers are close to zero and insignificant for both regimes. In the calm regime, the cumulative multiplier over the horizon of one year is still small and insignificant. With a longer horizon it becomes larger and significant. At the horizon of three years, the median cumulative multiplier exceeds 1.0. In contrast, in the crisis regime, the cumulative multipliers over the horizon of one year are positive and significant, but still close to zero. At the horizon of three years it reaches 0.263, and is thus still far lower than in the calm regime.
The overall smaller multipliers in the crisis regime show that that the presence of sovereign risk attenuates the effects of fiscal consolidations on output, and can be taken as evidence that supports theoretical arguments that make case that fiscal retrenchment is less harmful, when the fiscal sustainability is doubted. While I do not find support for negative multipliers, as claimed by the EFC, my results are consistent with the theoretical result by Corsetti, Kuester, Meier, and Müller (2013).

[20] This assumption allows for a contemporaneous effect of changes in the slow-moving variable, output growth, on the fast-moving variable, the spread.

The results share some features with the findings of other fiscal SVAR studies on Italian data. In a linear SVAR, Giordano, Momigliano, Neri, and Perotti (2005) find small and insignificant impact multipliers as well as relatively high cumulative multipliers, as I do for the calm regime. In their regime-switching study which focusses on recessions and expansions, Batini, Callegari, and Melina (2012) find small multipliers across regimes for the tax shocks they construct, as well as for their government spending shocks in expansions. However, they find impact multipliers larger than one for government spending shocks in the recession regime.

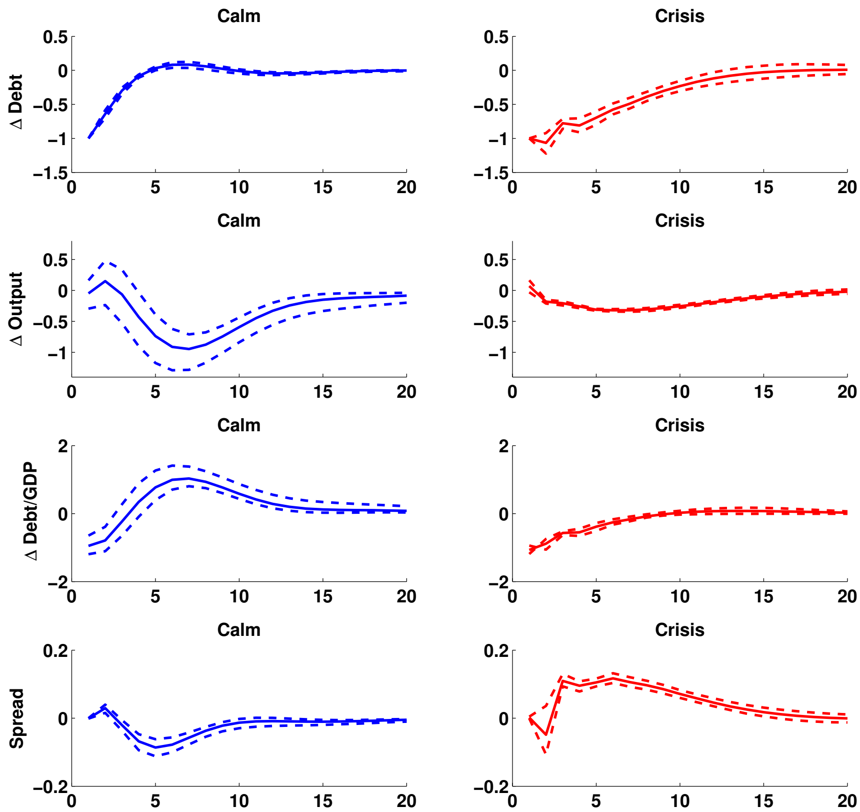

Figure 4: Impulse response of growth rate of real public debt, real output growth, debt-to GDP growth and the sovereign risk spread to a 1 percentage point increase in the growth rate of public debt. The dashed lines show the 90% confidence intervals. The reaction of all variables are in percentage values

Table 1: Cumulative Fiscal Multipliers

$\Sigma_h Y_h / \Sigma_h D_h$*	Crisis Regime			Calm Regime		
Horizon	median	5th %ile	95th %ile	median	5th %ile	95th %ile
1 quarter	-0.055	-0.143	0.033	0.049	-0.125	0.261
1 year	0.091	0.042	0.133	-0.058	-0.339	0.496
2 years	0.193	0.165	0.216	0.692	0.012	1.381
3 years	0.263	0.246	0.277	1.395	0.543	2.190

*Accumulated change in GDP (in Euro) per accumulated change in public debt (in Euro)

Empirical studies which assess the influence of high public debt on the effect of fiscal shocks in a panel of countries, find strong differences for low-debt and high-debt countries. For instance, in their panel SVAR, Ilzetzki, Mendoza, and Végh (2013) find that for the high-debt countries in their sample, the long-run fiscal multiplier is roughly minus three, while for low-debt countries it is minus 0.36. Perotti (1999) finds that higher debt lowers the impact multiplier by 1.61. Thus difference in the cumulative multipliers that I find across regimes is consistent with their results.

