AN EVENT STUDY ANALYSIS OF ECB UNCONVENTIONAL MONETARY POLICY

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An Event Study Analysis of ECB Unconventional Monetary Policy

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Abstract

This paper analyzes the impact of the unconventional monetary policy measures implemented by the European Central Bank since 2007 to cope with the financial and sovereign debt crisis. The focus is on government bond yields of 10 European countries and 6 extra-Euro countries to evaluate the monetary policy transmission mechanism. In particular, I evaluate the effects of monetary policy announcements and liquidity injections on the yield curve. The econometric tool applied is the event-study methodology on policy announcements and liquidity injections (longer-term refinancing operations). Results supports the existence of an expectational channel of transmission and, more important, they shows that the effects of unconventional measures are not unique inside the monetary union but vary between countries and over time. In particular, the unfolding of the European sovereign debt crisis completely changed the impact of liquidity injections as they led to a rise in interest rate spreads for highly indebted countries.

JEL Codes: E52, E58, G12, G14

Keywords: central bank announcements, unconventional monetary policy, event-study, government bond yields, European sovereign debt crisis

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1 Introduction

This paper aims to evaluate the effects of the recent unconventional monetary policy measures implemented by the European Central Bank on government bond yields using an event-study approach.

Unconventional measures became necessary since the main European policy rate (interest rate on the main refinancing operations) had already been lowered to almost zero and this raises a large number of issues concerning the conduct of monetary policy. First of all, when the nominal rate is low it is likely that the real short term rate differs from the value necessary to ensure stable prices. In particular, if inflation expectations are negative, the real rate will be higher than needed while when inflation is expected to be high the real interest rate becomes negative. A second issue concerns the interest rate rule that looses its effectiveness when the nominal rate reaches the zero level. This in turns puts forward the problem of how to conduct monetary policy when the main instrument of the central bank is not anymore at its disposal.

Bernanke and Reinhart (2004) argue that three types of actions should be used to overcome the policy problems connected to the zero-lower bound. A communicative strategy should be used to influence expectations over the future path of interest rates and inflation but then a a central bank should also directly intervene by expanding and changing the composition of its balance sheet to provide liquidity and affects yields.

These three actions have been actually implemented by several central banks around the world to respond to the financial crisis.

My work deal with the effectiveness of such extraordinary measures in particular on European government bond yields.

The reason why I focus on government bond yields is that, starting from the second half of 2009, the financial crisis, which as for then was mainly a liquidity crisis of the banking sector, spilled over involving the public finance of Euro-area countries. Therefore, the ECB had to face a double problem: ensure the correct functioning of the credit market and mitigate tensions on government debt markets.

I use an event-study methodology; I focus on the days surrounding policy announcements and policy actions, because this allows me to capture the direct effects on bond yields. By studying yield changes on a day-by-day basis I can sweep aside the macroeconomic context as it is considered to be fixed in a short period of time. Therefore significant changes in yields around some key dates can be attributed to the effects of policy news and interventions on markets.

The event-study approach is what distinguishes my work from the recent literature on the effects of ECB interventions which bases the analysis on the historical aggregate relationships between macroeconomic variables, e.g. Lenza, Pill, Reichlin (2010), Peersman (2011), Giannone, Lenza, Pill, Reichlin (2011 and 2012), Gambacorta, Hofmann, Peersman (2012), Giannone, Lenza, Reichlin (2012) and Darraq-Paries, De Santis (2013).

The work is organized as follows. Section 2 summarizes the recent interventions of the European Central Bank to curb the financial crisis. Section 3 reviews the literature about the event-study

methodology. Section 4 analyses the effects of the ECB announcements regarding its unconventional measures on government bond yields at different maturities of ten Euro-area countries. Section 5 presents a panel analysis to study the direct effects of liquidity injections (represented by six LTROs with very long maturity) on 10-year maturity government bonds of ten Euro-area countries and on six extra-Euro countries. Section 6 concludes.

2 The History of Unconventional Monetary Policy

Since October 2008 the European Central Bank started to implement non-standard policy measures to provide the financial sector with extra-sources of liquidity.

In normal times, weekly main refinancing operations are the ECB's main policy instrument to provide liquidity to the banking sector because the amount allotted is not predetermined but depends on the bids of the banks, i.e. on liquidity demand. On the other hand, longer-term refinancing operations (LTROs) are conducted through competitive tenders in which each bank demands an amount of liquidity and offers an interest rate to remunerate the central bank: the total amount of liquidity to be allotted is predetermined and only the bids at higher interest rates are satisfied. In implementing the recent unconventional monetary policy measures the ECB completely overturned the scope of LTROs, which are now conducted with fixed rate tender and full allotment procedure and they have become the main source of funding for banks.

