

The Implications of ECB's Asset Purchase Programmes for Liquidity Premia in Euro Area Government Bonds

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Abstract

This article examines the impact of the ECB's asset purchase programmes on the sovereign bond liquidity premia by employing both classical and controlled event-study analysis. We provide evidence that monetary news emerge as key determinants in bond market liquidity. More specifically, the estimates showed that all events were effective in countering upward pressure on Italian liquidity premia. The inclusion of macroeconomic surprises affects the results only marginally, indicating that the announcements are the most relevant news within the event window. Our findings show also robust, economically significant impact of SMP and OMT events on the Italian and Spanish liquidity premiums.

JEL Classifications: E52, E58, G14

I. Introduction

In response to the global financial crisis, the ECB has enacted several unconventional monetary policy measures with the objective of addressing the European economy and market dysfunctions and focus on issues such as the transmission mechanism of monetary policy. Especially important in restoring trust in the periphery of Europe was the ECB's Outright Monetary Transactions (OMT) in the secondary markets for government bonds. Note that the Securities Markets Programme (SMP) launched by the ECB in May 2010 was discontinued with the introduction of the OMT. Recently, the ECB has joined several central banks in implementing large-scale asset purchases, through an Asset Purchase Programme (APP). Announced on January 22, 2015, the ECB APP had the objective to address deflation risks and to ease borrowing conditions of households and firms.

There is clear empirical evidence that the asset purchases programs intervening in the secondary bond market¹ had an immediate and obvious impact on sovereign bond yields and spreads relative to German counterparts. For example, Szczerbowicz et al. (2015) show that the SMP and OMT announcements were particularly effective in reducing the periphery long-term sovereign bond spreads, whereas the yield spreads on French government bonds reacted very little if at all. Falagiarda and Reitz (2015) also confirm spread reducing effects. They find that news about SMP strongly affected the perceived sovereign risk of five stressed euro area countries (Greece, Ireland, Italy, Portugal, and Spain), while the OMT events substantially reduced yield spreads only in Italy and Spain. Kilponen, et al. (2015) find that the the ECB's SMP and OMT announcements had a significant negative effect on 10-year government bond spreads of several euro area countries, including Germany and France. Altavilla, et al. (2016), Krishnamurthy, et al. (2018), and Ferrando, et al. (2015) find clear empirical evidence that the OMT announcement significantly lowered Italian and Spanish government bond yields (around 200 basis points). The impact of such announcement, however, is insignificant for German and French bond yields of the same maturity. Ghysels et al. (2017) find that SMP interventions succeeded in lowering yield of sovereign bonds for the countries under the program, except Greece. More specifically, they estimate the effect of purchase program to be about 230 basis points on the 10-year yields for Italy and Spain. Recently, several articles focused on the effectiveness of the ECB's APP. For instance, De

¹ The effect of large-scale asset purchases on longer-term interest rates in the United States and in the United Kingdom is surveyed by Williams (2014).

Santis (2016) find that the APP reduced the GDP-weighted 10-year euro area sovereign bond yield by 56 basis points between September 2014 and February 2015. Similarly, Andrade et al. (2016) find that the January 2015 announcement of the APP has significantly lowered yields of 10-year government bonds.

While the motives and effectiveness of unconventional monetary policies in the United States and Eurozone have been intensely debated, the asset purchase programs' effects on market functioning, specifically on sovereign bond liquidity premia² has received much less attention³. No consensus has thus far been reached on this issue. Among the recent growing literature on large-scale asset purchase programs, Kandrac and Schlusche (2013) find evidence that Treasury purchases during the various quantitative easing (QE) programs by the Federal Reserve (Fed) have no significant liquidity effects. By contrast, Christensen and Gillan (2014) present some evidence that the Treasury inflation-protected securities (TIPS) purchases included during the Fed's QE2 program have improved liquidity in the TIPS market ; and hence reduced its liquidity premium. Using the publicly available weekly SMP holdings that operated from May 2010 to March 2012, De Pooter, et al. (2018) find statistically and economically significant effects on sovereign bonds' liquidity premia in response to purchases. In particular, they show an instantaneous and negative impact of 32-40 basis points from purchasing 1% of the outstanding market. Eser and Schwaab (2016) find that the ECB's SMP purchases when intervened, substantially improved market liquidity conditions in terms of reduced liquidity risk premia. More recently, Kandrac and Schlusche (2018) find that mortgage-backed securities (MBS) purchases adversely affected average trading volume, trade sizes, and the number of trades, whereas bid-ask spreads remained mostly unaffected. Gagnon et al. (2011) and Hancock and Passmore (2012) find that MBS purchase program improved the functioning of that market.