A further difference between the regimes lies in the persistence of response of debt growth to the fiscal shock. The first panel of figure (4) shows that the effect on the growth rate of debt is rather short-lived in the calm state. Debt growth returns to its stationary state after 5 quarters. This low persistence of the debt-growth shock is in line with results by Giordano, Momigliano, Neri, and Perotti (2005) who find the same property for shocks to government purchases, government wages, and net revenue in a linear fiscal SVAR on Italian data. In contrast, in the crisis regime, the response is far more persistent, and public debt only converges to its initial growth path after 20 quarters.
In the calm regime, the growth of the debt to GDP ratio decreases initially, but turns positive after four quarters and reaches its trough at 1.04 in the median in the seventh quarter after the shock before the effect dies out and it returns to its initial growth path. The finding that for some part of the time horizon the response of debt-to-GDP growth is positive is due to the higher identified persistence of the output response in contrast to the response of debt. In the crisis regime, the contractionary fiscal shock causes a persistent decline in the growth rate of debt-to-GDP.

After an initial increase, the response of the risk spread to the shock in the calm regime falls in the second quarter and stays negative thereafter. In the crisis regime, the initial response of the spread is negative and thus in line with the common assumption in the theoretical literature that the risk spread decreases with lower debt.

However, in the second quarter it rises again, overshoots and stays positive thereafter. The subsequently higher spread in response to a persistent negative debt shock is an odd finding. A possible explanation could be that the fiscal retrenchment is associated with higher political instability, which would be captured by the spread. However, any attempt to explain the reaction of the spread, remain purely speculative, at this stage.

5 Conclusion

The main goals of this paper were to characterize the dynamic effects of a contractionary fiscal shock during and outside a sovereign risk crisis. This study presents empirical evidence which should serve as a stepping stone for understanding the working of fiscal policy in a sovereign risk crisis. From the econometric analysis I draw the following main conclusions.

The contractionary impact on output of fiscal contractions in the form of a negative shock to public debt growth, is weaker in crisis times than outside sovereign risk crises. While, I find that while impact multipliers are close to zero and insignificant for both regimes, for a time horizon longer than one year, the cumulative multipliers are lower in the crisis regime. As is common for fiscal SVARs on Italy, multipliers are rather low across regimes.

While I do not find support for negative multipliers, as claimed by the EFC, my results are consistent with the theoretical argument by Corsetti, Kuester, Meier, and Müller (2013). that in cases of sovereign risk, the negative output effects of fiscal retrenchment are attenuated by gains in macroeconomic stability.

With regard to the current eurozone crisis, my results give a different picture of fiscal multipliers in crisis than studies that focus on the influence of underlying output dynamics, instead on variations in sovereign risk. When assessing the effects of fiscal retrenchment, it is recommended to keep both empirical results in mind. The results of this paper serve to emphasize the role of sovereign risk, as an additional determinant for the effectiveness of fiscal policy.

Caveats of this study are the short sample and that I focus exclusively on Italian data. Ilzetzki, Mendoza, and Végh (2013) and Baum, Polawski-Ribeiro, and Weber (2012) find vastly different fiscal multipliers for different countries. It is likely that the same heterogeneity across countries applies for fiscal multipliers in sovereign risk periods. However, the focus on sovereign risk makes an analysis of other countries difficult, as Italy presents the rare case of a country with a prolonged history of sovereign risk, no default, and available data for this time. While, my results are thus not one-to-one transferrable to other countries, they can serve as supporting evidence for theoretical arguments that link the presence of sovereign risk to lower fiscal multipliers. With the growing availability of longer macroeconomic and fiscal time-series data for a larger panel of countries, it will be fruitful to investigate further into the relation between sovereign risk and the size of fiscal multipliers, and to compare the results for different countries and different fiscal instruments.