The ECB interventions prevented the collapse of the financial sector and acted along different dimensions:

- maturity transformation (the maturities of repos were lengthened);
- liquidity transformation (illiquid assets were accepted as collateral);
- transaction services (the number of eligible counterparties was increased);
- adverse selection (the counterparties' credit risk was absorbed).

In the following the unconventional actions are presented in chronological order.

The intervention of the ECB with supplementary liquidity measures has started in August 2007 when it announced a 3-month LTRO for an amount of 40 billion euros in addition to the regular monthly one, with the aim to support the normalization of the functioning of the euro money market. In September 2007 a further supplementary LTRO was implemented. The renewal of both these LTROs was decided in November of the same year. After few weeks the ECB announced that "in line with its aim to keep very short term money market interest rates close to the minimum bid rate in the Eurosystem's main refinancing operations, it would reinforce its policy of allotting more than the benchmark allotment amount in main refinancing operations for as long as needed and at least until after the end of the year". However these measures cannot fully be considered "unconventional" because the terms and the allotment procedures were standard. At the beginning of February 2008

the ECB announced a further renewal of the previous LTROs to consolidate the normalization of the euro area money market.

The first 6-month LTRO was introduced in March 2008. The allotment procedure was standard and so, although the term of the operation was lengthened, this cannot be considered a fully unconventional measure yet.

In October 2008, after the Lehman Brothers' bankruptcy, the ECB started to lower interest rates. Concerning liquidity measures, the Governing Council decided to increase the frequency and the size of its LTROs, and to conduct all the refinancing operations through a fixed rate tender procedure with full allotment. This implied that the ECB gave the full amount of liquidity that banks requested at a previously announced fixed interest rate, subject to being able to provide sufficient collateral. Also the list of eligible collaterals was expanded to include securities (other than ABS) rated BBB or higher. In addition, the ECB started to offer funding in US dollars and Swiss francs through foreign exchange swaps. This represents the official beginning of unconventional monetary policy measures.

In May 2009 the ECB announced the Enhanced Credit Support programme by which it introduced three longer-term refinancing operations with maturity of 12 months at a quarterly frequency with fixed rate tender procedures and full allotment. Moreover, the European Investment Bank (EIB) became an eligible counterparty in the Eurosystem's monetary policy operations under the same conditions as any other counterparty, therefore supporting lending in the euro area. Finally, the Governing Council announced the first Covered Bonds Purchase Programme (CBPP1) (see Beirne et al. (2011) for full details). The programme consists in the direct purchase, starting from July 2009, of euro-denominated covered bonds (with a minimum rating of AA or equivalent) issued in the euro area for an amount of 60 billion euros, in order to improve liquidity in private debt security markets, to ease banks funding conditions and to improve the risk profile of institutions holding covered bonds. As a matter of fact, the covered bond market is the most important privately issued bond segment in Europe and represents one of the main sources of banks' funding for mortgage lending. The financial crisis led to an increase in secondary-market spreads and then to a decrease in new issuances. This worsened the banks' liquidity condition, which was already jeopardized by the stall in money market activity so that an intervention by the ECB was necessary. The CBPP1 remained in place until June 2010.

In May 2010 the Governing Council established the Securities Markets Programme. Under this decision the Eurosystem central banks purchased Euro-area marketable-debt instruments issued by central governments or public entities. The aim of the program was to address the severe tensions observed in certain market segments ensuring depth and liquidity in order to restore an appropriate monetary policy transmission mechanism. The actual implementation of purchases started on the same day of the announcement. This action was designed not to affect the monetary policy stance: the impact of the interventions has been sterilized through specific operations to re-absorb the injected liquidity[1]. In addition, LTROs with maturity of three and six months and fixed rate tender

[1]Sterilization can happen, for example, through the sell of highly valued assets contemporaneously to the purchase

procedure with full allotment were scheduled. Finally, the temporary liquidity swap lines with the Federal Reserve System and US dollar liquidity-providing operations was reactivated. These operations took the form of repurchase operations against collateral and have been carried out as fixed rate tenders with full allotment.

A second round of the Securities Markets Programme was implemented starting in August 2011.

In the following months the ECB repeatedly renewed its decision to conduct its main refinancing operations as a fixed rate tender procedure with full allotment, and it established several LTROs of different maturities (up to 12 months) always with fixed rate tender procedure and full allotment.

