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THE EFFECTS OF MACROECONOMIC, FISCAL AND MONETARY POLICY ANNOUNCEMENTS ON SOVEREIGN BOND SPREADS: AN EVENT STUDY FROM THE EMU*

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Abstract

We assess the impact of announcements corresponding to different fiscal and monetary policy measures on the 10-year sovereign bond yield spreads (relative to Germany) of the 10 EMU countries during the period 01:1999 - 07:2016. Implementing pooled and country-fixed effects OLS regressions, we find that the European Commission's (EC) releases of the excessive deficit procedure significantly affect the yield spreads. The EC releases of higher debt and better budget balance forecasts contribute to the rise and the decline of spreads, respectively. Moreover, we find that the announcements of the ECB's key interest rates together with the longer-term refinancing operations (LTROs) and the first covered bond purchase programme (CBPP1) negatively affect sovereign yield spreads in our sample of EMU countries.

JEL: C23, E52, E62, G10, H63

Keywords: sovereign yields, fiscal policy, monetary policy, event analysis, panel data

* The opinions expressed herein are those of the authors and do not necessarily reflect those of the authors' employers.

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1. Introduction

The economic literature suggests that government's borrowing costs depend on the fundamental economic conditions, particularly the fiscal stance and key macroeconomic developments (see, e.g., Poghosyan, 2012).¹ There seems to be widespread understanding that an under-pricing of sovereign risk in the Economic and Monetary Union (EMU) occurred before the 2008-2009 economic and financial crisis, while an overpricing of it followed during the subsequent sovereign debt crisis. Such developments were caused both by the fluctuations in the risk appetite and by Euro area country-specific concerns regarding underlying economic fundamentals. The successful elimination of fears of a looming Eurozone break-up following the Global Financial Crisis, can be partly attributed to improvements in economic fundamentals (particularly in periphery European countries) (Muellbauer, 2014). This suggests that economic announcements (which often include release of new economic projections and/or announcements of (fiscal or monetary) policy decisions by EU institutions) are an important source of information, containing news that typically spills over internationally across markets, affecting sovereign bond yields (Andersen et al., 2006). To the extent that fundamentals are well captured by forecasts produced by official (and/or private sector) agencies, the release of such forward-looking views on an economy's performance can affect yields by offering market participants valuable insights and by shaping their expectations on potential portfolio returns.²

Rational investors absorb and incorporate all the available information at their disposal in real-time, meaning that there are no information rigidities, thus a release of new information will cause a rearrangement in their investment portfolio. A forecast revision in a positive and desirable way (e.g. higher GDP growth, lower public debt, lower unemployment, etc.) should bring the sovereign yields down, as more investors are interested in buying bonds of this country due to the lower risk of default. The same would be true of a positive assessment of the EC relative to a Stability and Growth Program of a given country. In addition, monetary policy events, typically the ECB's conventional and unconventional monetary policies, would also play a role in the

¹ For example, as governments debt rises, sovereign bond yields should go up in recognition of the higher risk (default, monetization-driven depreciation and inflation) carried by investors holding government securities.

² Expectations have long been ascribed a central role in macroeconomics (Pigou, 1927). For instance, Balduzzi, Elton and Green (2001) considered the effects of US announcements on US yields outcomes. An earlier study by Porter-Hudak and Quigley (1994) found significant responses of US' interest rates to budget deficit announcements.

development of sovereign yield spreads, directly or indirectly either via changes in the aggregate demand or via changes in the fiscal behavior.

In this paper, we study the impact of macroeconomic, fiscal and monetary developments and well-defined events on sovereign bond yield spreads in 10 Economic and Monetary Union (EMU) countries. Such developments cover the European Commission (EC) releases (twice a year until Autumn 2012 and three times a year afterwards) of short-term economic forecasts for the member states of the EMU. This is a natural and legitimate avenue of research that has been somewhat neglected in the literature in the sense that most papers have not look closely at the role played by different types of forecasts (see section 2 for details). We consider one source for macroeconomic and fiscal expectations: the EC's forecasts.³ Additionally, we have collected information on the EC's announcements regarding the excessive deficit procedures (EDP) that contains information regarding the adoption of appropriate policy responses to correct excessive deficits and/or debts by the member states. Moreover, we study the impact of the monetary policy events such as the announcements of the ECB's interest rates together with the announcements of unconventional monetary policy on the sovereign bond yield spreads of the sample countries.

We contribute to the literature notably by: i) constructing a set of fiscal events, type 1 and type 2, related to the EC announcements of fiscal developments and excessive debt procedures related decisions in 10-Euro area countries; ii) conducting an identification and analysis of conventional and non-conventional monetary policy events; iii) assessing the impact of fiscal and monetary policy events on 10-year sovereign bond yield spreads.

Our main results show that the ECB's key interest rates announcements mainly the deposit facility, main refinancing operations and marginal lending facility rate tenders, negatively affected the bond yield spreads of the sample countries. Moreover, the announcements of the nonstandard measures of the ECB notably the first covered bond purchase programme and the longer-term refinancing operations contributed to decreasing the spreads. Regarding the impact of the fiscal policy events, we found that the EC releases of the economic forecasts on government debt and budget balance contribute to increase and decrease the spreads respectively. The EC releases of the excessive deficit procedures (EDP) contribute in reducing the yield spreads.

³ Nowadays, the European Commission (EC) releases on a regular basis short-term economic forecasts for more than 180 variables of member states of the Economic and Monetary Union (EMU). Most studies suggest that forecasts produced by international organizations are less subjected to biases. Keereman (1999) was the first to examine the track record of EC forecasts and argued that its forecasts displayed a reasonable track record.

The remainder of the paper is organized as follows. Section 2 reviews the relevant literature. The following section presents the empirical methodology and describes the data used. Section 4 discusses the main empirical results and the last section concludes.

2. Literature

There is a vast literature looking at the determinants of sovereign yields. Studies looking specifically at EMU's bond yields include the work by Manganelli and Wolswijk (2009).

