Smells Like Fiscal Policy? Assessing the Potential Effectiveness of the ECB's OMT Programme

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Abstract

This paper explores the potential effectiveness of the ECB's Outright Monetary Transactions (OMT) programme in safeguarding an appropriate monetary policy transmission. Since the programme aims at manipulating bank lending rates by conducting sovereign bond purchases on secondary markets, a stable relationship between bank lending rates and government bond rates is of prime importance. Using vector autoregressive models with time varying parameters (TVP–VAR) we evaluate the stability of this relationship by focusing on the reaction of bank lending rates to movements in government bond rates over the period 2003–2013. Our results suggest that the potential success of the OMT in restoring the monetary transmission mechanism is limited as the link between bank lending rates and government bond rates has significantly weakened over time.

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"Within our mandate, the ECB is ready to do whatever it takes to preserve the euro. And believe me, it will be enough."

– Mario Draghi, 12th July, 2012

1   Introduction

The European Central Bank (ECB) launched its Outright Monetary Transactions (OMT) programme on September 6, 2012 to safeguard an appropriate monetary policy transmission (European Central Bank, 2012a). Tensions emerged as banks in the euro area have become reluctant to decrease lending rates after mid 2008 despite the vigorous cut in policy rates, which has hampered the transmission of impulses coming from the accommodative monetary policy.[1] The OMT is aimed at reestablishing an efficient transmission of monetary policy to the real economy by means of sovereign bond purchases on secondary markets, which seek to lower bank lending rates by reducing government bond rates.

This paper explores the potential effectiveness of the ECB's OMT programme in restoring the monetary transmission mechanism. Using vector autoregressive models with time varying parameters (TVP-VAR) for several euro area periphery countries we examine the reaction of bank lending rates to movements in government bond rates. The strength and the stability of the relationship between these interest rates is of major importance in the context of the OMT programme. For, if the link between sovereign bond yields and loan rates turns out to have been very weak or even negligible over the past couple of years, then tensions in some periphery countries' bond markets should not be viewed as the primary reason for the irresponsiveness of that countries loan rates to monetary policy. Accordingly, in that case, it would be highly questionable whether the announcement of the OMT programme was necessary at all and whether its potential benefits in terms of lowering loan rates through announcements or even actual interventions in sovereign bond markets can outweigh the potential risks associated with this new measure of the ECB.

The OMT programme of the ECB is officially aimed at sovereign bond markets in euro area member countries, which face difficulties in issuing government bonds at sustainable interest rates due to tensions that possibly originate from fears of the reversibility of the euro (European Central Bank, 2012b). OMTs are in principle

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[1]The ECB identified obstacles in the monetary transmission mechanism as the spreads between bank lending rates over money market rates started to increase sharply since the mid of 2008 albeit the policy rate on the main refinancing operations was reduced by 375 basis points between July 2008 and May 2013. See Hristov, Hülsewig, and Wollmershäuser (2012), Aristei and Gallo (2012) or Blot and Labondance (2013) for a discussion.

unlimited (Deutsche Bundesbank, 2012), however, a precondition for support will be compliance with a EFSF/ESM programme that embeds strict conditionality (Petch, 2013). The programme will be concentrated on purchases of government bonds referring to the shorter part of the yield curve, with maturities of between one and three years.[2]

The OMT programme rests on the notion that lending rates set by banks are influenced by movements in government bond rates (European Central Bank, 2012a). Thus, bank lending rates in euro area member countries may react differently to a decline in policy rates due to fears of adverse developments affecting the sovereign that undermine the monetary transmission mechanism by causing widening differences of government bond rates. The link between bank lending rates and government bond rates is explained by the impact of government bond markets on financing conditions (Neri, 2013; Albertazzi, Ropele, Sene, and Signoretti, 2012; European Central Bank, 2012a). First, banks may suffer from write–offs in their balance sheets after a devaluation of sovereign bonds, which possibly deteriorates the capital position. Second, the rating of banks may be downgraded following a reduction in the rating of the sovereign causing an increase of the risk premium on external financing. Third, the collateral base of banks may be damaged due to tensions in sovereign bond markets which limits the access to liquidity. Finally, fourth since savers may regard sovereign bonds as close substitutes for deposits, an increase in sovereign bond rates likely triggers a raise in deposits rates. Consequently, bank lending rates may increase due to distortions in sovereign bond markets that cause raising deposit rates. The OMT is aimed at removing the adverse consequences of these effects on the transmission of monetary policy that become relevant once sovereign risk intensifies.

However, in the view of critics like Weidmann (2013), Sinn (2013), Konrad (2013), Fuest (2013) or Uhlig (2013), the ECB has breached its mandate by announcing potentially unlimited sovereign bond purchases. The OMT programme constitutes a step too far into the terrain of fiscal policy (Siekmann and Wieland, 2013), which violates European law (Art. 123 paragraph 1 TFEU) according to which monetary financing of sovereign entities is strictly prohibited. Political independence of the ECB is jeopardized by the support of fiscal policies in euro area crisis countries as selected sovereign bond purchases may give rise to moral hazard because of a lack of pressure to implement necessary structural reforms due to subsidized sovereign bond rates (Konrad, 2013; Fuest, 2013). The task of the ECB excludes the guarantee that euro area member countries remain sovereign (Weidmann, 2013). Distributional effects across euro area member countries likely emerge.

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[2]European Central Bank (2012b) for a survey of the modalities of OMTs.

Since the OMT is concentrated on sovereign bond purchases for euro area crisis countries this counteracts the neutrality of monetary policy (Sinn, 2013). Moreover, the adherence of the OMT to the compliance of euro area crisis countries with a EFSF/ESM programme is hardly credible (Uhlig, 2013). Euro area crisis countries may refuse to fulfill any obligations but still benefit from sovereign bond purchases, which are conducted to avoid contagion effects. Accordingly, conditionality in case of euro area crisis countries moving to the edge of national bankruptcy is likely sacrificed (Konrad, 2013). A reallocation of resources across euro area member states may be the consequence. Finally, monetary policy transmission is characterized by intricacies. Thus, differences in the level of sovereign bond rates may potentially reflect economic fundamentals rather than a broken monetary transmission mechanism (Deutsche Bundesbank, 2012). A quantitative proof concerning the irrationality of the spreads between sovereign bond rates is impossible to provide.

In contrast, supporters of the ECB's OMT programme like De Grauwe (2013) emphasize that the OMT enables the monetary authorities to act as a lender of last resort in the government bond markets, which eliminates the risk of a liquidity squeeze. Financial markets are frequently characterized by multiple equilibria (Fratzscher, Giavazzi, Portes, Weder di Mauro, and Wyplosz, 2013), where fundamentals of sovereigns are judged differently such that more than one price charged on sovereign debt may exist. The announcement of the OMT has induced a shift to a favorable equilibrium due to the commitment of unlimited sovereign bond purchases (Giavazzi, Portes, Weder di Mauro, and Wyplosz, 2013), which has immediately stopped the increase in sovereign bonds spreads. Moreover, signaling the willingness to take over sovereign liquidity risk has contributed to restore financial market confidence. Fratzscher (2013) points out that the OMT programme enables the ECB to fulfill its primary objective of maintaining price stability. The use of unconventional monetary policy measures such as sovereign bond purchases is required during a crisis to ensure that the monetary transmission mechanism functions. Thus, the OMT is a monetary policy instrument, and not a fiscal policy tool (Fratzscher, Giavazzi, Portes, Weder di Mauro, and Wyplosz, 2013).