In October 2011, the ECB launched a new Covered Bond Purchase Programme (CBPP2) to be implemented from November 2011. The programme consisted in the direct purchase in primary and secondary markets of 40 billion euros of covered bonds with a minimum rating of BBB- or equivalent, maximum residual maturity of 10.5 years and underlying assets that include exposure to private and/or public entities. The CBPP2 was expected to be completed by the end of October 2012. Moreover, the CBPP2 portfolio was available for voluntary lending through security lending facilities offered by central securities depositories.

In the same month the ECB published the schedule of the refinancing operations from October 2011 to July 2012. Two LTROs were announced, one with a maturity of approximately 12 months, to be implemented in October 2011, and the other with a maturity of approximately 13 months, to be implemented in December 2011. Both operations would be conducted with the fixed-rate full allotment procedure. Moreover the Governing Council decided to continue conducting its MROs with fixed rate tender procedures and full allotment for as long as necessary and the same procedure would be applied to the monthly 3-month LTROs to be allotted in the first half of 2012.

In December 2011 the ECB surprised the markets by announcing two longer-term refinancing operations with a maturity of 36 months and the option of early repayment after one year. Not only the maturity of these operation is extraordinary, but also the amount of loans announced: almost 490 billions. The loans have not been directly offered to governments but banks can use European government securities as collateral as well as mortgage securities and other commercial papers. Regarding this aspect, the ECB has extended the range of rating for asset-backed securities eligible as collateral in credit operations and it has reduced the reserve ratio from 2% to 1%. The first of this measures has been implemented in December 22nd 2011, while the second one has been put in place on March 1st 2012 for an amount of nearly 530 billions.

After the increase in the tensions on sovereign bond markets the ECB intervened announcing a new program labeled Outright Monetary Transactions (OMT) in August 2012. This program allows the Euro-area countries to ask for financial assistance to the ECB which will purchase government bonds with maturity from 1 to 3 years, provided that the country agrees to adopt specific economic measures (the so-called conditionality principle). The aim of the program is to restore and maintain "an appropriate monetary policy transmission and the singleness of the monetary policy" by lowering bond yields and therefore decreasing borrowing costs. The details of the program were published in

of weaker securities (government bonds, in this case).

September 2012. The official announcement of the OMT was preceded by an important declaration by the President of the ECB, at the end of July 2012, that stated that "Within our mandate, the ECB is ready to do whatever it takes to preserve the euro. And believe me, it will be enough.". An important thing to notice here is that, at the end of 2013, no OMT purchases were carried out yet.

In the following sections I will analyze yield movements around policy announcements and actions. The long term yields of government bonds can be decomposed into the sum of the compounded short-term risk-free interest rate expected over the period to maturity and the risk premium. The SMP and the two CBPPs implemented by the ECB directly influenced the quantity of assets on the market and so it is likely that they had an effect on risk premia through a portfolio rebalancing effect or a liquidity premium effect. On the other hand, LTROs imply the injection of liquidity into the credit sector in exchange for securities to deliver as guarantee. These securities were pre-existing in the bank's balance sheet and so, in principle, this operation should not imply any direct change in yields. However a change in yields can occur depending on what banks decide to do with the liquidity. This paper will explore this issue.

3 Literature Review

This section reviews the theoretical and econometric aspects of the event-study approach and presents some recent work in which this methodology is applied.

3.1 The Event-Study Methodology

The original application of the event-study methodology was in accounting and corporate finance research to study the wealth and price effects of mergers and acquisitions, earnings announcements, financing decisions by firms, change in the regulatory environment and macroeconomic variables. Pastorello (2001) explains the econometrics of event-studies and MacKinlay (1997) provides a review of the methodology with focus on corporate finance issues. An important contribution to this literature is the work of Fama, Fisher, Jensen and Roll (1969) that formulated the methodology that is essentially the same as the one which is in use today. In general, the objective of an event study is to evaluate whether movements of a time series around a certain date are consistent with normal returns or they can be considered abnormal in a statistically significant way. As a matter of fact, the event study approach relies firmly on the efficient market hypothesis, by which prices and returns incorporates all the information available, and on the rational expectation hypothesis. Therefore, in the present framework, bond yields should react to announcements regarding monetary policy because expectations are affected by those announcements.