Some studies, in the spirit of this paper, have proxied fundamentals using expectations about the future values of key macroeconomic variables and related these to interest rates or yields or financial variables. Canzoneri et al. (2003) using Congressional Budget Office (CBO) budget forecasts, found that there existed a sizable and statistically significant effect of projected surpluses on the spread between long-term treasury yields and Treasury bill yields. Strauch et al. (2004) conclude that when actual output growth exceeds its forecast, the budget balance improves when compared with budget predictions; Moulin and Wiertz (2006) identified effects from divergence in predictions in GDP as well as from expenditure or revenue items; Afonso (2010) shows that yields increase with better growth forecasts and with decreases in budget balance ratios. Beirne and Fratzscher (2013), based on panel regressions, found that the increase of interest rate spreads in the Eurozone could be explained by a combination of deteriorating fundamentals and an increased sensitivity of investments for these fundamentals. Afonso and Nunes (2015) assessed whether forecast revisions of macro variables affected sovereign yields in a sample of 15 European countries between 1999 and 2012. They found that corrections in both macro and fiscal variables had a strong influence in sovereign bond yields (and more strongly so in countries characterized by weak fundamentals). Godl and Kleinert (2016) explored whether and to what extent government bond yields were driven by fundamentals as opposed to market sentiments. Similarly, to our approach, they also relied on EC's forecasts, which they argued to be important sources of information to investors for assessing the future solvency of governments. These authors provided empirical evidence that government bond yields indeed react to negative economic forecasts. More recently, De Grauwe, Ji and Macchiarelli (2017) also found that government bond markets in the Eurozone to be highly sensitive to changing fundamentals.

Regarding specific event studies there are different methodologies in the literature. Afonso and Strauch (2007) evaluate to which extent relevant fiscal policy events taking place in 2002 produced a reaction in the long-term bond segment of European capital markets, and they uncover

some evidence in that direction. Arru et al. (2012) conducted a study including six countries from the EMU where they gauge about the impact of macroeconomic data releases from several macro-areas such as US, Japan and EU. These authors applied a method used by Balduzzi et al. (2001) and Andersen et al. (2005) to compute the so-called standardized news. They find a reaction by the sample countries, excluding Spain, from positive news in the US, and that macroeconomic surprises on the Euro-area business cycle affect the volatility of the series for four of the six sample countries and these reactions are only captured by negative surprises.

Focusing on the second type of the fiscal policy events that we use in this paper, we can mention a very recent study by Kalan et al. (2018) who estimate the effects of the fiscal rules specifically the Excessive debt procedure (EDP) on sovereign yield spreads for the 28 EU countries over the period 1999 to 2016. Using dynamic panel estimation techniques, they find that the sovereign spreads of countries under an EDP are higher than countries that are not under an EDP.

On the other hand, the monetary policy events literature gives some important insights about how markets react to central bank's monetary policy. For the Euro area, Andersson et al. (2009) and Bernoth and Hagen (2004) found evidence in the German long-term bond market and in EURIBOR futures market that agents predict well the ECB's monetary policy, reflecting transparency in ECB's monetary policy conduction. Interestingly, Brand et al. (2010), for the money market yield, found that expectations from monetary policy change considerably during ECB's press conferences. Finally, Andersson et al. (2009) compares the ECB's and the FED's monetary policy and concludes that both US bond and stock markets react more to the FED's monetary policy decisions than respectively the Euro area bond and stock market react to the ECB's monetary policy decisions.

In addition to economic fundamentals and specific monetary or fiscal policy events as determinants of sovereign bond yields or spreads, other factors have been found in the literature to be relevant predictors and that we employ in our empirical analysis. In particular, it is important to account for international risk, typically approximated using indexes of US stock market implied volatility or the spread between the yields of US corporate bonds against US treasury bills (Afonso et al., 2015; Silvapulle et al., 2016). Another aspect is the liquidity risk, usually proxied using bid-ask spreads (Favero et al., 2010).

3. Methodology and Data

3.1. Methodology

Our empirical analysis considers first the main determinants of sovereign spreads on a panel of 10 EU countries, namely: industrial production (percentage change with respect to Germany) and real effective exchange rate (both retrieved from the EC forecasts), international risk (proxied by the VIX) and the bid-ask spread. As a second step, we specifically assess the additional relevance of specific fiscal and monetary events for sovereign spreads from January 1999 until July 2016.

The event variables are constructed by flag procedure assuming so that there are two types of events, positive and negative, corresponding to a lower (higher) sovereign spread. Using monthly data, when there is a positive or a negative event on a given month we attribute the values -1 or 1 respectively and 0 for the non-event months. The monetary events are selected by collecting the interest rate policy announcements done by the ECB during the sample period. The fiscal policy events are collected from the EC website, based on the EU fiscal surveillance mechanism. With the purpose of capturing the fiscal policy decision-making in the EU, the assembled events are divided in two groups. One is composed by press releases resulting from the Commission assessment of the stability and convergence programs. The second group is essentially composed by press releases related with the EDP's that were implemented during the sample period.

We estimate directly the set of different determinants of sovereign bond yield spreads on the entire panel of 10 Euro area countries. Mathematically, our main regression equation is the following:

$$spreads_{it} = \alpha_i + \rho_t + \beta_i X_{it} + \varepsilon_{it} \quad (1)$$

where $spreads_{it}$ denotes the sovereign bond yield spread relative to Germany's, X_{it} is a vector of determinants already identified above. The coefficient β measures the degree of sensitivity of sovereign spreads to a given determinant. α_i, ρ_t denote country and time effects, respectively. The former capture unobserved heterogeneity across countries, and time-unvarying factors such as geographical variables; the latter aim to control for global shocks. Finally, ε_{it} is a disturbance term satisfying usual assumptions of zero mean and constant variance.

Equation (1) is first estimated by Ordinary Least Squares with robust standard errors clustered at the country level. We consider specifications with and without country and/or time effects for robustness purposes. Time fixed effects are included to control for global shocks; country fixed effects are included to control for unobserved cross-country heterogeneity and time invariant characteristics (geography, institutional aspects, etc.). In the robustness section, we take into account potential endogeneity concerns by re-estimating (1) with a Two Stage Least Squares approach.