Our analysis abstracts from issues concerning the legitimacy of the ECB's OMT programme as we use an agnostic approach to assess the potential effectiveness of OMTs in restoring the monetary transmission mechanism. We focus on a number of euro area periphery countries to explore the reaction of bank lending rates offered to non–financial cooperations with different maturities to shocks in government bond rates over the period 2003–2013 in order to assess the stability of the link between these interest rates. The set of countries includes Ireland, Italy, Portugal and Spain,

which might be considered as possible candidates for the OMT programme.[3] Overall, our results suggest that the potential effectiveness of the OMT programme in safeguarding an appropriate monetary policy transmission is limited. While bank lending rates reacted only sluggishly to changes in government bond rates before the start of the government bond market turmoil in 2010, their responsiveness to movements in sovereign bond rates has even significantly weakened thereafter. For example, a decrease of one percentage point in the interest rate on peripheral government bonds with maturities of 1 to 3 years induced a decrease in the short–term periphery bank lending rate of about $-.4$ percentage points after 4 months in 2006, but only a decrease of $-.2$ percentage points after 4 months in 2013.

So far, only a few number of studies focusing on euro area member countries have analyzed the reaction of bank lending rates to changing government bond rates after the outbreak of the sovereign debt crisis at the beginning of 2010. Neri (2013) estimates autoregressive distributed lag (ADL) models to explore the responsiveness of bank lending rates to tensions in sovereign debt markets over the period 2003–2011 by using the seemingly unrelated regression (SUR) method. Sovereign risk is measured by means of the spread between the yields on government bonds and the 10–year swap rate of equal maturity. His findings depart from ours as he reports that the impact on bank lending rates in the euro area periphery countries arising from increasing government bond rates due to tightening sovereign risk has significantly raised over time. Moreover, he concludes that *"… if the system of equations […] is estimated over the period 2003–2007 the parameters measuring the pass–through of changes in the sovereign spreads to bank lending rates in all the countries considered are not statistically different from zero. This is in accordance with the thesis that prior to the crisis government bond yields had little importance for banks' price setting policies for short-term loans"* (Neri, 2013, p. 14). The latter finding is at odds with the view of the ECB, which justifies the OMT programme by arguing that government bond markets *"… are very relevant in determining the financing conditions of banks"* (European Central Bank, 2012a, p. 7).

Zoli (2013) estimates a VAR model for Italy to evaluate the reaction of bank lending rates to sovereign spreads over the period 2006–2012. Her findings suggest that changes in sovereign spreads quickly affect bank lending rates. Albertazzi, Ropele, Sene, and Signoretti (2012) provide similar results. However, a drawback of these studies is the assumption of model parameter stability over time since potential distortions that likely arose during the financial market turmoil in 2008 are neglected. Hristov, Hülsewig, and Wollmershäuser (2012) show that bank lending

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[3]Note that we exclude Greece from the analysis because of a lack of data.

rates in the periphery euro area member countries were significantly affected by the systematic increase in the volatility of structural shocks since 2008 and additionally that shocks particularly related to the financial crisis, such as loan supply shocks, became more relevant. The findings of Neri (2013) provide support for this result, at least by showing that the transmission of tensions in sovereign debt markets to bank lending rates has changed over time. Thus, the assumption of parameter stability seems doubtful. Therefore, in this study we employ a time-varying parameter VAR setup that allows us to account for dynamics of the pass–through from bond to loan markets.

The following policy implication can be drawn from our findings. Although the ECB's OMT programme had immediate success in lowering sovereign bond rates in euro area periphery countries (Draghi, 2013; Giavazzi, Portes, Weder di Mauro, and Wyplosz, 2013), the potential effectiveness of the programme in restoring the monetary transmission mechanism seems doubtful. According to our results, a significant drop in bank lending rates induced by OMTs would require continuous government bond purchases, which, however, would come along with a number of serious problems: (i) they could potentially undermine the incentives for governments to impose structural reforms, (ii) the monetary financing prohibition laid down in Art. 123 paragraph 1 TFEU could be potentially violated as ongoing purchases of sovereign bonds would directly affect the conditions at which governments can issue debt, and (iii) intensive government bond purchases could expose risk to the central bank balance sheet that might impose threats to the political independency of the monetary authority and eventually lead to fiscal redistribution among the euro area member countries. Comparing the consequences of the problems related to OMTs with their potential chances of success, the ECB may rather impose alternative monetary policy measures that are more suitable to restore the monetary transmission mechanism without going too far into the terrain of fiscal policy.

The reminder of the paper is organized as follows. Section 2 outlines the TVP–VAR model setup. We provide an overview of the model framework, introduce the data base and discuss the model specification strategy. In Section 3 we present our empirical results for a number of selected periphery euro area member countries that might be considered as possible candidates for the OMT programme. Moreover, we discuss the implications of our results and conduct a robustness check. Section 4 summarizes and concludes.

2 TVP–VAR Model Setup

2.1 Model Framework

We use TVP–VAR models for selected euro area periphery countries to explore the reaction of bank lending rates to shocks in government bond rates over time. We refer to Primiceri (2005), Nakajima (2011) and Nakajima, Kasuya, and Watanabe (2011) for a full–fledged discussion of the framework. The use of models with both time–varying coefficient matrices and time–varying covariance matrices of the exogenous shocks has the advantage that the framework is flexible enough to cope with changes in the monetary transmission mechanism as well as with the huge distortions arising from crises, such as the financial crisis that erupted in 2008 and the sovereign debt crisis that started at the beginning of 2010.

Consider the reduced form TVP–VAR model:

$$Y_t = C_t + B_{1t}Y_{t-1} + \cdots + B_{kt}Y_{t-k} + u_t, \qquad t = k+1, ..., T, \qquad (2.1)$$

where Y_t is a $n \times 1$ vector of endogenous variables, C_t is a $n \times 1$ vector of time varying intercepts, B_{it} are $n \times n$ matrices of time varying coefficients with $i = 1, ..., k$ and k equal to the number of lags, and u_t is a $n \times 1$ vector of possibly correlated residuals.

Let Ω_t denote the covariance matrix of u_t, which can be decomposed as follows:

$$\Omega_t = A_t^{-1}\Sigma_t A_t^{-1\prime},$$

where A_t is a lower triangular matrix of the form

$$A_t = \begin{bmatrix} 1 & 0 & \ldots & 0 \\ \alpha_{21,t} & 1 & \ddots & \vdots \\ \vdots & \ddots & \ddots & 0 \\ \alpha_{n1,t} & \ldots & \alpha_{nn-1,t} & 1 \end{bmatrix}$$

and Σ_t is a diagonal matrix

$$\Sigma_t = \begin{bmatrix} \sigma_{1t} & 0 & \ldots & 0 \\ 0 & \sigma_{2t} & \ddots & \vdots \\ \vdots & \ddots & \ddots & 0 \\ 0 & \ldots & 0 & \sigma_{nt} \end{bmatrix}.$$

Following Primiceri (2005) the structural shock is identified recursively via

$$u_t = A_t^{-1} \Sigma_t^{\frac{1}{2}} \varepsilon_t,$$

and $\text{Var}(\varepsilon_t) = I_n$. The TVP–VAR model (2.1) can be rewritten as:

$$
\begin{aligned}
Y_t &= X_t' B_t + A_t^{-1} \Sigma_t^{\frac{1}{2}} \varepsilon_t \\
X_t' &= I_n \otimes [1, Y_{t-1}', ..., Y_{t-k}'],
\end{aligned}
\tag{2.2}
$$

where B_t is a stacked vector containing all coefficients of the right hand side of (2.1) and $\otimes$ denotes the Kronecker product. The model parameters are assumed to follow a random walk process (Primiceri, 2005):

$$
\begin{aligned}
B_t &= B_{t-1} + \nu_t \\
\alpha_t &= \alpha_{t-1} + \zeta_t \\
\log \sigma_t &= \log \sigma_{t-1} + \eta_t,
\end{aligned}
$$

where α_t denotes a stacked vector of the lower triangular elements in A_t and σ_t is the vector of the diagonal elements in Σ_t. The random–walk specification is used in most studies resorting to the TVP-VAR approach. All innovations in the model are assumed to be jointly normally distributed with variance–covariance matrix

$$
\Xi \equiv Var([\varepsilon_t \ \nu_t \ \zeta_t \ \eta_t]') =
\begin{bmatrix}
I_n & 0 & 0 & 0 \\
0 & Q & 0 & 0 \\
0 & 0 & S & 0 \\
0 & 0 & 0 & W
\end{bmatrix}.
$$

Following Nakajima (2011), we further reduce the parameter space by assuming the covariance matrices Q, S and W to be diagonal.