² This premia exist since sovereign bonds are traded mostly over the counter (OTC). Except the very liquid U.S., U.K., and German bond markets, other bonds required a substantial liquidity premium given that it might be difficult to find a counterparty that is willing to buy or sell in an illiquid market.

³ Relatively few papers to date have attempted to provide an explanation for the interbank's reaction to unconventional monetary policy. One effort along these lines is that of Dubecq et al. (2013), who used a quadratic term structure model of the EURIBOR-OIS spreads to perform the effectiveness of selected ECB' unconventional monetary policies. They find that the SMP had no effect on interbank premia, however, the OMT helped ease liquidity risk. More recently, Casiraghi et al. (2016) find that money markets were not significantly affected by the OMT program. They argued that OMT did not involve changes in excess liquidity as liquidity was abundant at that time as a consequence of the three-year LTROs.

Studies from the United States and Europe highlight that asset purchase programs' effects on government bonds futures markets are substantial, but there has been considerable debate over the channels through which the programs work. These channels are not mutually exclusive, given that some may be at play simultaneously. We briefly review the major important channels building on the contributions by Krishnamurthy and Vissing-Jorgensen (2011), Glick and Leduc (2012) for US QE and Fratzscher et al. (2016) for ECB policies.

First, one channel works through the portfolio balance channel in that by purchasing asset (for instance, US Treasuries and euro area government bonds) the central bank may reduce the overall supply of these securities, available to private sector, and, as a result, compressing the term premium required to compensate investors to hold them and causing their interest rates to fall. In the euro area, such scenario creates more favorable conditions for economic recovery which led to lower sovereign risk in countries under stress (such as Italy). Gagnon et al. (2011) argue that Fed announcements work primarily through the portfolio balance channel. Falagiarda and Reitz (2015) argued that only purchases of securities (for example, SMP, and OMT) might influence financial markets and the economy through the portfolio rebalancing channel.

Second, asset purchases may also affect government bonds futures markets via signaling policy. More specifically, the announcements of unconventional monetary policies can be considered as signaling effects about the central bank's perception about future economic conditions and policy actions. In this context, Glick and Leduc (2012) emphasize the role of expectations of private agents. In particular, when investors feel that conditions are worse in the future, they can boost their demand for Treasuries considered as safe-haven investments, lowering their yields. In addition, Saka et al. (2015) document that the OMT events signaled investors by the intention of ECB to take up the function of lender of last resort. Falagiarda, et al. (2015) provide evidence consistent with the view that the signaling channel played an important role in the transmission of SMP announcements.

Third, the sovereign credit risk channel is a potential channel of transmission of asset purchases. As pointed out by Rogers et al. (2014), several unconventional policies of the ECB during the crisis, namely, the SMP and OMT were aimed at containing sovereign risk premia that were considered excessive.

Finally, the channel we emphasize in this study is for asset purchase programs to have influence on the liquidity premiums that investors demand as an additional compensation for holding any security that is less than perfectly liquid. To be specific, when a central bank launches an asset purchase program, we argue that it is equivalent to the presence of a new

large buyer into sovereign bond markets. This picture leads to a change in the outcome of the game that determines the liquidity premiums for the securities targeted by the asset purchases. As a result, such programs can be expected to improved the liquidity and functioning of the market and reduced related premia by making a counterparty easier to find. The relevance of the liquidity channel, has been examined e.g. by Christensen and Gillan (2014), Hancock and Passmore (2012), Eser and Schwaab, (2016), and De Pooter et al. (2018). All these studies find that the asset purchases by the Fed or the ECB were effective in reducing liquidity premia and, thus, improved the functioning of related market.