3.2. Data

Our empirical analysis relies on a panel of ten Euro area countries (Austria, Belgium, Finland, France, Greece, Ireland, Italy, Netherlands, Portugal and Spain) using monthly data between January 1999 and July 2016. Following existing literature, we will model spreads on a fixed block of determinants that deal with international risk conditions, liquidity risk and credit risk. First, international financial risk will be proxied by the S&P 500 implied stock market volatility index (VIX), a common proxy for global financial instability (Mody, 2009; Beber et al., 2009; Gerlach et al., 2010; Bernoth and Erdogan, 2012). We expect a higher (lower) value for the global risk factor to cause an increase (reduction) in government bond spreads. Second, the 10-year government bond bid-ask spread will serve as our measure of bond market illiquidity, with a higher value of this spread indicating a fall in liquidity leading to an increase in government bond yield spreads (Codogno et al., 2003; Gomez-Puig, 2006). Credit risk will be captured using a number of macro/fiscal indicators. Third, a real exchange rate appreciation is expected to increase spreads as justified by Arghyrou and Tsoukalas (2011) and Arghyrou and Kontonikas (2012).

In addition, to capture the effects of economic growth, we use the annual growth rate of industrial production (relative to that of Germany), capturing the argument of Alesina et al. (1992) according to which sovereign debt becomes riskier during periods of economic slack.

Moreover, we add to the model four types of events as explanatory variables. We add the ECB's interest rates announcements on the Deposit facility (DF), Marginal Lending Facility (MLF) and Main Refinancing Operations (MROs) and call them as Monetary Policy (MP) type 1 events. We also consider the Unconventional Monetary policy events of the ECB as MP type 2 events specifically the announcements of the longer term refinancing operations (LTROs), securities market programme (SMP) and the first corporate bond purchase programme (CBPP1). We consider

the fiscal forecasts of the EC of the government debt, budget balance and current account balance as Fiscal Policy (FP) type 1 events and the EC's EDP decisions as FP type 2 events. Table 1 summarizes the nomenclature of the events.

[Table 1]

Table A1 in the Appendix presents the summary statistics of the relevant variables while Table A2 shows detailed data definitions and sources. Finally, Tables A3-A5 provide the fiscal and monetary events dataset that we have constructed for our empirical analysis.

4. Empirical Results

4.1 Baseline

In the first step, we estimate the baseline model considering the main determinants of sovereign yield spreads identified earlier. We find that, Industrial production and bid-ask spread have a negative and positive statistically significant impact on yield spreads respectively (as expected) when using the Pooled OLS and fixed effect OLS. We do not find evidence of statistically significant impacts of neither VIX nor REER on spreads. However, we found a positive and statistically significant impact of VIX on the spreads in our robustness analysis.

4.1.1 MP type 1 events

Considering the first type of the monetary policy events, we find that all of the ECB's key interest rates announcements contribute to reduce the spreads when running Pooled OLS and fixed effects OLS. For instance, when considering the results of the pooled OLS regression, we see that the announcement of rates on the DF contributed to reduce the spreads by 0.607 percentage points on average. The announcement of interest rates on the MLF contributed to reduce the spreads by 0.533 percentage points and the announcement of the rates on the MROs contributed to decrease the spreads by 0.682 percentage points on average when running pooled OLS regressions. However, when considering the rates on the DF and MLF in a single regression, the impact of the MLF disappears in both types of regressions (see Tables 2 and 3). The country-specific rates on the MROs also contribute to decreasing the spreads. These results are in line with the literature which highlights the relevance of the ECB's news releases (see, e.g., Brand et al., 2010) and the

literature that found that the ECB's key interest rates contribute to reducing the spreads (see, e.g., Afonso and Jalles, 2018).

[Table 2]

[Table 3]

4.1.2 MP type 2 events

Using the second type of the monetary policy variables in pooled OLS regressions, we find that the impact of the announcement of the SMPs on spreads is positive (against our priors): such announcements increase spreads by 0.018 percentage points on average. However, in this specification (specification (9)), the real effective exchange rate contributes to lower spreads (we find a negative and statistically significant coefficient estimate) which is (yet again) contrary to our expectations. The signs of the other monetary policy event variables appear to be negative but not statistically different from zero.

Adding fixed effects yields some additional insights. We find that the announcements of the CBPP1 contribute to decreasing the spreads (negative significant signs) by 0.257 percentage points on average. SMP's events effect is no longer statistically significant and real effective exchange rate, now, contributes to increase spreads, which is actually as what we expected.

We do not find any statistically significant impact of longer-term refinancing operations announcements on 10-year sovereign bond yield spreads.

4.1.3 FP type 1 events

Including the first type of fiscal policy events in the regressions, we find that EC releases on the Excessive Deficit Procedures (EDP) have a positive and statistically significant impact on spreads when running both Pooled and fixed effects regressions (see Tables 4 and 5). This means that noncomplying with the EU fiscal framework (that is, being under an EDP) contributes to an average increase in spreads of 0.889 or 0.595 percentage points, for pooled or fixed effects regressions respectively. This is in line with the results obtained by Kalan et al. (2018).

4.1.4 FP type 2 events

Adding the second type of fiscal policy event variables to the baseline model, we observe that the announcements of both one year and two years-ahead forecasts of public debt contribute

to the increase in spreads (approximately 0.04 and 0.06 percentage points on average for pooled or fixed effects regressions respectively). However, when using both 1 year and 2 years-ahead forecasts announcements in one regression, the one year ahead debt forecast announcements lead to a fall in spreads (not statistically significant in fixed effects regressions) while the two year-ahead forecast announcements lead to a rise in spreads.