2.2 Data

We employ monthly data for a number of euro area periphery countries covering the period 2003M1–2013M4. The countries include Ireland, Italy, Portugal and Spain.[4] Since our analysis is aimed at elaborating the reaction of bank lending rates to changes in government bond rates we use a bivariate model $Y_t = [\text{GBR}_t, \text{BLR}_t]'$, where GBR_t denotes the government bond rate and BLR_t is the bank lending rate. The government bond rates are monthly averages, calculated from the FTSE Global

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[4]Note that we neglect Greece due to a lack of data.

Government Bond Indices with an average maturity of one to three years. The choice of this time period is related to the modalities of the OMT programme according to which only the shorter part of the yield curve, with maturities between one and three years are considered (European Central Bank, 2012b). The series for the government bond rates are taken from the Thomson Reuters DataStream database. The bank lending rates refer to interest rates on new business loans to non–financial corporations (excluding revolving loans and overdrafts, convenience and extended credit card debt), with a maturity of up to one year (`BLR -1Y`) and over one year (`BLR +1Y`). The series are taken from the ECB's harmonized MFI interest rate statistics (see Appendix A for further information on the time series).

In order to economize on computing time we refrained from estimating a TVP–VAR model for every periphery euro area member country that would possibly be eligible for the OMT programme. Instead, we calculated average interest rates for the periphery countries by using national nominal GDPs as weights.[5]

2.3 Model Specification and Priors

The TVP–VAR model setup leaves various degrees of freedom regarding the exact specification of the lag length considered and the informativeness of the priors for the degree of time–variation in the coefficient matrices and covariance matrices. This ambiguity makes a thorough model selection process particularly important. The lag length k of each TVP–VAR model is set equal to 2 and is determined using the Schwarz information criterion, that is computed from a constant–parameters model estimated over the entire sample from 2003M1–2013M4.

The priors for the diagonal elements of the hyperparameters Q, S and W are assumed to be distributed as (independent) inverse–Gamma while the priors for the initial states of the time varying VAR–parameters, B_0, α_0 and $\log \sigma_0$, are chosen to be normal (see Primiceri, 2005; Nakajima, 2011, and others). In particular, we parameterize the prior distributions as recommended by Primiceri (2005):

$$B_0 \sim N(\hat{B}_{OLS}, 4 \cdot V(\hat{B}_{OLS})),$$
$$\alpha_0 \sim N(\hat{\alpha}_{OLS}, 4 \cdot V(\hat{\alpha}_{OLS})),$$
$$\log \sigma_0 \sim N(\log \hat{\sigma}_{OLS}, I_n \cdot 10),$$
$$Q \sim IG(k_Q^2 \cdot 36 \cdot V(\hat{B}_{OLS}), 36),$$
$$S \sim IG(k_S^2 \cdot 2 \cdot V(\hat{A}_{OLS}), 2),$$
$$W \sim IG(k_W^2 \cdot 3 \cdot I_n, 3),$$

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[5]See Appendix A for a description of the respective country weights adopted.

where $\hat{B}_{OLS}$, $\hat{\alpha}_{OLS}$ and $\hat{\sigma}_{OLS}$ are the OLS–estimates of B, A and σ based on a time invariant VAR estimated on a training sample covering the first 36 months of the complete sample. $V(\hat{B}_{OLS})$ and $V(\hat{\alpha}_{OLS})$ are the vectors containing the variances of $\hat{B}_{OLS}$ and $\hat{\alpha}_{OLS}$ obtained from the same OLS estimation. B_0, α_0 and $\log \sigma_0$ and their corresponding variances are used as a starting values in the Carter–Kohn algorithm used to infer the paths of B_t and α_t and the Metropolis-Hastings algorithm used to compute the path of σ_t.[6]

Since our sample is relatively short, the scaling parameters k_Q, k_S and k_W can have non-negligible effects on the estimated time variation in the VAR coefficients. Accordingly, caution is warranted when selecting values for these parameters. Since there are no economic reasons for preferring one (k_Q, k_S, k_W) combination over another, we base our parametrization on a formal statistical criterion. In particular, we evaluate the marginal likelihood for our TVP–VAR model at each point of the three dimensional grid defined by $k_Q = \{0.005, 0.01, 0.025, 0.05, 0.075, 0.100, 0.125\}$, $k_S = \{0.001, 0.01, 0.05, 0.1, 0.5, 1.0, 2.0, 4.0\}$, $k_W = \{0.05, 0.10, 0.25, 0.5, 1.0, 2.0, 5.0\}$ and choose the combination of (k_Q, k_S, k_W) with the highest marginal likelihood.[7]

The posterior distributions as well as various statistics of interest are computed by means of a Markov Chain Monte Carlo (MCMC) algorithm described in Appendix B. We choose the number of Markov–Chain samples such that all Markov chains converge according to the Geweke criterion,[8] using a burn-in rate of 20 %.

Tables 1 and 2 show the marginal likelihood of selected prior specifications. For the TVP–VAR model with short–term bank lending rates (`BLR -1Y`, see Table 1) the highest marginal likelihood is obtained when setting (k_Q, k_S, k_W) equal to $(0.05, 0.05, 1.0)$, which henceforth will be our baseline specification. Since already small deviations in k_Q and k_W from the baseline values lead to significant decreases in the marginal likelihood, we are quite confident with the choice of these hyper-parameters. By contrast, deviations of k_S from 0.05 (keeping k_Q and k_W at their baseline values) only marginally deteriorates the marginal likelihood, which induces us to check the robustness of our empirical results with respect to alternative values for k_S (equal to 1 and 0.01). The baseline model of the TVP–VAR model with long–term bank lending rates (`BLR +1Y`, see Table 2) uses priors for (k_Q, k_S, k_W) equal to $(0.075, 0.05, 0.5)$. In contrast to the shorter maturity loans, the prior specification for longer maturity loans is more clear cut, as deviations from the baseline model along all three dimensions lead to strong decreases in the marginal likelihood.

In addition, it is important to note that for both models the use of a time–

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[6]See Appendix B for details.

[7]See Appendix C for details on the computation of the marginal likelihood.

[8]See Geweke (1994) for a description of the statistic.