Against this background, the goal of this paper is to examine the effectiveness of ECB's unconventional monetary announcements on the dynamics of liquidity premiums in selected euro area sovereign bond markets. The current analysis extends the available literature in a number of ways. First, contrary to study by Eser and Schwaab (2016), and the more recent work of De Pooter, et al. (2018) which focused only on the asset purchases within the SMP, we include, in our analysis, the major events of asset purchase programs by the ECB during the period 2010-2015, which allows us to compare program effectiveness across all purchase programs. Second, the main idea is to assess the effects of the policy announcements through the regression of liquidity premiums within a narrow time interval around event dummies (taking value one in the date of the event, the ECB announcements of asset purchases, and zero elsewhere). At the same time, to the best of our knowledge, this paper is the first to examine not only the impact of the announcements, but control for other potential confounding factors, by including in the regression the surprise component of a broad set of market-moving macroeconomic releases as specified by Scotti (2016). Third, we carry out a classical and controlled event-study analysis to assess in some detail the sovereign liquidity premium's response when considering the nature of the operations announced. Finally, we try to gain some insights into the reasons for the sovereign bond market's response.

The key findings of this paper are summarized as follows. First, with classical event-study analysis, we find that all identified ECB announcements have been much more effective in reducing the liquidity premiums in Italy than in Spain, where bond market have not significantly reacted to the policy events. More specifically, we find that such announcements induce lower liquidity premiums in Italian bond market. Second, by increasing the event window to two days to allowing for possible anticipated and delayed reactions to news by market participants, we show that the effect of the all events on the Italian liquidity premiums has been very persistent, with no signals of possible rebound in the following or before days. Third, we also find that the inclusion of macroeconomic surprises affects the results only

marginally. This suggests that when a selected event occurred, the Italian bond market were dominated by monetary policy announcements and not by macroeconomic surprises within the event window. Fourth, by considering the nature of the announced operations, we can confirm that SMP and OMT events feature the highest effect on the Italian and Spanish liquidity premiums. By contrast, the effect of the APP events is found to be statistically insignificant for Italy and Spain. The results of the event study ‘controlling’ for macroeconomic news surprises, can confirm that the effects of SMP events change marginally for both markets. Whereas, the effects of OMT announcements show a quite large difference between the two countries. In particular, once the effects of all macroeconomic news are taken into account, the estimated effects of the all OMT events significantly change only for Spain and not for Italy. This result indicates that such events are the most pertinent news within the event window only for Italian bond market. In addition, APP events are associated with significant impact on the liquidity premiums for both bond markets, namely for the one day event window.

Taken together, these results suggest that the main asset purchases by the ECB are determinants of sovereign bond liquidity. This situation gives rise to the so-called liquidity channel in which the measures taken by the ECB are viewed as the equivalent to the presence of a new large buyer into bond markets. This interpretation is supported by the findings that the effect is negative during times when liquidity conditions for investors are favorable.

The article is organized as follows. Section 2 describes the data and briefly presents the major events related to ECB's asset purchase programs that will be employed on our study. In Section 3, we present the model. Section 4 reports the empirical results from the event-study analysis. The last section concludes.

II. Data

The dataset used for this paper contains daily 5-year sovereign credit default swaps (CDSs) spreads and bond price data and spans a sample period that extends from August 14, 2009, to May 12, 2015. The data corresponds to two euro area periphery countries, called also distressed countries. These countries are: Italy and Spain. They have experienced severe problems during the European sovereign debt crisis. Subsequently, the 5-year sovereign bond yields have been transformed into 5-year sovereign bond spreads with respect to German sovereign bond yields. While Altavilla, et al. (2016) focused on their analysis on the 2-year and 10-year maturity bonds, we used in our current study the 5-year maturity. The rationale

behind this choice is double. First, the 5-year maturity has been used because it is in the middle between the 2-year and 10-year maturity bonds that were targeted by the ECB (Eser and Schwaab, 2016; p. 10). Second, this choice echoes the view, commonly held among CDS market practitioners, that 5-year sovereign CDSs are typically the most liquidly traded.⁴

In the subsection below, we detail the measure of liquidity premiums in sovereign bond yields that we will later relate to unconventional monetary policy announcements in our empirical analysis. Ideally, we would like to use a pure measure of liquidity premiums in our analysis that is typically assumed to reflect liquidity conditions for a given market.

A major difficulty inherent in measuring the effect of liquidity considerations in sovereign bond yields is that liquidity premium is unobservable. Some effort is therefore taken to consider several measures such as traded volumes and bid-ask spreads that imperfectly capture some aspects of liquidity. Another important additional reason explaining a difficult issue of such proxies is that they are not always available or their reliability differs across bond markets, which in turn not allow drawing strong conclusions for multi-country analysis (Garcia and Gimeno, 2014). Moreover, Eser and Schwaab (2016) argued that “in the context of large-scale asset purchases, bid-ask spreads are imperfect measures of asset specific liquidity in that they apply only to a small fraction of a potentially much larger order”.