The first step to conduct an event-study analysis is to identify the events of interest and the event-period. Then it is necessary to decompose the observed returns into two components, the normal and the abnormal return. The objective of the analysis is to verify the statistical significance of abnormal returns for individual (or asset) i on an event date τ , which can be obtained as the

difference between the actual return ($R_{i\tau}$) and the normal or expected return ($\mathbb{E}[R_{i\tau} \mid X_\tau]$):

$$AR_{i\tau} = R_{i\tau} - \mathbb{E}[R_{i\tau} \mid X_\tau].$$

Here X_τ is the information available to markets and that, combined with the market equilibrium relationship, allows to formulate expectations of future returns.

In general, the underlying assumption is that a security's return follows a general process of the form:

$$R_t = x_t\beta + \varepsilon_t. \tag{3.1}$$

Then, when an event occurs the model is assumed to change:

$$R_\tau = x_\tau\beta + z\alpha + \varepsilon_\tau. \tag{3.2}$$

Here x_t is a vector of independent variables at time t, β is the relative vector of parameters, z is a vector containing asset's characteristics that influence the return when the event occurs, α is a vector of coefficient measuring the effect of z and ε_t is a disturbance term with zero mean that possibly changes in event and non-event periods. So, the event study analysis amounts at evaluating the significance of the difference between the return generated by model 3.1 and the one coming from model 3.2, i.e. the abnormal return defined above.

This can be achieved in two different ways which differ from each other by the way they estimate the abnormal returns. The first approach estimates abnormal returns as forecast errors from a market equilibrium model and so the necessary tools are model 3.1 and the actual returns during the event of interest, which are assumed to be generated by model 3.2. The second approach estimates directly model 3.2 and evaluates the significance of parameters contained in α, where the null hypothesis is that such coefficients are zero. The second approach is the one I will apply for my study but it is useful to briefly review also the first approach.

Concerning the first approach, the models used to obtain market expectations are various in nature and types but generally they can be divided between statistical or economic models. The difference is that economic models are based on identifying assumptions while statistical models simply rely on statistical regularities. The selected model must be estimated on a pre-event sample and then the forecast will be used as expected returns to obtain estimated abnormal returns $\hat{AR}_{i\tau}$ for each asset. Then abnormal returns should be aggregated across assets and time to be able to perform statistical tests that will allow to draw inference about the overall effect of the event.

A more general and complementary approach for conducting an event-study analysis consists of estimating a multivariate regression model with dummy variables for the event date, which is the second methodology mentioned before. In particular, it is possible to define an event dummy which has value of one during the event of interest and zero otherwise. This dummy can be added to the market equilibrium model to capture the effect of the event in a specific date.

In Section 5 I will apply a modified version of this approach as my regressors will only be

time-varying dummy variables.

3.2 Applied Literature

Some drawbacks are connected to the event-study methodology. First of all, the assumptions of market rationality and efficiency are very strong and their indiscriminate application may invalidate any econometric study of financial markets. Another problem is the impossibility of controlling for other factors that occurs at the same time as the change in policy to analyse and that can by themselves justify the changes in prices and yields.

However, the event study methodology applied by Swanson (2011) seems to provide a solution to these two problems. He studies the first Operation Twist[2] implemented in 1961 to forecast the effects of the second quantitative easing operation[3] (QE2) of the Federal Reserve announced in November 2010. The methodology consists of looking at the major announcements regarding the first Operation Twist and of focusing the attention on changes in Treasury yields in a narrow window of time (about 2 days) around each announcement. This very narrow window allows to consider the macroeconomic framework as stable so that changes in prices and returns are only due to the policy announcement. Moreover, regarding the assumptions on efficiency and rationality, the considered announcements are the most relevant ones and so it is plausible that the market responded to them. The only drawback of this methodology is the inability to capture delayed effects of policy decisions. The econometric test is based on a two-sided t-test and the null hypothesis is the ineffectiveness of the announcements on the term structure at any maturity. Under the alternative hypothesis, long-term yields should decrease and short-term yields should increase or stay the same. Six different announcements are tested and the result is that four of them had significant effects on the yield curve. Their cumulative effect, although quite low (15 basis points), is also statistically significant. Finally he investigates the response of agency and corporates yields. The conclusion is that, given the similarities between Operation Twist and QE2, we should expect QE2 to lead to a decrease in long-term Treasury yields by about 15 basis points and to a much smaller effect on corporate bond yields. The result of this paper are opposite with respect to the findings of Modigliani and Sutch (1966), but at the end of their paper is stated that "any effects, direct or indirect, of Operation Twist in narrowing the spread which further study might establish, are most unlikely to exceed some ten to twenty base points", in line with the 15 basis points decline found by Swanson (2011).