Table 1: Marginal likelihood of selected prior specifications (`BLR -1Y`)

	k_S	k_W 0.25	0.5	1.0	2.0	5.0
	4.000	-681.9	-668.9	-670.1	-670.2	-669.4
	1.000	-682.9	-667.5	-669.3	-676.4	-678.7
$k_Q = 0.1$	**0.050**	-674.3	-666.1	-666.3	-675.7	-672.3
	0.010	-674.2	-666.1	-666.1	-672.0	-690.9
	0.001	-703.4	-694.9	-688.5	-682.4	-693.2
	4.000	-979.7	-664.9	-659.5	-667.7	-672.0
	1.000	-677.4	-665.1	-656.3	-669.3	-674.4
$k_Q = 0.05$	**0.050**	-677.9	-663.7	**-655.3**	-664.1	-683.4
	0.010	-704.4	-663.6	-655.4	-663.7	-696.5
	0.001	-713.6	-696.5	-686.4	-682.2	-683.0
	4.000	-686.6	-671.7	-664.1	-668.6	-688.2
	1.000	-684.4	-672.9	-657.8	-668.1	-685.5
$k_Q = 0.01$	**0.050**	-684.0	-671.8	-658.4	-665.9	-674.7
	0.010	-684.2	-671.9	-657.9	-665.9	-686.3
	0.001	-711.7	-699.4	-687.0	-684.5	-686.0

Table 2: Marginal likelihood of selected prior specifications (`BLR +1Y`)

	k_S	k_W 0.25	0.5	1.0	2.0	5.0
	4.000	-748.2	-737.6	-736.0	-746.5	-751.4
	1.000	-746.0	-730.8	-729.3	-740.7	-758.3
$k_Q = 0.1$	**0.500**	-748.8	-736.3	-727.8	-747.5	-746.5
	0.050	-752.8	-734.4	-732.7	-736.6	-756.6
	0.001	-752.6	-743.5	-752.9	-755.6	-758.4
	4.000	-753.5	-739.2	-727.7	-743.8	-752.9
	1.000	-745.8	-731.5	-736.2	-739.1	-745.5
$k_Q = 0.075$	**0.500**	-746.0	-731.7	-738.4	-735.6	-749.8
	0.050	-747.2	**-722.0**	-729.1	-741.5	-744.5
	0.001	-747.6	-744.9	-753.4	-749.7	-766.1
	4.000	-749.1	-727.9	-728.4	-738.3	-749.7
	1.000	-744.9	-731.8	-733.2	-732.1	-744.4
$k_Q = 0.05$	**0.500**	-745.6	-730.6	-725.1	-742.3	-745.7
	0.050	-744.5	-732.8	-725.8	-737.1	-747.8
	0.001	-753.5	-747.3	-748.8	-761.9	-759.2

varying parameter set–up is largely confirmed by the data. If we choose hyper-parameters which are much smaller than in our baseline specification (for instance $(k_Q, k_S, k_W) = (0.01, 0.001, 0.25)$ for the model using short–term bank lending rates and $(k_Q, k_S, k_W) = (0.05, 0.001, 0.25)$ for the model using long–term bank lending rates), the marginal likelihoods significantly decrease (by 9% in the model using short–term bank lending rates and by 4% in the model using long–term bank lending rates). From this we conclude that a TVP–VAR model is strictly preferable to a standard VAR model with constant parameters.

3   Empirical Results

3.1   Impulse Response Functions

Figure 1 displays the time profile of the median impulse responses of the bank lending rate to a shock in the government bond rate. The z–axis measures the deviation of the bank lending rate from its steady state in percentage points, the x–axis displays the point of time on the basis of which the impulse response functions have been computed, and the y–axis shows the periods following the shock. Since for the estimation of the TVP–VAR model a training sample of 36 months was chosen and since the lag length k was set equal to two months, the first impulse response function is obtained for 2006M3. For the computation of the impulse responses we use the model parameters estimated for a specific point in time (as shown on the x–axis) and assume that these parameters remain constant over the impulse horizon. In order to isolate changes in the propagation of the shock from changes in the volatility of the shocks over time, the impulse responses are constructed so that in each month the bond rate shock is normalized to –1%. Figure 2 shows the same impulse responses, but using an individual graph for each response horizon, ranging from the impact response (impulse horizon 0) to 11 months following the shock. This way of illustrating the results allows us to plot the confidence intervals of the impulse response functions, which are computed as the 5 and 95% quantiles of the draws of the MCMC algorithm and which are depicted as shaded areas in Figure 2.

The graphs show that after a 1% drop of the government bond rate the bank lending rate immediately falls. While the impact reaction of the bank lending rate turns out to be rather stable over time, with an average reduction of the short–term (long–term) bank lending rate by 0.06 (0.22) percent, the response some months after the occurrence of the shock shows a pronounced time–varying pattern.
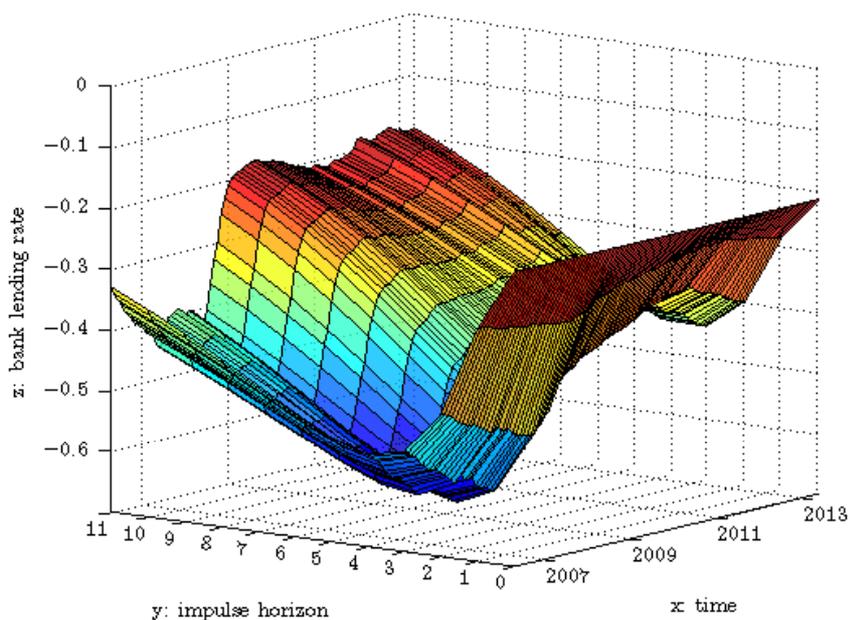
In the period up to mid–2008 the pass–through was highest with approximately