The announcements of the 1 year and 2 years ahead forecasts of the budget balance tend to lower spreads in both pooled and fixed effect regressions (we obtain negative and statistically significant coefficient estimates). We find that the impact of the announcement of the one-year ahead forecast of the budget balance on spreads is slightly higher than the announcements of the two years-ahead forecasts. When both forecasts are considered in one single regression the impact of the two years ahead forecast disappears irrespective of the type of regression.

Announcements of the current account balance forecasts, when estimating fixed effects regressions, contribute to an increase in spreads, while in the pooled OLS regression these announcements have no significant impact. Including both forecasts events in one regression, the announcement of one year-ahead forecast seems to have a negative impact on spreads (only in pooled OLS regression) and the two years-ahead forecast announcements have positive impact on spreads in both type of regressions.

[Table 4]

[Table 5]

4.2 Robustness

Due to potential endogeneity concerns of some of our variables in the X_{it} vector, we rely on a Two-Stage-Least-Squares estimator to re-run equation (1). We employ lags of the dependent variable and regressors as the instruments. We use the Hansen J statistic - test of over identification - to test the validity of the over identifying restrictions. With the Kleibergen-Paap LM statistic - under identification test - we test whether our instruments are relevant. When running fixed effects IV (Table 6), the impact of VIX becomes statistically significant (positive as expected). All the remaining baseline variables remain qualitatively unchanged.

We then look at the diagnostic presented to assess the validity of the instrumental variable strategy. The underidentification test tests that the excluded instruments are "relevant" (meaning

correlated with the endogenous regressors). Our obtained statistics generally reject the null that the different equations are underidentified. Then the Hansen test statistics reveal that the instrument sets contain valid instruments (i.e., uncorrelated with the error term, and that the excluded instruments are correctly excluded from the estimated equation) is not rejected.

4.2.1 MP type 1

Running fixed effects IV (Table 6, specifications 2-6) gives us slightly different results. Whereas the announcement of the rates on the DF does not have significant impact on spreads anymore but MLF rates announcements lead to an increase in spreads. However, when we include both interest rates on the DF and MLF in a single regression we find that the announcement of DF rates contributes to lower spreads while the announcement of the MLF leads to a rise in spreads. We do not find any statistically significant impact of MROs rates announcements on spreads but the country specific interest rates on MROs lead to a fall in spreads. In general, coefficient estimates turn out with a higher level of significance when running the fixed effects IV and the only variable that appears not to be significant is REER.

4.2.2 MP type 2

As we can observe in Table 6, the announcements of LTROs (LTRO includes also the TLTROs while Net_LTRO only includes the LTROs) together with the announcements of TLTRO-I and TLTRO-II and CBPP1 contribute in decreasing the spreads slightly SMP's impact is not significant anymore. More variables of each specification appear to have significant impact on spreads when using country fixed effects IV.

[Table 6]

4.2.3 FP type 1

When implementing fixed effects IV, the effect of an EDP event appears to increase bond spreads, as before and all the variables in the model appear to have statistically significant impact on the yield spreads (see Table 5).

4.2.4 FP type 2

Once more, both 1 year and 2 years-ahead forecasts announcements of public debt contribute to increase spreads when using them separately in the fixed effects IV regression but when both forecasts are included together in one regression, the 2 years-ahead forecasts announcement appears to decrease spreads. The one-year and two years-ahead forecast announcements of the budget balance contribute to reduce spreads (negative and statistically significant coefficient) but when both are considered together in one regression the impact of the announcement of the 2 years-ahead forecast disappears. The announcements of the forecasts of the current account balance appear not to have any significant impact on the spreads. However, when using both forecasts in one regression, the announcement of the one year-ahead forecast seems to have a negative impact and the announcement of the two years-ahead forecasts has a positive impact on spreads.

[Table 7]

5. Conclusion

In this paper, we studied the impact of macroeconomic, fiscal and monetary developments and well-defined events on sovereign bond yield spreads in 10 Economic and Monetary Union (EMU) countries for the period 01:1999 – 07.2016 implementing pooled and fixed effects OLS and IV regressions.

We modelled spreads on a fixed block of determinants that deal with international risk conditions, liquidity risk, credit risk and economic growth. In addition, we added to the model four different types of fiscal and monetary event variables. Fiscal events data include the European Commission (EC) releases of the short-term economic forecasts as well as the Excessive Deficit Procedures (EDP). Monetary events data include the announcements of the ECB's main interest rates and the unconventional monetary policies.

Our results showed that the announcement of a negative fiscal forecast by EC (e.g. upward revision in the public-to-GDP ratio) contributed to the increase in bond spreads while a positive fiscal announcement (e.g. downward revision in the public-to-GDP ratio) contributed to the decrease in spreads. We also found that noncomplying with the EDP, tends to increase sovereign yield spreads. These results imply that the investors associate higher risk of default to the bonds of countries that are not characterized by positive economic prospects.

Regarding the monetary events, we found that the announcements of the ECB's interest rates contributed to decreasing the spreads. Moreover, we found that the announcements of the longer-term refinancing operations (LTROs), and the first covered bond purchase programme (CBPP1) negatively affected the sovereign yield spreads of the sample countries.

Further work could consider the effects of the gradual phasing out of the non-conventional monetary policy measures of the ECB, once they have played out in the markets. Another possible avenue of research could focus on the EC announcements related not only to the EDP events, but also the more recent ones linked to the Macroeconomic Imbalance Procedure. However, to conduct such analyses empirically more time needs to elapse to allow sufficient degrees of freedom.