In the current study, we focus on a more direct approach of liquidity premium which allows us to circumvent difficult issues with the mentioned proxies. Our identification of changes in liquidity premium in individual bond markets is based on the well-known CDS-bond basis (De Pooter, et al. 2018, and Eser and Schwaab, 2016). The latter is defined as the difference between the CDS spread and the sovereign yield spread, for a given country and maturity. Eser and Schwaab (2016) considered this measure as a useful indicator of asset-specific liquidity and the well-functioning of bond markets. The rationale is that, in theory, sovereign bonds and CDSs markets have the same default premium, and the difference in their associated spreads, consequently, provides evidence of the liquidity premium in each bond market.⁵ Note that CDS prices are not necessarily tied to liquidity conditions in the bond

⁴ Using three months of confidential trading data, Chen et al. (2011) find that 84% of all index transactions are in the 5-year maturity.

⁵ As demonstrated by Duffie (1999), the CDS-bond basis should theoretically be close to zero. Brunnermeier and Pedersen (2009) argued that “trading requires capital and capital availability is subject to market conditions”. In that context, the component of the yield spread which is not explained by default risk (the CDS) can be attributed in particular to bond-specific liquidity. Prior research by Longstaff, et al. (2005) finds that the non-default component extracted from fitting a reduced form model to CDS prices and corresponding bond yields can be related to measures of asset specific liquidity. Blanco, et al. (2005) argued that deviations from parity can be explained by imperfections in contract specifications, liquidity and informational effects. More recently, Fontana

market. In the same spirit, Longstaff (2004) measures liquidity premium as the spread between U.S. Treasuries and bonds issued by Refcorp, that are guaranteed by the U.S. Treasury. For the euro area, Monfort and Renne (2014) capture bond market liquidity effects by the KfW-Bund spread which is based on the yield spreads between German sovereign bond (i.e. Bund) and KfW agency bonds, guaranteed by the German government.

Since the beginning of financial crisis the ECB has engaged in several unconventional monetary policy measures with the objective of addressing the European economy and market dysfunctions and focus on issues such as the transmission mechanism of monetary policy. We briefly describe below the major events related to ECB's asset purchase programs occurred between May 2010 and March 2015 and that will be used on our study.

On 10 May 2010, the ECB announced the SMP which consists on the purchases of long-term sovereign bonds. The aim of this programme was to reduce market uncertainty in general and more specifically to ensure depth and liquidity in secondary markets that were dysfunctional. Purchases of government bonds were initially limited to Greek, Portuguese and Irish government bonds (May 2010). On August, 2011 a second phase of purchases extended to government bonds issued by Italy and Spain. In February 2012, the ECB bought around 220 euro billions of government bonds of countries experiencing financial stress. The OMT was announced in July and August 2012 and adopted in September 2012. The SMP was discontinued with the introduction of the OMT. Under this programme, the ECB can purchase government-issued bonds maturing in 1-3 years of a government asking for financial assistance. This programme specially designed to address default risk in general, or in particular, the risk that one country will leave the euro. On 22 January 2015, the ECB announced the expanded asset purchase programme which covers securities issued by euro area sovereigns, agencies situated in the euro area and supranational European institutions. This programme adds a purchase programme for public sector securities to the existing asset

(2011) and Bai and Collin-Dufresne (2013) argued that, during the financial crisis, the CDS-bond basis became significantly negative for many reference entities. Bhanot and Guo (2012) has documented that negative deviations of the CDS-bond spread basis during the global financial crisis, are explained primarily by funding liquidity and asset-specific market liquidity. In that sense, Beber, et al. (2009) and Monfort and Renne (2014) reported a significant role of the default risk premium and the liquidity risk premium in explaining the level and dynamics of euro-area yields, especially during the debt crisis in the euro area.

purchase programmes for private sector. The monthly purchase volume will amount to €60 billion of public and private securities, starting in March 2015.

Table 1 reports the events related to ECB's asset purchase programmes over the period 2010-2015 that might affect the stressed government bond markets in the euro area, and namely their associated liquidity premiums. For each event, we report the day when it was announced, the type of the announcement, and a brief description.

TABLE 1. Announcements of ECB's unconventional monetary policy measures.