Figure 1: Bank Lending Rate Response to a –1% Government Bond Rate Shock
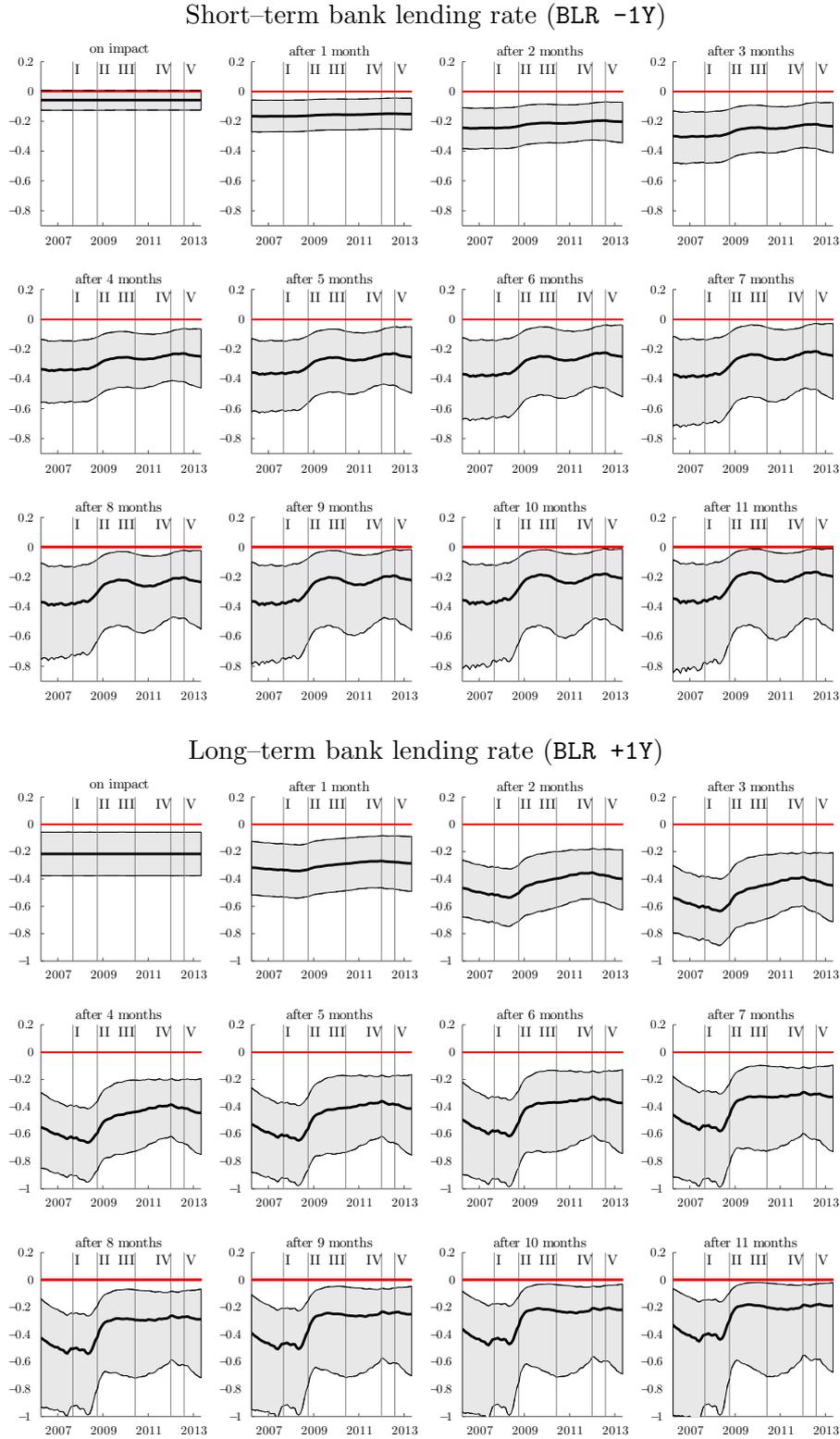
Short–term bank lending rate (`BLR -1Y`)
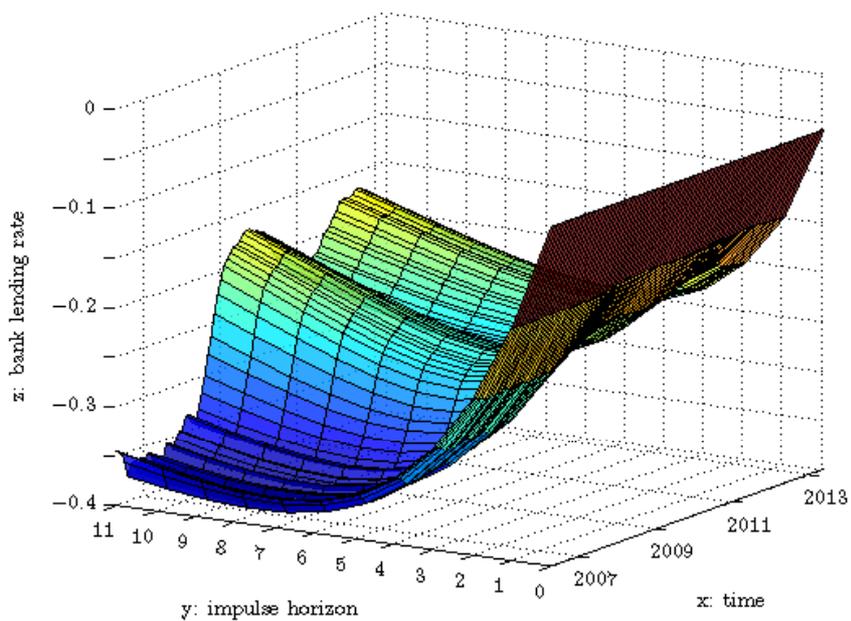
Long–term bank lending rate (`BLR +1Y`)

Notes: The graph plots the time–varying median response of the bank lending rate (as percentage deviation from its steady state) to a –1% shock of the government bond rate equation over the 12 months following the shock.

Figure 2: Bank Lending Rate Response to a –1% Government Bond Rate Shock

Short–term bank lending rate (`BLR -1Y`)

Long–term bank lending rate (`BLR +1Y`)

Notes: For each horizon the graph plots the response of the bank lending rate (as percentage deviation from its steady state) to a –1% shock of the government bond rate equation. The bold line is the median response; the shaded areas are the related 90% confidence intervals. The vertical lines enumerated by I to V mark important events occurring during the euro crisis.

40% (60%) of the initial bond rate reduction being reflected in short–term (long–term) bank lending rates after about 7 (4) months. While the impact of the government bond rate shock on short–term bank lending rates was very persistent, long–term bank lending rates declined by about 0.2 percentage points until the end of the response horizon. Interestingly, the beginning of the financial crisis in the summer of 2007 (vertical line I in Figure 2), when interbank–market credit spreads started to increase and when, as a consequence, the ECB adopted its first quantitative measures by offering a number of additional 3–month–LTROs, hasn't had any impact yet on the transmission of government bond rates on bank lending rates.

A quantitatively important change in the pass–through relationship was observed around September 2008, when the investment bank Lehman Brothers went bankrupt and when the ECB started to vigorously cut policy rates and to adopt its full allotment policy (vertical line II in Figure 2). The maximum fall in bank lending rates following the –1% shock of the government bond rate was significantly smaller thereafter and only reached about two thirds of the maximum pre–crisis decline; after one year the response even halved compared to the pre–crisis period. Thus, the world financial crisis marked a pronounced structural break in the transmission of government bond rates on bank lending rates.

The burgeoning euro crisis, which gained momentum in May 2010 (vertical line III in Figure 2) when government bond spreads of the euro area periphery countries sharply increased and when the ECB launched its Securities Markets Programme (i.e. the outright purchase of government bonds from the periphery countries), did not have any further impact on the link between government bond rates and bank lending rates, which continued to remain weak. The massive interventions of the ECB by the end of 2011, when it provided two long–term refinancing operations with full allotment and a maturity of 3 years each (vertical line IV in Figure 2) and the ECB's announcement of the OMT program in the summer of 2012 (vertical line V in Figure 2) did not fundamentally change this result. If anything at all, a slight increase in the pass–through can be observed. However, compared to the pre–crisis period the response of bank lending rates to shocks of the government bond rate remained significantly weaker.

3.2 Stochastic Volatilities

Instead of improving the transmission of monetary impulses by restoring a stronger link between government bond rates and bank lending rates, our estimates reveal that the main effect of the ECB's unconventional measures was a significant reduction of the uncertainty on government bond markets of the periphery countries.

Figure 3 shows that the increase in the estimated stochastic volatility of the government bond rate, which can be observed since the summer of 2007 and which accelerated since May 2010, started to decline significantly with the ECB's liquidity injection by the end of 2011.