Appendix

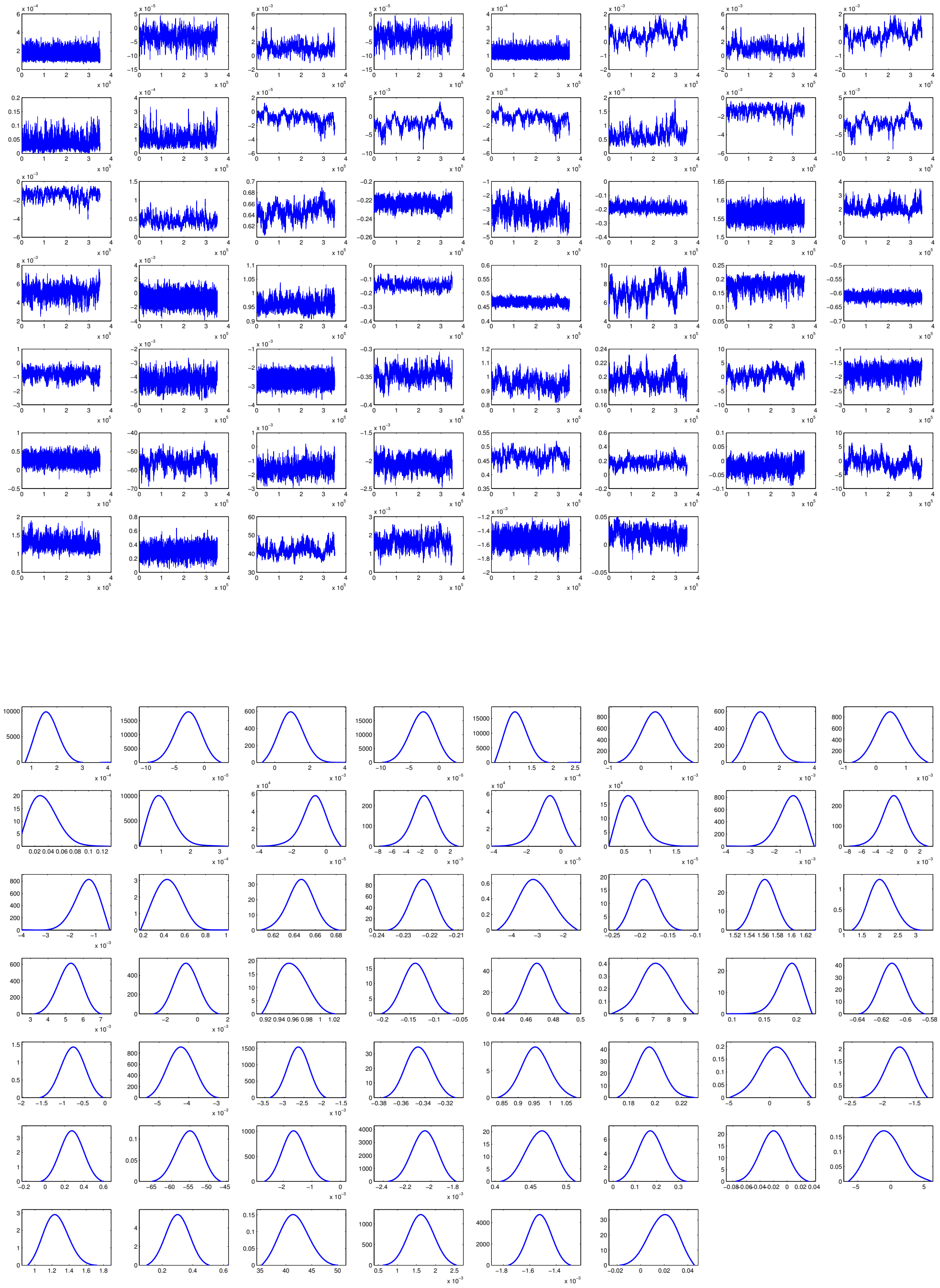

Figure 5: Above: Markov chains of the parameter estimates of the reduced form VAR of the baseline specification–Below: distribution of the draws from the Markov chains above