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Table 1 – Events’ nomenclature

	MP events	FP events
Type 1	Interest rate announcements	EC fiscal forecasts
Type 2	Unconventional Monetary policy (TLTRO and purchase programs)	EDP related decisions

Table 2. Baseline and Monetary Policy Events (type 1 and 2) – Pooled OLS

Specification	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Regressors	baseline	MP type 1					MP type 2			
IP_PCH_DEU	-0.0886* (0.047)	-0.0922* (0.049)	-0.0906* (0.048)	-0.0921* (0.049)	-0.0917* (0.049)	-0.1195* (0.058)	-0.0887* (0.047)	-0.0900* (0.047)	-0.2683** (0.103)	-0.2323** (0.092)
vix	0.0029 (0.005)	-0.0015 (0.007)	-0.0016 (0.007)	-0.0023 (0.007)	-0.0025 (0.007)	0.0223*** (0.004)	0.0042 (0.005)	0.0048 (0.004)	0.0078 (0.026)	0.0341* (0.016)
reer	-0.0288 (0.025)	-0.0288 (0.025)	-0.0288 (0.025)	-0.0288 (0.025)	-0.0288 (0.025)	-0.0591 (0.043)	-0.0284 (0.025)	-0.0281 (0.024)	-0.2344** (0.083)	-0.2087** (0.090)
bid_ask	6.9975*** (0.886)	6.9868*** (0.888)	6.9909*** (0.888)	6.9869*** (0.888)	6.9873*** (0.888)	6.6256*** (0.912)	7.0502*** (0.857)	7.0584*** (0.854)	5.7849*** (0.931)	5.8879*** (0.965)
D.DF		-0.6073** (0.244)		-0.4197*** (0.128)						
D.MLF			-0.5333* (0.254)	-0.2596 (0.187)						
D.MRO					-0.6822** (0.293)					
D.CMRO						-0.0000 (0.000)				
D.LTRO							-0.0020 (0.002)			
D.Net_LTRO								-0.0023 (0.002)		
D.SMP_p									0.0182* (0.010)	
D.CBPP1_p										-0.0296 (0.074)
Observations	1,940	1,940	1,940	1,940	1,940	1,304	1,940	1,940	704	804
R-squared	0.5132	0.5143	0.5142	0.5144	0.5145	0.5429	0.5151	0.5157	0.6127	0.6088

Note: Dependent variable is the 10-year bond yield spread (relative to Germany). Robust standard errors clustered at the country level are in parenthesis below each coefficient estimate. Prefix “D” denotes first difference of a given variable. A constant term was also estimated but omitted. *, **, *** denote statistical significance at the 10, 5, and 1 percent level, respectively.

Table 3. Baseline and Monetary Policy Events (type 1 and 2) – fixed effects OLS

Specification	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Regressors	baseline	MP type 1					MP type 2			
IP_PCH_DEU	-0.0970** (0.034)	-0.1018** (0.036)	-0.0996** (0.035)	-0.1016** (0.036)	-0.1011** (0.036)	-0.1314** (0.043)	-0.0965** (0.034)	-0.0973** (0.035)	-0.0401 (0.089)	-0.0984** (0.038)
vix	0.0031 (0.006)	-0.0016 (0.007)	-0.0016 (0.008)	-0.0024 (0.008)	-0.0026 (0.008)	0.0234*** (0.005)	0.0041 (0.005)	0.0046 (0.005)	0.0200 (0.017)	0.0435*** (0.012)
reer	-0.0324 (0.030)	-0.0327 (0.030)	-0.0326 (0.029)	-0.0327 (0.029)	-0.0327 (0.029)	-0.0706 (0.041)	-0.0318 (0.029)	-0.0315 (0.029)	0.0820** (0.028)	0.0099 (0.013)
bid_ask	6.1898*** (0.792)	6.1767*** (0.793)	6.1818*** (0.793)	6.1768*** (0.793)	6.1775*** (0.793)	5.7623*** (0.768)	6.2332*** (0.768)	6.2418*** (0.765)	3.7152*** (0.554)	4.1265*** (0.579)
D.DF		-0.6644** (0.212)		-0.4758*** (0.116)						
D.MLF			-0.5707** (0.237)	-0.2609 (0.203)						
D.MRO					-0.7382** (0.264)					
D.CMRO						-0.0000* (0.000)				
D.LTRO							-0.0015 (0.001)			
D.Net_LTRO								-0.0018 (0.002)		
D.SMP_p									0.0078 (0.011)	
D.CBPP1_p										-0.2572** (0.104)
Observations	1,940	1,940	1,940	1,940	1,940	1,304	1,940	1,940	704	804
R-squared	0.5989	0.6003	0.6000	0.6004	0.6004	0.6342	0.6000	0.6004	0.8287	0.8023

Note: Dependent variable is the 10-year bond yield spread (relative to Germany). Robust standard errors clustered at the country level are in parenthesis below each coefficient estimate. Prefix “D” denotes first difference of a given variable. Country and time effects were estimated but omitted for reasons of parsimony. A constant term was also estimated but omitted. *, **, *** denote statistical significance at the 10, 5, and 1 percent level, respectively.

Table 4. Baseline and Fiscal Policy Events (type 1 and 2) – Pooled OLS

Specification	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Regressors	FP type 2	FP type 1								
IP_PCH_DEU	-0.0889* (0.045)	-0.0799** (0.033)	-0.0444* (0.022)	-0.0621 (0.036)	-0.0713** (0.031)	-0.0567* (0.026)	-0.0701 (0.039)	-0.0521** (0.022)	-0.0319 (0.025)	-0.0110 (0.027)
vix	0.0025 (0.006)	0.0236*** (0.006)	0.0007 (0.007)	-0.0026 (0.008)	0.0218*** (0.005)	-0.0008 (0.007)	-0.0012 (0.008)	0.0150*** (0.004)	0.0038 (0.007)	-0.0063 (0.008)
reer	-0.0288 (0.025)	0.0254** (0.011)	-0.0230 (0.025)	-0.0294 (0.024)	0.0246* (0.012)	-0.0258 (0.026)	-0.0293 (0.025)	0.0164 (0.014)	-0.0193 (0.025)	-0.0302 (0.023)
bid_ask	6.9435*** (0.906)	5.5434*** (1.140)	6.6297*** (0.868)	6.8450*** (0.940)	5.4678*** (1.137)	6.6967*** (0.915)	6.9069*** (0.926)	5.4579*** (1.119)	6.5880*** (0.795)	5.9953*** (0.984)
EDP	0.8895* (0.407)									
f1_debt		0.0377** (0.013)						-0.0934** (0.037)		
f1_OB			-0.2147*** (0.063)						-0.5536* (0.258)	
f1_CAB				-0.0680 (0.042)						-1.8309* (0.838)
f2_debt					0.0388** (0.013)			0.1303** (0.045)		
f2_OB						-0.1901** (0.060)			0.3405 (0.254)	
f2_CAB							-0.0514 (0.038)			1.7607* (0.822)
Observations	1,940	1,940	1,940	1,940	1,940	1,940	1,940	1,940	1,940	1,940
R-squared	0.5164	0.6608	0.5682	0.5273	0.6734	0.5579	0.5213	0.6860	0.5748	0.6132