Figure 3: Stochastic Volatilities
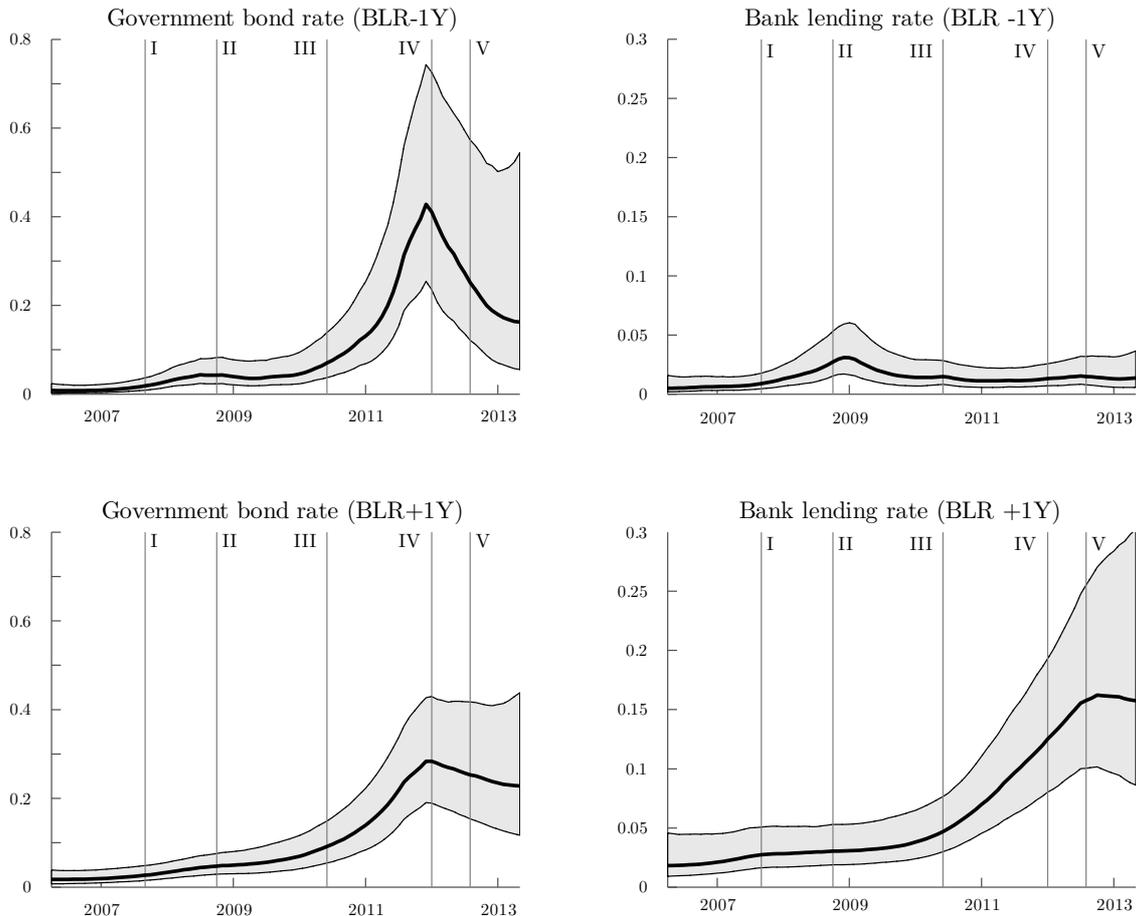
Notes: The graph plots the estimated stochastic volatilities $\hat{\sigma}_t$. The bold line is the median over all draws of the MCMC algorithm; the shaded areas are the related 90% confidence intervals. The vertical lines enumerated by I to V mark important events occurring during the euro crisis.

3.3 Policy Experiment

As shown above the pass–through from government bond to bank lending rates was significantly attenuated in the euro area periphery countries in the wake of financial and sovereign crisis. However, for policy makers it is important to understand both, the qualitative effects of the impaired pass–through as well as its quantitative implications. To illustrate the latter, we consider the following out–of–sample-simulation.

We assume that the ECB would have started buying periphery government bonds via the OMT programme in May 2013, i.e. the month following the end of our sample, in an amount such that periphery government bond rates would have fallen instantaneously and permanently to the level of the core countries, which was observed in April 2013. This implies that the counterfactual ECB intervention is assumed to be successful in fully eliminating the spreads of periphery government bond yields over core government bond yields. We then address the following two questions. First, how large should have been the intervention of the ECB? And second, how would have reacted periphery bank lending rates to such an intervention in the government bond market?

The upper two graphs of Figure 4 show the results of this counterfactual simulation for the TVP–VAR model with short–term bank lending rates (`BLR--1Y`) as endogenous variable using both, the estimated coefficients of the pre–crisis model (2006M3) and and those of the crisis model (2013M4). The lower two graphs show the same simulation for the model with long–term bank lending rates (`BLR+1Y`).

The right column of graphs plots the sequence of government bond rate shocks, which is required to permanently bring down the sovereign bond spread of the periphery to zero. Following a very strong intervention in 2013M5, which would have an immediate impact on bond rates of almost -2 percentage points, the intervention activity would stabilize from 2013M7 on at a permanent level of about -0.3 percentage points per month.

[to be completed]

4 Conclusion

This paper has explored the potential effectiveness of the ECB's OMT programme in restoring the monetary transmission mechanism. Using TVP–VAR models for a number of euro area periphery countries we have analyzed the response of bank lending rates to movements in government bond rates.

According to the ECB, the necessity of the OMT programme is related to the point of view that the transmission of monetary policy in the euro area is severely impaired due to widely divergent borrowing costs across member countries. A major source of impairment is the fear that one of the euro area periphery member countries – or more – could exit the euro, which has driven up the risk premium on sovereign bonds. Since government bond markets play an important role for the determination of bank lending rates, basically because sovereign bond rates serve directly as a benchmark for the pricing of bank loans, the government bond market turmoil has

Figure 4: Simulation of an ECB Intervention
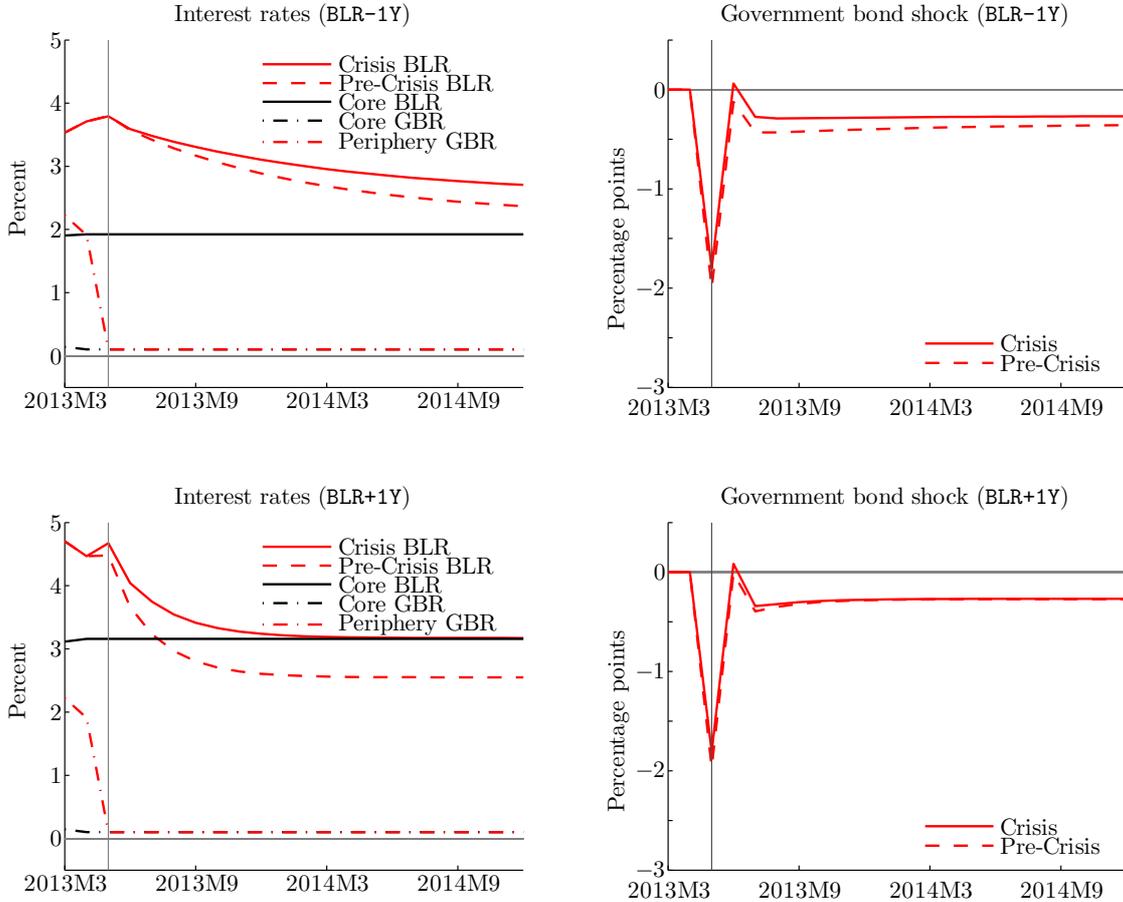
Notes: The simulation of the pre–crisis model uses the estimated coefficients for 2006M3, while the simulation of the crisis model is derived from the estimates for 2013M4. In the counterfactual, the ECB pushes the periphery bond rates instantaneously and permanently to the core's level.