Other examples of event-study analysis can be found in Bernanke, Reinhart and Sack (2004), in Gagnon, Raskin, Remache and Sack (2010), in Krishnamurthy, Vissing-Jorgensen (2011) and in

[2]With this operation the Federal Reserve aimed at influencing the term structure raising yields on short-term securities and lowering yields on long-term securities. Practically this was done by selling short-term bonds and purchasing long-term bonds. In September 2011 the Fed announced the "Maturity Extension Programme" which has been informally called "Operation Twist 2" for the similarities with the first Operation Twist. Following this programme, the Fed sold shorter-term Treasury securities, i.e. securities with maturities of 3 years or less, and used the proceeds to buy longer-term Treasury securities, i.e. securities with maturities between 6 and 30 years.

[3]In November 2010 the Fed announced a second large-scale asset purchase operation (LSAP2) also known as the second quantitative easing program (QE2). The programme consisted in the expansion of the Fed holdings of securities by purchasing a further $600 billion of longer-term Treasury securities by the end of June 2011.

Neely (2010).

Bernanke, Reinhart and Sack (2004) conducted a wide range of econometric tests to evaluate the effectiveness of the Fed measures that could be used when the zero lower bound is reached. The results shows that the Fed's communications were successful in shaping market expectations and that assets purchases influenced the yield curve. On the other hand, the other three papers produce evidence on the effects of recent quantitative easing policies in the United States.

As regards the Euro area, Dell'Erba (2012) applies an event-study methodology to evaluate the effects of sovereign rating actions on yield spreads of European countries during the current debt crisis. The events of interest are both changes in ratings and outlooks by the three main credit rating agencies (Fitch, Moody's and Standard & Poor's). He builds two panel datasets: in the first one the dependent variables are 2-year and 10-year yield spreads of nine European countries while in the second one the dependent variables are credit default swap spreads. In both cases the regressors are time-varying dummy variables identifying periods surrounding rating and outlook changes. This methodology is very similar to the one that I apply in Section 5.

The effect of policy measures related to the European crisis resolution is analysed also by Kilponen, Laakkonen and Vilmunen (2012). They develop an empirical model for the long-term sovereign bond yield spreads of seven Euro-area countries where the regressors are proxies to capture the three main risk factors (credit risk, liquidity risk and general risk appetite) and, to allow for the possibility of contagion, also the lagged bond yield spreads is included. Policy decisions are included as dummy variables on the day of the announcement. As they consider a wide set of events, policy decisions are grouped into ten categories and dummy variables belonging to the same category are combined. Results show that the proxies for credit and liquidity risk are significant while those for risk appetite do not seem to correctly capture the effect of uncertainty on the bond market. As regards policy decisions, the LTROs significantly reduced yields especially in the larger countries like France, Spain and Italy and appear to have had the strongest stabilizing effect in the short-run. Direct support to governments led to a decrease in yields of countries for which the ECB granted the purchases while increased those of Italy and Spain. The evidence on the remaining policy decisions is mixed but in general coefficients have the expected sign and some pieces of evidence can be also interpreted as a result of a flight to safety. Overall, announcements regarding the stabilization of the European debt crisis produced significant effects at least in the short run.

More recently, Falagiarda and Reitz (2013) study the effects of ECB communications about unconventional monetary policy measures on the perceived sovereign risk of Italy over the period 2008-2012. The event-study analysis considers the changes in government bond yield spreads around announcement dates finding that they have been able to reduce the sovereign risk of Italy. Stronger yields reductions are associated mainly to announcements of the CBPP, the SMP and OMTs and more in general to all announcements in the period 2010-2012. The second part of the analysis is based on GARCH model estimated with high-frequency data. The first difference of the spread is regressed on its first and second lag, on a monetary policy surprise indicator and on a set of control variables. Results confirm the previous findings.

4 Analysis of Policy Announcements

In this section I will consider all the main policy announcements of the European Central Bank from the 2007 on. In particular I will focus on announcements regarding unconventional measures such that supplementary LTROs, the Securities Markets Programme, the Covered Bonds Purchase Programme and the Outright Monetary Transactions. The aim is to evaluate whether policy announcements had the power to move markets, i.e. if an expectational channel was operative, for which type of announcements and to what extent.

In particular, announcements regarding unconventional monetary policy measures can influence financial markets because the central bank provides the market with a signal of its willingness to restore the correct functioning of some market segments (in the case of the ECB, interventions involved the banking sector and sovereign debt markets) but also because they push upwards inflation expectations so that real interest rates stay low leading to an expansionary effect on the economy.