Note: Dependent variable is the 10-year bond yield spread (relative to Germany). Robust standard errors clustered at the country level are in parenthesis below each coefficient estimate. Prefix “f1” and “f2” denote one or two years-ahead forecasts of a given variable, respectively. A constant term was also estimated but omitted. *, **, *** denote statistical significance at the 10, 5, and 1 percent level, respectively.

Table 5. Baseline and Fiscal Policy Events (type 1 and 2) –fixed effects OLS

Specification	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Regressors	FP type 2	FP type 1								
IP_PCH_DEU	-0.0976** (0.034)	-0.0896*** (0.024)	-0.0491** (0.019)	-0.1113** (0.036)	-0.0794*** (0.022)	-0.0663** (0.021)	-0.1112** (0.036)	-0.0751*** (0.019)	-0.0274 (0.027)	-0.0590** (0.020)
vix	0.0029 (0.006)	0.0359*** (0.009)	0.0009 (0.006)	0.0099 (0.006)	0.0312*** (0.007)	-0.0002 (0.007)	0.0116* (0.005)	0.0286*** (0.006)	0.0040 (0.007)	0.0041 (0.007)
reer	-0.0325 (0.030)	0.0348*** (0.011)	-0.0253 (0.028)	-0.0199 (0.030)	0.0285** (0.011)	-0.0301 (0.029)	-0.0162 (0.028)	0.0246* (0.012)	-0.0172 (0.028)	-0.0233 (0.030)
bid_ask	6.1617*** (0.797)	4.6529*** (0.944)	5.9212*** (0.799)	6.1769*** (0.755)	4.6468*** (0.947)	5.9777*** (0.841)	6.1260*** (0.728)	4.6702*** (0.933)	5.8841*** (0.724)	5.6646*** (0.800)
EDP	0.5954** (0.234)									
f1_debt		0.0594*** (0.017)						-0.0268 (0.024)		
f1_OB			-0.2059*** (0.060)						-0.5762* (0.283)	
f1_CAB				0.0994* (0.048)						-1.3492 (0.775)
f2_debt					0.0570*** (0.017)			0.0818* (0.038)		
f2_OB						-0.1750** (0.060)			0.3680 (0.280)	
f2_CAB							0.1281** (0.048)			1.4066* (0.752)
Observations	1,940	1,940	1,940	1,940	1,940	1,940	1,940	1,940	1,940	1,940
R-squared	0.6003	0.7467	0.6392	0.6083	0.7543	0.6300	0.6158	0.7551	0.6463	0.6572

Note: Dependent variable is the 10-year bond yield spread (relative to Germany). Robust standard errors clustered at the country level are in parenthesis below each coefficient estimate. Prefix “f1” and “f2” denote one or two years-ahead forecasts of a given variable, respectively. Country and time effects were estimated but omitted for reasons of parsimony. A constant term was also estimated but omitted. *, **, *** denote statistical significance at the 10, 5, and 1 percent level, respectively.

Table 6. Robustness: Monetary Policy Events (type 1 and 2) –fixed effects IV

Specification	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Regressors	baseline	MP type 1					MP type 2			
IP_PCH_DEU	-	-	-	-	-	-	-	-	-0.0125	-
	0.0205*** (0.004)	0.0207*** (0.004)	0.0199*** (0.004)	0.0207*** (0.004)	0.0201*** (0.004)	0.0268*** (0.005)	0.0203*** (0.004)	0.0207*** (0.004)	(0.010)	0.0274*** (0.008)
vix	0.0052*** (0.001)	0.0050*** (0.001)	0.0062*** (0.001)	0.0058*** (0.001)	0.0057*** (0.001)	0.0085*** (0.002)	0.0057*** (0.001)	0.0058*** (0.001)	0.0160** (0.007)	0.0153*** (0.004)
reer	-0.0008 (0.001)	-0.0008 (0.001)	-0.0007 (0.001)	-0.0008 (0.001)	-0.0007 (0.001)	-0.0046** (0.002)	-0.0005 (0.001)	-0.0004 (0.001)	0.0273*** (0.008)	0.0097* (0.006)
bid_ask	0.7490*** (0.051)	0.7491*** (0.051)	0.7469*** (0.051)	0.7453*** (0.051)	0.7483*** (0.051)	0.7775*** (0.062)	0.7751*** (0.051)	0.7780*** (0.051)	0.9084*** (0.084)	0.8983*** (0.080)
D.DF		-0.0239 (0.068)		-0.1928** (0.091)						
D.MLF			0.1158* (0.064)	0.2392*** (0.087)						
D.MRO					0.0595 (0.072)					
D.CMRO						- 0.0000*** (0.000)				
D.LTRO							- 0.0008*** (0.000)			
D.Net_LTRO								- 0.0008*** (0.000)		
D.SMP_p									-0.0015 (0.004)	
D.CBPP1_p										- 0.0402*** (0.014)
Observations	1,511	1,511	1,511	1,511	1,511	1,511	1,511	1,136	558	655
Kleibergen-Paap statistic (p-value)	0.004	0.002	0.003	0.009	0.003	0.040	0.003	0.003	0.005	0.003
Hansen statistic (p-value)	0.200	0.489	0.227	0.181	0.488	0.685	0.726	0.893	0.996	0.787

Note: Dependent variable is the 10-year bond yield spread (relative to Germany). Robust standard errors clustered at the country level are in parenthesis below each coefficient estimate. Prefix “D” denotes first difference of a given variable. Country and time effects were estimated but omitted for reasons of parsimony. A constant term was also estimated but omitted. The null hypothesis of the Kleibergen-Paap test is that the structural equation is underidentified (i.e., the rank condition fails). Stock-Yogo critical values were applied. The Hansen test is a test of overidentifying restrictions. *, **, *** denote statistical significance at the 10, 5, and 1 percent level, respectively.