affected bank lending conditions. As a consequence bank lending rates in the euro area periphery countries have remained on a relatively high level, despite the massive cut of policy rates. The OMT programme is officially considered as a sufficient means for restoring the transmission mechanism of monetary policy.

However, the results of our analysis cast serious doubts on the potential effectiveness of the OMT programme in safeguarding an appropriate monetary policy transmission as we find that the reaction of bank lending rates to movements in sovereign bond rates is only minor. While bank lending rates in the euro area periphery member countries reacted sluggishly to changes in sovereign bond rates before the outbreak of the government bond market turmoil in 2010, their response to changes in sovereign bond rates has even significantly weakened thereafter. Therefore, the theoretical underpinning of the OMT programme, namely the view that

bank lending rates are largely determined by movements in sovereign bond rates, is hardly supported empirically.

Although the announcement of the ECB's OMT programme has lowered the borrowing costs for sovereigns in the euro area periphery countries, our findings suggest that a significant reduction of bank lending rates would require continuous government bond purchases. In turn, continuous purchases of bonds issued by the peripheral sovereigns would come along with a number of problems: (i) they could potentially undermine the incentives for governments to impose structural reforms, (ii) the monetary financing prohibition could be potentially violated as ongoing purchases of sovereign bonds would directly affect the conditions at which governments can issue debt, and (iii) intensive government bond purchases could expose risk to the central bank balance sheet that might impose threats to the political independence of the monetary authority and eventually lead to fiscal redistribution among the euro area member countries. Given the limited effect of the OMT programme on safeguarding an appropriate transmission of monetary policy to the real economy we conclude that the application of OMTs would rather damage the reputation of the monetary authority. Executing OMTs would only fan the critics' flames in academic and public discussion, who accuse the ECB of steeping too deep into fiscal territory, without generating promising policy benefits.

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Appendix

A   Data

The bank lending rates refer to interest rates on new business loans to non–financial corporations (excluding revolving loans and overdrafts, convenience and extended credit card debt), with a maturity of up to one year (`BLR -1Y`) and over one year (`BLR +1Y`). The monthly series, which are taken from the ECB's harmonized MFI interest rate statistics, cover the period 2003M1–2013M4. The data code is `MIR.M.XX.B.A2A.F.R.A.2240.EUR.N` for the short–term bank lending rates and `MIR.M.XX.B.A2A.K.R.A.2240.EUR.N` for the long–term bank lending rates; `XX` is the country acronym.

The government bond rates are monthly averages, calculated from daily FTSE Global Government Bond Indices with an average maturity of one to three years. The series are taken from the Thompson Reuters DataStream database. We use the series `RGXX1T3(RY)`, where again `XX` denotes the country acronym.

For the estimation of the TVP–VAR we use monthly time series for Ireland, Italy, Portugal and Spain and aggregate it to time series for the euro area periphery by using nominal GDPs as weight. Since the time series for nominal GDP, which are taken from the Eurostat database, are only available on a quarterly frequency, we assume weights to remain constant within a given quarter. Figure 5 shows the complete time series that we use for estimation, including the training sample of 36 month.

Figure 5: Periphery Time Series
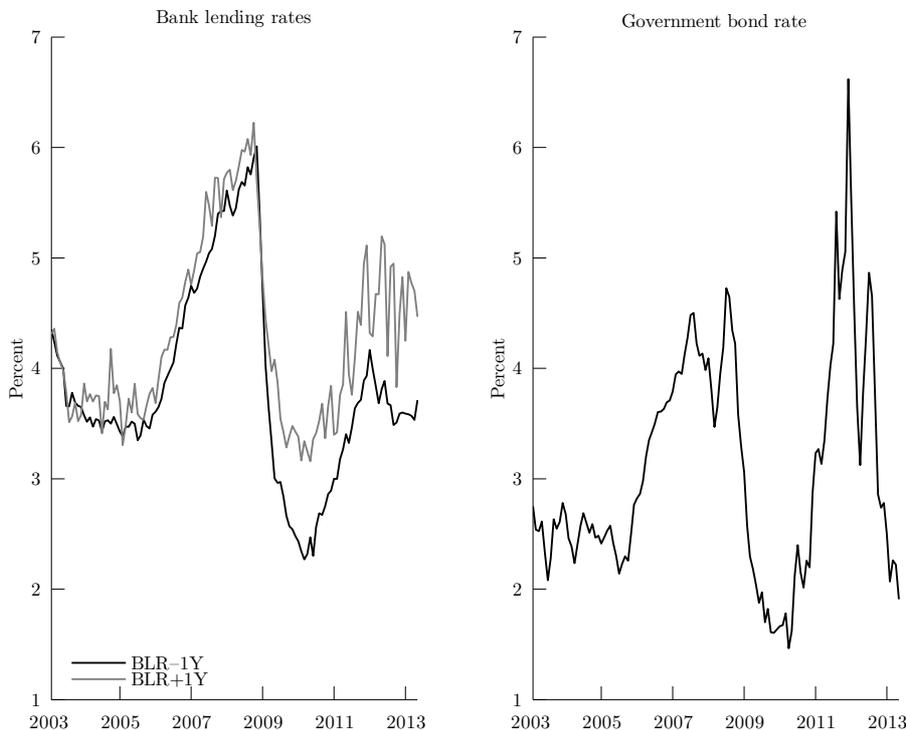
B   Markov–Chain Monte–Carlo Algorithm

The parameters of the TVP–VAR models as well as various statistics of interest are estimated by means of a version of the Markov–Chain Monte–Carlo (MCMC) algorithm. In particular, the *unconditional* posterior distributions of Q, S and W are approximated by drawing from their *conditional* posterior distributions, the Carter–Kohn algorithm is used to draw the time paths of B_t and α_t while we resort to the Metropolis–Hastings approach for the stochastic volatilities $\log \sigma_t$. The algorithm includes the following steps:

1. Set priors for Q, S, W, B_0, α_0 and $\log \sigma_0$.

2. Set a starting values for Q, S and W: We use $Q_{start} = V(\hat{B}_{OLS})$, $S_{start} = V(\hat{A}_{OLS})$ and $W_{start} = I_2 * 0.0001$.

3. Set starting values for the Carter-Kohn algorithm: Following (Primiceri, 2005) we set $B_0 = \hat{B}_{OLS}$, $P_{B,start} = 4 \cdot V(\hat{B}_{OLS})$, $\alpha_0 = \hat{A}_{OLS}$, $P_{A,start} = 4 \cdot V(\hat{A}_{OLS})$, where P_B and P_A denote the covariance matrices of the initial state vectors B_0 and α_0. Note that in our case α_0 is a scalar.