Date	Programme	Description
10 /05/2010	SMP	The Governing Council decided to proceed with the SMP as part of a package with other measures to address severe tensions of financial markets in the euro area.
08/08/2011	SMP	The ECB's president Mario Draghi decided to actively implement the SMP targeting Italian and Spanish bonds in particular.
26/07/2012	OMT	Draghi announced in his famous speech, during a conference in London that the ECB is "ready to do whatever it takes to preserve the euro".
02 /08/2012	OMT	During the Governing Council meeting, the OMT framework was announced: "ECB may undertake outright open market operations of a size adequate to reach its objective."
06/09/2012	OMT	The Governing Council announced a number of technical details regarding OMT program.
22 /01/2015	APP	The Governing Council announces an expanded asset purchase programme, encompassing the new PSPP as well as the formerly launched ABSPP and the CBPP3.
09/03/2015	APP	The APP is implemented.

III. Empirical framework

In this paper, we assess the responses of liquidity premiums in the sovereign bond markets in Italy and Spain to announcements related to ECB's asset purchase programs for the sample period August 14, 2009, to May 12, 2015 by using estimating the following regression model:

$$\Delta y_{L,t}^j = \delta_0 + \delta_1 \Delta y_{L,t-1}^j + \delta_2 D_t + \delta_3 News_t + \varepsilon_t \quad (1)$$

The dependent variable $\Delta y_{L,t}^j$ denotes the daily change in liquidity premium embedded in 5-year bond yields at time t and for each country i . Following De Pooter et al. (2018), we use the negative of the CDS-bond basis, reported in units of yield basis points.

D_t to a vector of event dummies in which each variable is equal to one on the corresponding “event day” and zero on the other days. The event dummies correspond to major events related to ECB's asset purchase programs occurred between May 2010 and March 2015.

To check whether such events may have had only a temporary impact on asset prices, we extend the size of the event window up to two days. Precisely, we follow Falagiarda and Reitz (2015) by allowing for possible anticipated and delayed reactions to news by market participants. We refer to two different two-day event windows. The first one is implemented by assigning the value of one to the unconventional monetary policy dummy on the day of the announcement and the day before and zero elsewhere. In the second two-day event window, the unconventional monetary policy dummy takes the value of one on the day of the announcement and the day after and zero elsewhere. Altavilla, et al. (2016) justify this two-day event window by the fact that, during a period of low liquidity, the prices of bonds may react slowly in response to an announcement.

To control for other potential confounding factors, we augment the regression estimated in classical event-study analysis by including the surprise component of a broad set of macroeconomic news. More in detail, the “controlled” event-study analysis aims at taking into account all macroeconomic news that materialized within each event window and that could have, possibly, influenced the government bond rates in that particular time window (see Altavilla, et al., 2016 and Altavilla and Giannone, 2017).

Data on macroeconomic news surprises are sourced from Scotti (2016)⁶. They cover daily euro-area surprise index. The index of macroeconomic news surprises summarizes the recent economic data surprises and measures. In other words, it is defined as the deviation of released data from consensus expectations. This index measures also the optimism/pessimism about the state of the economy.

IV. Empirical results

We now present our empirical results examining the reaction of liquidity premiums on sovereign bond markets to unconventional monetary announcements along several main dimensions. First, we conduct a comprehensive and classical event-study to observe the patterns of daily changes of liquidity premiums of stressed euro area economies within a narrow time interval around a set of event dummies associated with selected ECB announcements of asset purchases. Second, we control for other potential confounding

⁶ Available at: <https://sites.google.com/site/chiarascottifrb/research/surprise-and-uncertainty-indexes>.

factors, by including in the regression the surprise component of a broad set of market-moving macroeconomic releases as specified by Scotti (2016). Third, we have explored whether sovereign liquidity premiums react, when considering the nature of the announced operations.

The Panel A of Table 2 report each country's estimation coefficients of equation (1) as specified in Section 2 without distinguishing events and based on classical event-study analysis. The key contribution of this paper is to suggest that all identified ECB announcements have been much more effective in reducing the liquidity premiums in Italy during the sample period. Specifically, Column (4) of Table 2 reveals that the coefficient associated with the all events as estimated with classical event-study analysis, is significant and have the expected magnitude. The rationale behind this finding is that the announcements of purchases of securities went through the liquidity channel.

At the same time, for Spain, we show that policy events have at best no effect, and at worst the negative consequence of increasing liquidity premiums, rather than reducing them. Thus, we conclude that these purchases had no effect on the functioning of the bond market. At this stage, one can confirm that the Spanish bond market developed in relative isolation with respect to external factors, like monetary policy announcements. The result is understandable, given that the ECB's asset purchase programs was directed to support distressed markets namely for Spain.