Table 7. Robustness: Fiscal Policy Events (type 1 and 2) –fixed effects IV

Specification	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Regressors	FP type 2	FP type 1								
IP_PCH_DEU	-	-	-	-	-	-	-	-	-	-
	0.1331*** (0.016)	0.0223*** (0.004)	0.0170*** (0.004)	0.0210*** (0.004)	0.0217*** (0.004)	0.0182*** (0.004)	0.0213*** (0.004)	0.0205*** (0.004)	0.0164*** (0.004)	0.0176*** (0.004)
vix	0.0327*** (0.004)	0.0075*** (0.001)	0.0049*** (0.001)	0.0054*** (0.001)	0.0073*** (0.001)	0.0048*** (0.001)	0.0056*** (0.001)	0.0066*** (0.001)	0.0050*** (0.001)	0.0049*** (0.001)
reer	-0.0081* (0.004)	0.0032** (0.001)	-0.0005 (0.001)	-0.0004 (0.001)	0.0030** (0.001)	-0.0008 (0.001)	-0.0001 (0.001)	0.0019 (0.001)	-0.0003 (0.001)	-0.0009 (0.001)
bid_ask	4.7698*** (0.141)	0.7911*** (0.051)	0.7716*** (0.051)	0.7532*** (0.052)	0.8010*** (0.051)	0.7659*** (0.051)	0.7571*** (0.052)	0.8085*** (0.052)	0.7737*** (0.051)	0.7662*** (0.051)
EDP	0.3523* (0.199)									
f1_debt		0.0044*** (0.001)						-0.0071** (0.003)		
f1_OB			- 0.0177*** (0.004)						-0.0294* (0.017)	
f1_CAB				0.0033 (0.004)						- 0.1177*** (0.025)
f2_debt					0.0045*** (0.001)			0.0111*** (0.003)		
f2_OB						- 0.0158*** (0.004)			0.0115 (0.016)	
f2_CAB							0.0058 (0.004)			0.1185*** (0.025)
Observations	1,511	1,511	1,511	1,511	1,511	1,511	1,511	1,136	558	655
Kleibergen-Paap statistic (p-value)	0.066	0.074	0.065	0.097	0.065	0.091	0.065	0.065	0.069	0.056
Hansen statistic (p- value)	0.113	0.399	0.989	0.988	0.292	0.834	0.323	0.872	0.696	0.301

Note: Dependent variable is the 10-year bond yield spread (relative to Germany). Robust standard errors clustered at the country level are in parenthesis below each coefficient estimate. Prefix “f1” and “f2” denote one or two years-ahead forecasts of a given variable, respectively. Country and time effects were estimated but omitted for reasons of parsimony. A constant term was also estimated but omitted. The null hypothesis of the Kleibergen-Paap test is that the structural equation is underidentified (i.e., the rank condition fails). Stock-Yogo critical values were applied. The Hansen test is a test of overidentifying restrictions. *, **, *** denote statistical significance at the 10, 5, and 1 percent level, respectively.

APPENDIX

Table A1. Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Bond_Spread	2,110	1.117	2.528	-0.050	27.390
VIX	2,100	20.811	7.940	10.420	59.890
BAS	2,048	0.042	0.245	-0.004	5.886
REER	2,090	98.900	11.102	70.125	144.533
IP_PCH_DEU	1,990	-0.403	2.763	-10.776	20.385
DF	2,110	1.2431	1.2197	-0.400	3.750
MLF	2,110	2.873	1.633	0.250	5.750
MRO_F	1,120	1.115	1.049	0.000	4.250
MRO_V	1,000	3.125	0.953	2.000	4.750
LTRO	2,110	309.945	284.072	45.000	1092.400
Net_LTRO	2,110	274.114	287.771	20.800	1092.400
TLTRO_I	230	311.348	126.833	63.900	425.100
TLTRO_II	10	399.300	0.000	399.300	399.300
SMP	750	147.576	51.632	35.000	219.500
CBPP1	850	41.167	16.045	4.200	61.100

Source: authors' computations.

Table A2. Data Description and Sources

Variable	Description	Source
Bond_Spread	10 year bond yield spread against German bond	ECB; Own calculations
VIX	Chicago Board of Exchange Volatility Index	Bloomberg
BAS	10 year bond yield bid-ask Spread	Bloomberg; ECB
REER	Real Effective Exchange Rate, CPI based	IFS
IP_PCH_DEU	Annual growth rate differentials of IP(seas adjusted) vs Germany	IMF
DF	Deposit Facility, percent per annum	ECB
MLF	Marginal Lending Facility, percent per annum	ECB
MRO_F	Main Refinancing Operations-fixed rate tenders, percent per annum	ECB
MRO_V	Main Refinancing Operations-variable rate tenders, percent per annum	ECB
LTRO	Longer-term Refinancing Operation (includes TLTRO_I and TLTRO_II), Holdings	ECB
Net_LTRO	Longer-term Refinancing Operation, Holdings	ECB and own calculations
TLTRO_I	First Targeted Longer-term Refinancing Operation, Holdings	ECB and own calculations
TLTRO_II	Second Targeted Longer-term Refinancing Operation, Holdings	ECB
SMP	Securities Market Programme, Holdings	ECB
CBPP1	Covered bond purchase programme 1, Holdings	ECB
F1_debt	General Government Gross Debt – one year ahead forecasts	EC
F1_OB	General Government Balance – one year ahead forecasts	EC
F1_CAB	Current Account Balance – one year ahead forecasts	EC
F2_debt	General Government Gross Debt – two years ahead forecasts	EC
F2_OB	General Government Balance – two years ahead forecasts	EC
F2_CAB	Current Account Balance – two years ahead forecasts	EC

Notes: Expected budget balances and government debt are the differences vis-à-vis Germany of the European Commission vintage forecasts, taking the same value in the months between each forecast vintage. The volumes securities purchases are for the overall euro area.