The existence of such transmission channels would reinforce the effectiveness of the recent extraordinary policy actions.

In doing this I will apply the same methodology as Swanson (2011) and my the variables of interest are government bond yields with maturities from 3 months to 30 years.

By looking through the ECB website, 20 interesting events among the ones described in Section 2 have been identified and they are summarized in table 1. The considered events cover a timely broad sample starting with the very first announcement of a supplementary liquidity injection in August 2007, when market tensions were low, and ending with the OMT program announced in the summer of 2012.

In particular, most of the selected events are "pure" announcements in the sense that I take note of the days in which ECB communicated his future plans to the public, but the actual implementation of the announced measures is typically done later in time. The only measures for which I consider the effects on yields of the actual implementation are the Securities Markets Programme (because implementation immediately follows the announcements) and the LTROs with maturity of one or more years. It is necessary to point out that the actual implementation of an LTRO consists of three days: the first is the announcement day, the second is the allotment day (when the ECB receive all the bids) and the third is the settlement day (when the ECB allocates money to the bidders). For LTROs I consider both the days in which the ECB communicated the intention of implementing such measures, and the days in which the call for bids took place.

Another relevant issue is the timing of the announcements as this piece of information is necessary to correctly decide the size of the event window. I consider a 1-day event window for announcements made early in the trading day or after the market closure, while I consider a 2-day event windows when the announcement was made in a late time for the investment community to completely influence markets. To get these information I searched on the commonly platform of financial and economics news Bloomberg. There, in the ECB news section, I found the timing of the snaps releases which I consider as indicative of the effective time in which financial markets got the news.

4.1 Data

For the analysis on bond yields I use series calculated by Thomson Reuters and available on Datastream.

The yield curves are calculated by Thomson Reuters using a cubic spline interpolation[4] based on data of a minimum of five bonds of the required currency/rating/sector/issuer combination. As not all bonds get ask prices, to be sure to have a liquid price, bid prices are used. Finally, no extrapolation is performed: if no assets are available beyond a certain maturity date, the curve ends with the last standard term available.

I consider government bonds' yields of countries with different ratings, namely: Austria, Belgium, Finland, France, Germany, Greece, Italy, Netherlands, Portugal and Spain. The aim is to give a stylized but detailed view of what happened along the yield curve and so the considered maturities are: 3 months, 6 months, 1 year, 2 years, 3 years, 5 years, 7 years, 10 years, 15 years, 20 years and 30 years. These data are not provided for all countries and in such a case the dataset is integrated with the series of the closest maturities to the ones selected. However this has not always been possible (e.g. for Greece data on intermediate maturities are completely missing) and so the dataset is not complete from the point of view of maturities. Moreover, even though some series are short, i.e. observations start after the 2007, they are kept in the dataset so to use all information available.

Each year is made up from 260 to 262 observations which correspond roughly to the number of working days in one year. When a national holiday happens to fall on a working day the value registered in the previous working day is applied. This smooths a little the variability of data but, on the other hand, it allows to have the same number of observations in each time series. This is one of the reasons that convinced me to use this dataset.

4.2 Econometric Methodology

In this part of my work I will apply the event-study methodology used by Swanson (2011). In particular, the econometric methodology is based on a two-sided t-test, by which the null hypothesis is rejected when the value of the test statistic is either sufficiently small or sufficiently large, i.e. there are two alternative hypothesis, one positive and one negative. This contrasts with a one-sided t-test, in which there is only one alternative hypothesis that represents either the rejection region "sufficiently small" or "sufficiently large". Concerning the objectives of this paper, I consider as null hypothesis the fact that bond yields remained unchanged after the announcements of unconventional monetary policy measures. By contrast, the alternative hypothesis is that those announcements had some kind of effects on bond yields and so the null hypothesis is rejected when the value of the test statistic is either sufficiently small or sufficiently large.