4. Set priors for the Metropolis-Hastings algorithm (used to infer the path of σ_t):

We resort to $\log \sigma_0 \sim N(\bar{\mu}, \bar{\sigma})$ with $\bar{\mu} = \log \hat{\sigma}_{OLS}$ and $\bar{\sigma} = I_n \cdot 10$.

5. Specify a starting value for the time path of α_t: We set $\alpha_{t,start} = \hat{A}_{OLS}$ for all $t = T_0 + 1, ..., T$.

6. Specify a starting value for the time path of σ_t: We set $\sigma_{1,t} = u^2_{1,OLS}$ and $\sigma_{2,t} = u^2_{2,OLS}$ for all $t = T_0 + 1, ..., T$, where $u^2_{1,OLS}$ and $u^2_{2,OLS}$ are the OLS estimates of the variances of the reduced form residuals based on the training sample.

7. Set $Q = Q_{start}$, $S = S_{start}$, $W = W_{start}$, $\alpha_t = \alpha_{t,start}$ and $\log \sigma_t = \log \sigma_{t,start}$.

8. Conditional on Q, α_t and $\log \sigma_t$ draw a new time path B_t using the Carter-Kohn algorithm.

9. Given the draw for B_t calculate the corresponding draw for the residuals $\nu_t = B_t - B_{t-1}$.

10. Conditional on the draw for ν_t draw the ith diagonal element of the diagonal matrix $\tilde{Q}$ from the inverse Gamma distribution with scaling parameter equal to the ith element of $diag(\nu'_t \nu_t + k^2_Q \cdot T_0 \cdot V(\hat{B}_{OLS}))/2$ and degrees of freedom $(T_0 + T - T_0)/2$. If Q is allowed to be non-diagonal, draw $\tilde{Q}$ from the inverse Wishart distribution with scaling matrix $\nu'_t \nu_t + k^2_Q \cdot T_0 \cdot V(\hat{B}_{OLS})$ and degrees of freedom $T_0 + T - T_0$.

11. Conditional on S, $\log \sigma_t$ and the new draw B_t draw a new time path α_t using the Carter-Kohn algorithm.

12. Given the draw for α_t calculate the corresponding draw for the residuals $\zeta_t = \alpha_t - \alpha_{t-1}$.

13. Conditional on the draw for ζ_t draw the $\tilde{S}$ from the inverse Gamma distribution with scaling parameter $(\zeta'_t \zeta_t + k^2_S \cdot 2 \cdot V(\hat{A}_{OLS}))/2$ and degrees of freedom $(T - T_0 - 1)/2$.

14. Conditional on the draws for B_t and α_t calculate a new draw for the reduced form residuals $\epsilon_t = A_t u_t$.

15. Conditional on W and the draw ϵ_t use the independence Metropolis-Hastings algorithm (with parameters $\bar{\mu}$ and $\bar{\sigma}$) to derive a new draw for σ_t. Note that, since $\epsilon_{1,t}$ and $\epsilon_{2,t}$ are mutually uncorrelated, $\sigma_{1,t}$ ($\sigma_{2,t}$) is computed based on $\epsilon_{1,t}$ ($\epsilon_{2,t}$) only.

16. Given the new draw for σ_t draw the ith diagonal element of the diagonal matrix $\tilde{W}$ from the inverse Gamma distribution with scaling parameter $\frac{(\log \sigma i,t - \log \sigma i,t-1)'(\log \sigma i,t - \log \sigma i,t-1) + k_W^2 \cdot 3}{2}$ and degrees of freedom $(T - T_0)/2$.

17. Set $Q = \tilde{Q}$, $S = \tilde{S}$ and $W = \tilde{W}$.

18. Repeat steps 8 through 17 X times. Discard the *burn-in* draws. The remaining draws are used to compute the statistics of interest.

C   Marginal Likelihood

Let $\theta = (Q, S, W)$, $\vartheta = (\{B_t\}_{t=T_0+1}^T, \{\alpha_t\}_{t=T_0+1}^T, \{\sigma_t\}_{t=T_0+1}^T)$ and $Y = \{Y_t\}_{t=T_0+1}^T$. The marginal likelihood for our model $F(Y)$ is defined as the integral

$$F(Y) = \int f(Y \mid \theta; \vartheta)\pi(\theta)d\theta,$$

where $f(Y \mid \theta; \vartheta)$ denotes the likelihood function of the model while $\pi(\theta)$ denotes the joint prior density of the parameters. Accordingly, the marginal likelihood corresponds to the posterior distribution with the parameters integrated out. Since for our TVP–VAR the above integral can not be evaluated analytically, we follow Nakajima (2011) and approximate it by the method suggested by Gelfand and Dey (1994):

$$\frac{1}{F(Y)} \approx \frac{1}{N_{draws}} \cdot \sum_{j=1}^{N_{draws}} \frac{\phi(\theta_j)}{f(Y \mid \theta_j; \vartheta_j)\pi(\theta_j)},$$

where N_{draws} is the number of MCMC draws, θ_j denotes the jth draw of θ and $\phi(\theta_j)$ is the probability density function of the truncated normal distribution recommended by Geweke (1994). In particular

$$\phi(\theta_j) = \frac{1}{(1-\tau)(2\pi)^{\frac{K}{2}}}|\Upsilon|^{-\frac{1}{2}} \exp\left[-\frac{1}{2}(\theta_j - \bar{\theta})'\Upsilon^{-1}(\theta_j - \bar{\theta})\right] \cdot \mathbb{I},$$

where $\bar{\theta}$ is the posterior mean and Υ the posterior covariance matrix of the parameter vector θ. K is the number of elements in θ. $\mathbb{I}$ denotes the indicator function taking the value of one if

$$(\theta_j - \bar{\theta})'\Upsilon^{-1}(\theta_j - \bar{\theta}) \leq \chi^2_\tau(K)$$

and zero otherwise. $\chi^2_\tau(K)$ denotes the τth percentile of the inverse χ^2-distribution with K degrees of freedom. Following Nakajima (2011) we set $\tau = 0.99$.

D   Bazooka Mario Rap

This song is a tribute from the bankers – it should be taken too seriously

−1− Our Mario
floods us with liquidity
attempts to court our sympathy
asks us to do some serious bond buying
but we are denying
Bazooka, zooka Mario (x2)

Yo! Mario!
thanks for the liquidity
but due to limited financial ability
we store everything in the deposit facility
Bazooka, zooka Mario (x2)

−2− Our Mario
gives us the cash
to prevent the crash
he wants us to extend bank lending
to stimulate domestic spending
Bazooka, zooka Mario (x2)

Yo! Mario!
due to frayed nerves
we hold all cash in the form of excess reserves
we don't care about stimulation
we keep on the economic strangulation
Bazooka, zooka Mario (x2)

−3− Our Mario
recognized our denial to provide peripheral sovereigns liquidity transfusion
launched the OMT programme to generate the illusion
that monetary policy stands ready to solve all things
now we rely on Mario's guarantee and see what it brings
Bazooka, zooka Mario (x2)

Yo! Mario!
anyway we refuse to reduce lending rates
no matter if the economy breaks
but we pay low rates on deposits
thanks for improving short–run profits
Bazooka, zooka Mario (x2)

−4− Our Mario
would ascend the bankers' throne
by announcing to buy every non–performing loan
call this programme the ECB's death star
because this one would go so far
Bazooka, zooka Mario (x2)

Yo! Mario!
much better than the bazooka, the death star
would allow us to bath daily in Beluga caviar
Beluga, luga Mario (x2)

This song is dedicated to all economist brothers and sisters working at the ECB. Lyrics should best be rapped to the beat of *Bazooka Joe* by Bazooka Joe available at `http://www.youtube.com/watch?v=yZXRaVBf0pY`.