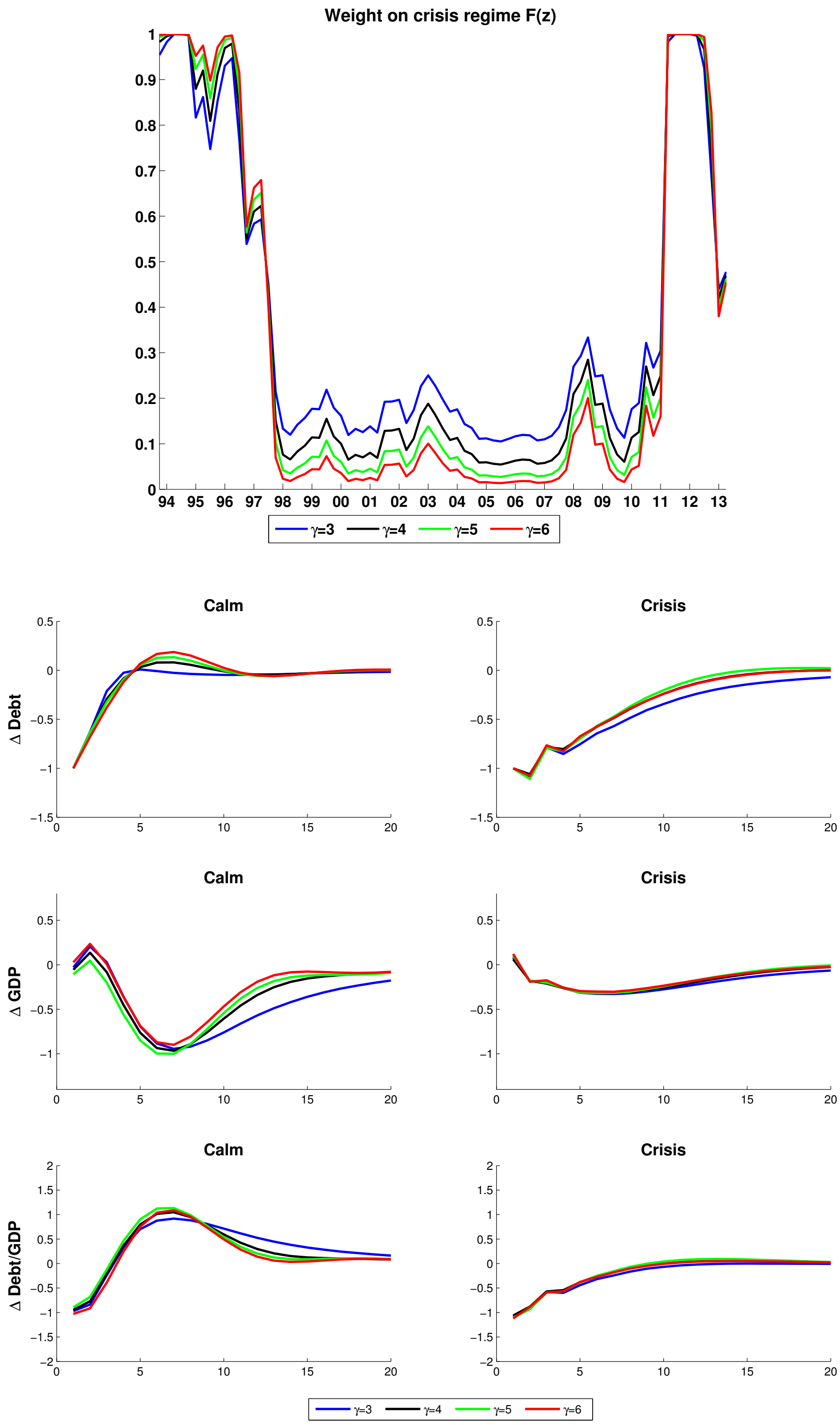

Figure 6: Weight on the crisis regime and median impulse response to a 1 percentage point decrease in the growth rate of public debt for $\gamma \in [3, 6]$

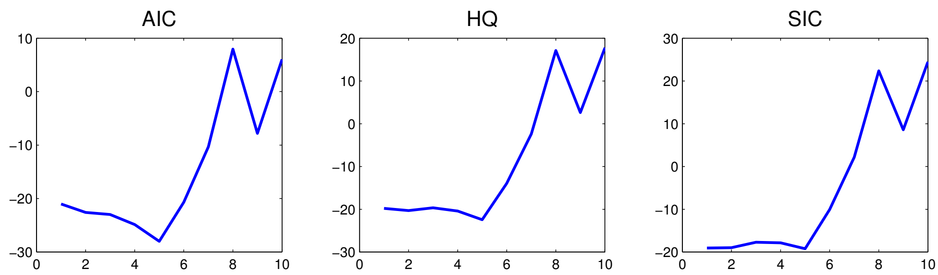

Figure 7: Selection criteria for the lag order of the VAR: Akaike criterion, Hannan Quinn-Criterion and Schwarz Information Criterion

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