To check whether the ECB monetary announcements may have only a temporary impact on liquidity premiums, we extend the event window to two days to allowing for possible anticipated and delayed reactions to news by market participants. The results for the classical event-study analysis are reported in the Columns 2-3 and 5-6 of Table 2, respectively. The empirical evidence indicates that the effect of the all events on the Italian liquidity premiums has been very persistent, with no signals of possible rebound in the following or before days. This leads also to the main finding of our paper, which suggests that announcements about the asset purchases led to lower Italian premia. In addition, we can confirm that monetary events feature the highest effect on the Italian bond liquidity premia within the anticipation window than within the delayed one. Turning to Spanish market, we document a similar pattern to one day event window in the sense that liquidity premia do not respond to monetary news.

Panel B of Table 2 reports the results of the event study 'controlling' for macroeconomic news surprises. In Columns 4, 5, and 6 of Table 2, we can show that the introduction of macroeconomic surprises affects the results only marginally. This suggests that when our selected events occurred, the Italian bond market were dominated by monetary policy

announcements and not by macroeconomic surprises. Columns 1, 2, and 3 of Table 2 reveals that once the effects of all macroeconomic news are taken into account, the estimated effects of the all ECB unconventional monetary events significantly change. These findings lend strong support to the view that the announcements are not the most relevant news within the event window for the Spanish bond market.

TABLE 2. Changes in sovereign bond liquidity premiums around policy event dates: All events

Panel A	Spain			Italy		
	Classical			Classical		
	One Day	2-day (lagged effects)	2-day (anticipation effects)	One Day	2-day (lagged effects)	2-day (anticipation effects)
δ_0	-8.19E-05 (0.974)	7.98E-05 (0.975)	-9.09E-05 (0.972)	0.000 (0.944)	0.000 (0.818)	0.000 (0.748)
δ_1	-0.015 (0.559)	-0.015 (0.559)	-0.013 (0.603)	-0.010 (0.678)	-0.013 (0.593)	-0.008* (0.750)
δ_2 All events	0.041 (0.272)	0.003 (0.891)	0.021 (0.419)	-0.059* (0.070)	-0.068*** (0.003)	-0.089*** (0.000)
Panel B	Controlled			Classical		
	One Day	2-day (lagged effects)	2-day (anticipation effects)	One Day	2-day (lagged effects)	2-day (anticipation effects)
δ_0	-8.19E-05 (0.974)	7.93E-05 (0.975)	-9.74E-05 (0.970)	0.000 (0.943)	0.000 (0.816)	0.000 (0.747)
δ_1	-0.015 (0.561)	-0.019 (0.451)	-0.005 (0.836)	-0.011 (0.645)	-0.020 (0.436)	-0.009 (0.727)
δ_2 All events	0.174*** (0.000)	0.057 (0.103)	0.087** (0.013)	-0.153*** (0.000)	-0.139*** (0.000)	-0.143*** (0.000)
δ_3	-0.469*** (0.000)	-0.188** (0.021)	-0.230*** (0.004)	0.328*** (0.001)	0.247*** (0.000)	0.190*** (0.007)

Table 2 reports the estimated coefficients from ordinary least squares regressions of the effects of the ECB's unconventional monetary policy announcements on 5-year sovereign bond liquidity premiums. The results are of the classical and controlled event-study analysis. Note that the controlled event study corresponds to the model given in eq.(1) where the daily changes in liquidity premiums are regressed on a set of event dummies and the macroeconomic news surprises. The sample includes two periphery countries (Italy and Spain). Data are daily and cover a sample period that starts on August 14, 2009 and ends on May 12, 2015. The macroeconomic news surprises are collected from Scotti (2016). Statistical significance at the 1% and 5% levels is denoted by *** and **, respectively. p-values - are shown in parentheses.

To better understand how unconventional monetary announcements affect liquidity premiums of sovereign bonds markets in the euro area, we check for robustness over the sample period by considering the nature of the announced operations.

The previous analysis doesn't discriminate between the different monetary actions. Should the response of liquidity premiums to SMP events differs from that to OMT events for example, the specifications given in Equation 1 become too restrictive to capture such nuanced reactions.