Table A3 – Type 1 Fiscal events (Excessive Deficit Procedures (EDP))

country	date	event	country	date	event
Austria	02.12.2009	+1	Ireland	27.04.2009	+1
	20.06.2014	-1		02.12.2009	+1
Belgium	02.12.2009	+1		07.12.2010	+1
	21.06.2013	+1		17.06.2016	-1
	20.06.2014	-1	Italy	05.07.2004	-1
Finland	13.07.2010	+1		28.07.2005	+1
	12.07.2011	-1		03.06.2008	-1
France	21.01.2003	+1		02.12.2009	+1
	03.06.2003	+1		21.06.2013	-1
	30.01.2007	-1	The Netherlands	02.06.2004	+1
	27.04.2009	+1		07.06.2005	-1
	02.12.2009	+1		02.12.2009	+1
	21.06.2013	+1		21.06.2013	+1
	27.02.2015	+1		20.06.2014	-1
	10.03.2015	+1	Portugal	12.02.2002	-1
Greece	05.07.2004	+1		20.09.2005	+1
	18.01.2005	+1		03.06.2008	-1
	17.02.2005	+1		02.12.2009	+1
	05.06.2007	-1		09.10.2010	+1
	27.04.2009	+1		21.06.2013	+1
	02.12.2009	+1		12.07.2016	+1
	16.02.2010	+1	Spain	27.04.2009	+1
	10.05.2010	+1		02.12.2009	+1
	07.09.2010	+1		10.07.2012	+1
	07.03.2011	+1		21.06.2013	+1
	12.07.2011	+1		12.07.2016	+1
	08.11.2011	+1			
	13.03.2012	+1			
	04.12.2012	+1			
	20.08.2015	+1			

Note: Events that have negative impact are flagged by +1 (increasing the spreads) and events that have positive are flagged by -1 (decreasing the spreads). For instance, on 02.12.2009 EC reports the council decision on the existence of an excessive deficit for Austria, which is considered as a negative effect, that increases the yield, spreads so it is flagged by +1. On 20.06.2014 EC reports council decision abrogating the decision on the existence of an excessive deficit for Austria where it is flagged by -1 as it has a positive effect and decreases the yield spreads. Source: EC.

Table A4 – Type 1 Monetary events (Key ECB interest rates)

	Date	DF	MRO (fixed and variable rates)	MLF
1999	01 January	2.00	3.00	4.50
	04 January	2.75	3.00	3.25
	22 January	2.00	3.00	4.50
	09 April	1.50	2.50	3.50
	05 November	2.00	3.00	4.00
2000	04 February	2.25	3.25	4.25
	17 March	2.50	3.50	4.50
	28 April	2.75	3.75	4.75
	28 June	3.25	4.25	5.25
	01 September	3.50	4.50	5.50
2001	06 October	3.75	4.75	5.75
	11 May	3.50	4.50	5.50
	31 August	3.25	4.25	5.25
	18 September	2.75	3.75	4.75
	09 November	2.25	3.25	4.25
2002	06 December	1.75	2.75	3.75
2003	07 March	1.50	2.50	3.50
	06 June	1.00	2.00	3.00
2005	06 December	1.25	2.25	3.25
2006	08 March	1.50	2.50	3.50
	15 June	1.75	2.75	3.75
	09 September	2.00	3.00	4.00
	11 October	2.25	3.25	4.25
	13 December	2.50	3.50	4.50
2007	14 March	2.75	3.75	4.75
	13 July	3.00	4.00	5.00
2008	09 July	3.25	4.25	5.25
	08 October	2.75	-	4.75
	09 October	3.25	-	4.25
	15 October	3.25	3.75	4.25
	12 November	2.75	3.25	3.75
2009	10 December	2.00	2.50	3.00
	21 January	1.00	2.00	3.00
	11 March	0.50	1.50	2.50
	08 April	0.25	1.25	2.25
	13 May	0.25	1.00	1.75
2011	13 April	0.50	1.25	2.00
	13 July	0.75	1.50	2.25
	09 November	0.50	1.25	2.00
	14 December	0.25	1.00	1.75
2012	11 July	0.00	0.75	1.50
2013	08 May	0.00	0.50	1.00
	13 November	0.00	0.25	0.75
2014	11 June	-0.10	0.15	0.40
	10 September	-0.20	0.05	0.30
2015	09 December	-0.30	0.05	0.30
2016	16 March	-0.40	0.00	0.25

Notes: DF - The interest rate on the deposit facility; MLF – The interest rate on the marginal lending facility; MRO – The interest rate on the marginal refinancing operations. We merged the fixed and variable rate tenders to a single column. On 08.06.2000 the ECB announced that, starting from the operations to be settled on 28.06.2006 the MROs of the Eurosystem would be conducted as variable rate tenders. On 08.10.2008 the ECB announced that starting from the operations to be settled on 15.10.2008, the weekly MROs would be carried out through a fixed rate tender procedure. As we used monthly data in our study, we only considered the last rate announced in a given month.

**Table A5 – Type 2 Monetary events
(Conventional and Unconventional monetary policy)**

Instruments	Monetary policy measures	Conventional instrument?	Announcement and implementation
Open market operations	Longer-term refinancing operations (LTRO)	Yes	-
	Targeted longer-term refinancing operations I (TLTRO I)	No	5 June 2014 June 2014 – May 2016
	Targeted longer-term refinancing operations II (TLTRO II)	No	10 March 2016 Since June 2016
Asset purchase programmes	Covered bond purchase programme (CBPP1)	No	7 May 2009 July 2009 – June 2010
	Securities Markets Programme (SMP)	No	10 May 2010 May 2010 - September 2012

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