In particular, the t-statistic is distributed as a student-t with $T-1$ degree of freedom (where T

[4]Spline interpolation is a form of interpolation where the interpolant is spline, a smooth polynomial function that is piecewise-defined (it has a different shape in different areas of the horizontal axis variable), and possesses a high degree of smoothness at the places where the polynomial pieces connect (knots). So the spline fit is a data analysis technique that uses the least squares criterion to estimate the parameters of the spline polynomial model.

is the number of observation in the sample) and it is calculated as follows:

$$t_{cij} = \frac{v_{cij,tl} - v_0}{\text{sd}_{cij,l}} \sim T(T-1).$$

Here $v_{cij,tl}$ is the variation in yields of bond i of country c in event j at time t, which can be a 1-day variation or a 2-day variation ($l = 1, 2$), depending on the timing of the announcement and v_0 is the value under the null hypothesis. The 1-day change is calculated as the difference between the yield in t and the yield in $t-1$, while the 2-day change is calculated as the difference between the yield in t and the yield in $t-2$. Concerning the objectives of my work, I consider as null hypothesis the fact that bond yields remained unchanged after the announcements of unconventional monetary policy measures. By contrast, the alternative hypothesis is that those announcements had some kind of effects on bond yields. So $v_{cij,tl} = y_{cij,t} - y_{cij,t-l}$ with $l = 1, 2$, $v_0 = 0$ and the statistics becomes:

$$t_{cij} = \frac{v_{cij,tl}}{\text{sd}_{cij,l}}.$$

To reconcile this analysis with the general framework presented in Section 3.1, here the estimated variation is v_0 and the abnormal variation is $v_{cij,tl}$.

As I want to study the significance of the change in yields, the difference in yield variations is scaled on the standard deviation of 1- or 2-day changes of bond i in event j. The standard deviation is calculated on the 30 yield variations prior to the announcement day so it is not influenced by the variability caused by the announcement itself. A deeper explanation about the calculation of the standard deviation is needed. First of all I derived the series of 1- and 2-day changes, then the standard deviation is calculated as the square root of the yield changes' sample variance:

$$\text{sd}_{cij,l} = \sqrt{\frac{\sum_{t=1}^{n} \left(v_{cij,tl} - \bar{v}_{cij,l}\right)^2}{T-1}}.$$

So T is equal to 30 and $\bar{v}_{cij,l} = \frac{1}{T}\sum_{t=1}^{T} v_{cij,tl}$ is the average variation in the time-window of event j. However, as I mentioned before, not all the time series are available for the sample period needed because they start after the beginning of 2007. If observations are not enough to calculate the 30-days standard deviation I cannot compute the t-statistics and so the related yield change is not evaluated. This however happens in very few cases and not much information is lost.

To evaluate the joint significance of yields' changes for the same announcement I use a Wald test which is distributed as a chi-squared with q degrees of freedom (where q is the number of restrictions). The most simple Wald statistic to test the significance of a single coefficient is given by:

$$W = \left(\frac{coefficient}{std.error\,(coefficient)}\right)^2$$

This is the square of the t-statistic and it distributed as a chi-squared with 1 degree of freedom (because it tests only one restriction).

As I want to test the significance of q values, I can calculate the joint Wald statistic as the sum of q single Wald statistics which is asymptotically distributed as a chi-square with q degrees of freedom[5]:

$$W_{cj} = \sum_{i=1}^{q} \left(\frac{v_{cij,tl}}{\mathrm{sd}_{cij,l}} \right)^2 = \sum_{i=1}^{q} \left(t_{cij} \right)^2 \rightarrow \chi^2 \left(q \right)$$

Such a formulation is valid under the assumption that the t-statistics are independent implying that also the variations in yields are independent. At a macroeconomic level this might seem a quite strong assumption, but for daily data we can apply the assumption coming from theoretical finance that prices evolve following a random walk, which makes variations in yields independent.

Summarizing, the procedure consists of shrinking the dimensionality of data to obtain the statistics of interest. I start from yields of different bonds (i) for different countries (c) in different events (j) and I aggregate yield variations by time (t) to obtain q t-statistics for each event. Then I aggregate t-statistics by bonds to obtain Wald statistics specific for country and events.

As regards results, following the theory I would expect that all the announcements brought a decline in bond yields for at least two reasons. First, the direct purchase of bonds by the ECB decreased the total supply of bonds in the market producing a rise in prices and a decline in returns. On the other hand, liquidity injections increased the banks' availability of funds which should in principle have raised the amount of funds invested in financial markets both because banks may have decided to directly invest in bonds but also through an increase in lending flows to the private sector. Moreover positive spillovers on sovereign debt can be due to the fact that if banks are less liquidity-constrained it is less likely that the government would have to intervene to sustain the credit sector. Indeed, evidence about the importance of the banking sector in determining the level of bond yield spreads is presented by Gerlach, Schulz and Wolff (2010) and Acharya, Drechsler, Schnabl (2011). Second, these unconventional measures may be interpreted as a serious engagement of the ECB to maintain stability in credit and financial markets. Therefore any announcement should have shaped expectations towards an improvement of market functioning and might be interpreted as a signal of the fact that the expansionary monetary policy would be longlasting in the future.