We model the change in the liquidity premia as follows:

$$\Delta y_{L,t}^j = \delta_0 + \delta_1 \Delta y_{L,t-1}^j + \delta_2 D_t^{SMPevents} + \delta_3 D_t^{OMTevents} + \delta_4 D_t^{APPevents} + \delta_5 News_t + \varepsilon_t \quad (2)$$

Based on the classical event-study analysis, we can confirm that SMP and OMT events feature the highest effect on the Italian and Spanish liquidity risk premiums. This suggests that using the nature of the operations announced helps us overcoming the problems which plague analysis based on all events data. Estimates are very precise also for Spain, and unlike in the previous case the sign is almost always negative (one noticeable exception being the effects of SMP purchases on Spain). For instance, the flow of SMP purchases from an investor of last resort reduces liquidity premiums associated with Italian bonds by making a counterparty easier to find. Furthermore, we find that liquidity premia declined substantially when the OMT announced, suggesting substantially improved of Italian and Spanish market liquidity conditions.

However, rather than reducing the liquidity premium, the SMP purchases increased liquidity risk premia in the Spanish bond market. Table 4 reports estimates for the impact of SMP purchases on CDS premia and yield spreads in Spain. The main finding is that SMP events have a negative impact on CDS spreads, and that the impact is larger than that for the corresponding yield spreads. This holds for all the event windows taken in this study, and suggests an important role for the increase in liquidity risk premia. The SMP may have been seen as an indication of market participants that are confident about the reduction of default risk. In the same time, they may not have expected the program to be active in reducing liquidity risk premia on the bonds.

By contrast, the effect of the APP events is found to be statistically insignificant for Italy and Spain. In addition, even if not significant, in the case of Spain the coefficient associated with APP events has the wrong positive sign. The latter is understandable, given that the APP was directed to create additional liquidity in excess of that obtained using the standard

channel, when the short-term policy rate is since September 2014 reduced at a level close to zero. One possible explanation is that the monetary policy announcement in January 2015 was already implicitly communicated to the market in 2014 (De Santis, 2016). Taken together, the difference in the results indicates that the split of events matters.

Panel B of Table 3 presents the results of the event study ‘controlling’ for macroeconomic news surprises. Regarding the SMP events, we can show that the inclusion of macroeconomic surprises influences the results only marginally for both countries. Specifically, we notice that the impact of SMP purchases on the Italian liquidity premia has always the correct negative sign. These findings indicate that when our SMP events occurred the bond market were dominated by monetary policy announcements and not by macroeconomic surprises. The figures regarding OMT announcement effects show a quite large difference between the two countries. In particular, once the effects of macroeconomic news are taken into account, the estimated effects of the all OMT events significantly change for Spain. For Italy, it emerges that the bond liquidity premia has been marginally affected by OMT news confirming the view that the announcements are the most relevant news within the event window only for Italian bond market. Finally, the APP events are associated with significant impact on the liquidity premiums of all countries. The significance of the effects is heavily influenced by the macroeconomic news identified above, however.

TABLE 3. Changes in sovereign bond liquidity premiums around policy event dates: Events distinguished by type

Panel A	Spain			Italy		
	Classical			Classical		
	One Day	2-day (lagged effects)	2-day (anticipation effects)	One Day	2-day (lagged effects)	2-day (anticipation effects)
δ_0	-8.12E-05 (0.974)	7.81E-05 (0.976)	-9.63E-05 (0.970)	0.000 (0.943)	0.000 (0.817)	0.000 (0.747)
δ_1	-0.024 (0.338)	-0.028 (0.281)	-0.006 (0.791)	-0.012 (0.623)	-0.017 (0.498)	-0.009 (0.724)
δ_2 SMP events	0.296*** (0.000)	0.145*** (0.003)	0.239*** (0.000)	-0.066 (0.281)	-0.097** (0.025)	-0.124*** (0.004)
δ_3 OMT events	-0.089 (0.118)	-0.086** (0.033)	-0.099** (0.014)	-0.101** (0.043)	-0.100*** (0.004)	-0.129*** (0.000)
δ_4 APP events	-0.017 (0.801)	-0.002 (0.967)	-0.012 (0.792)	0.008 (0.890)	0.009 (0.830)	0.005 (0.903)
Panel B	Controlled			Classical		
	One Day	Two Days	Three Days	One Day	Two Days	Three Days
δ_0	-8.14E-05 (0.974)	7.79E-05 (0.976)	-9.97E-05 (0.969)	0.000 (0.943)	0.000 (0.816)	0.000 (0.747)
δ_1	-0.022 (0.377)	-0.030 (0.248)	-0.002 (0.919)	-0.011 (0.669)	-0.021 (0.419)	-0.009 (0.721)
δ_2 SMP events	0.339*** (0.000)	0.162*** (0.001)	0.255*** (0.000)	-0.102 (0.102)	-0.121*** (0.006)	-0.138*** (0.001)
δ_3 OMT events	0.017 (0.785)	-0.043 (0.355)	-0.059 (0.198)	-0.191*** (0.000)	-0.161*** (0.000)	-0.163*** (0.000)
δ_4 APP events	0.217** (0.028)	0.089 (0.203)	0.073 (0.296)	-0.189** (0.030)	-0.118* (0.054)	-0.069 (0.260)
δ_5	-0.442*** (0.000)	-0.172* (0.067)	-0.162* (0.084)	0.371*** (0.001)	0.240*** (0.003)	0.140* (0.088)

Table 3 reports the estimated coefficients from ordinary least squares regressions of the effects of the ECB's unconventional monetary policy announcements on 5-year sovereign bond liquidity premiums. The results are of the classical and controlled event-study analysis. Note that the controlled event study corresponds to the model given in eq.(1) where the daily changes in liquidity premiums are regressed on a set of event dummies and the macroeconomic news surprises. The sample includes two periphery countries (Italy and Spain). Data are daily and cover a sample period that starts on August 14, 2009 and ends on May 12, 2015. Our analysis includes three asset purchases by the ECB: SMP, OMT and APP. The macroeconomic news surprises are collected from Scotti (2016). Statistical significance at the 1% and 5% levels is denoted by *** and **, respectively. p-values - are shown in parentheses.

TABLE 4. Changes in Spanish yield and CDS spreads around SMP event dates

	One Day	2-day (lagged effects)	2-day (anticipation effects)
5y CDS spreads	-0.646*** (0.000)	-0.291*** (0.000)	-0.435*** (0.000)
5y yield spreads	-0.385*** (0.000)	-0.188*** (0.003)	-0.171*** (0.003)

Table 4 reports the estimated coefficients from ordinary least squares regressions of the effects of the SMP event announcements on 5-year sovereign bond yields and 5-year CDS premia. Data are daily and cover a sample period that starts on August 14, 2009 and ends on May 12, 2015. Statistical significance at the 1% level is denoted by ***. p-values - are shown in parentheses.

V. Conclusions

In this paper, we study the impact of unconventional monetary policy on one of the most important financial markets, the market for sovereign bonds. Studies from the United States and Europe highlight that asset purchase programs are transmitted through the bond market via several channels: for instance the portfolio balance, signaling and liquidity channels. Some observers also view the bond market dynamics susceptible to macroeconomic news. For these reasons, it will be useful to obtain quantitative estimates of the links between monetary policy changes and the functioning of the sovereign bond markets without and in the presence of macroeconomic news.

Our paper is most closely related to Eser and Schwaab (2016) and De Pooter, et al. (2018), who examined only the effectiveness of SMP program in reducing liquidity premia in euro area. We extend their work by analyzing the impact of a set of event dummies associated with selected ECB announcements of asset purchases (SMP, OMT and APP) on the liquidity premiums of two euro area periphery countries: Italy and Spain with a one and two-day event windows. This enables us to distinguish between each program effectiveness across all purchase programs. Our daily data runs from August 14, 2009, to May 12, 2015. We study the policy announcement effects with classical and controlled event-study analysis, where the explanatory variable is the change in the liquidity premia as measured by the negative of the CDS-bond basis.

Our paper provides several main findings. The main outcome of the classical event study is that policy decisions have had significant negative effects on sovereign bonds' liquidity premia for Italy. We show that the effect also proved significantly persistent, with no signals of possible rebound in the following or before days. Another interesting finding is that once the effects of all macroeconomic news are taken into account, the results only react marginally, indicating that the announcements are the most relevant news within the event window for the Italian bond market. In addition, when considering the nature of the operations announced, results suggest robust, economically significant impact of SMP and OMT events on the Italian and Spanish liquidity premiums. The findings of the event study 'controlling' for macroeconomic news surprises indicate that the responses to SMP programs are only marginally for both countries. Moreover, OMT announcements differently affect liquidity premia in the two markets. Finally, the asset purchase announcements may affect the functioning of the bond markets through the liquidity channel.

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