4.3 Results

Results are presented in Tables 2 to 11.

The first event is the announcement on August 22nd 2007 of a supplementary LTRO with 3-month maturity and for an amount of 40 billion euros that, although conducted with the standard variable-rate tender procedure, represents the start of the ECB injection of liquidity to support mar-

[5]This result is true asymptotically. Here the t-statistics have many degrees of freedom, they are asymptotically normally distributed, and then the sum of q normal distribution is a chi-square.

To get the true distribution of this Wald statistics it would be necessary to sum q F-distributions as:

$$t^2 = \left(\frac{N^2}{\sqrt{\frac{\chi^2}{V}}} \right) = \frac{\chi^2/_1}{\chi^2/_v} = F\left(1, v\right).$$

kets. Most of the short- and medium-term yields experienced significant positive changes. The most significant effects occurred for Belgium, Finland and Germany, while there has been no significant change for Greek and Dutch bond yields. This implies that the investment community exited the government bond market. Probably investors interpreted the ECB action as a confirmation of their fears about financial market instability. The Wald test for the joint significance of the movements along the yield curve finds that changes in Austrian, German, Finnish ans Spanish yields are significant at a 1% level, changes in Belgian yields are significant at a 5% level while French yields' changes are significant at the 10% level.

One month after the Lehman's Brothers Bankruptcy, on October 15th 2009, the ECB started to intervene on money markets more aggressively announcing several LTROs with 3/6-month maturity and fixed-rate full allotment procedure and the expansion of the list of eligible collaterals. This is the official beginning of the unconventional monetary policy measures. This event produced the expected effect, i.e. almost all bond yields declined on short and medium maturities. Changes are highly significant for Italy, Portugal and Spain. Yields of France, Austria and Germany have been affected with a lower significance. The Wald test finds significant changes at a 5% level for Italy and Portugal while overall changes in Spanish yields are significant at the 10% level.

On May 7th 2009 the ECB announced the Enhanced Credit Support programme and the first Covered Bond Purchase Programme. The first consisted of three LTROs with 12-month maturity and fixed-rate full allotment procedure to be conducted in June, September and December. Furthermore the European Investment Bank (EIB) became an eligible counterparty in the Eurosystem's monetary policy operations. With the the ECB engaged itself in directly purchasing of euro-denominated covered bonds for an amount of 60 billion euros. It must be also recalled that on the same day the Governing Council decided to cut interest rates by 25 basis points. The effects of these three interventions are difficult to disentangle as bond yields display changes of different sign and magnitude along the yield curve. In general, yields of bonds with shorter maturities (up to 10 years) declined, while the opposite happened in longer-term maturities. The most significant changes are for Belgian, French, German, Greek, Dutch and Spanish bonds. On the other hand, all Greek long-term yields declined significantly. Concerning the joint significance, changes for Belgium, France, Germany, Greece, the Netherlands and Spain are significant at the 1% level. But why short-term yields decreased while long-term yields increased? This seems to be the opposite effect than the one produced by the Operation Twist implemented by the Federal Reserve (the Fed was selling short-term government bonds and buying long-term government bonds). These results are consistent with a shift in the investors' portfolio composition: they sold longer-term bonds for shorter-term ones. This can be justified by a lowering in short-term risk perception due to an improvement in liquidity conditions. Moreover, when the available liquidity in the credit and financial sector is increased, it is likely that a part of this liquidity will be invested also in government bonds. Also the reduction in interest rates should induce a decrease in the yield curve. Nevertheless data show a rise in long-term rates which represents an increase in bonds riskiness. The only way to explain this pattern is a flight to quality due to the CBPP1: as the ECB announced that it would buy covered bonds, investors

might have switched to this type of assets. So the considered interventions had been able only to ease short-term market tensions, while concerns about long-term financial conditions remained high meaning that there was no positive spillovers on sovereign debt.

Details of the CBPP1 were published on June 4th 2009. The ECB revealed that it would directly buy covered bonds for an amount of 60 billion euros in both the primary and the secondary market, with rating not lower than BBB- or equivalent and with underlying assets that include exposure to private or public entities. Yields at all maturities and of all countries increased with very low p-values. Again, this piece of evidence suggests that there has been a flight to quality in investors' portfolio while no positive spillovers from the banking sector on expected government financial positions are detectable. However it is necessary to mention that in the same day the ECB left the interest rate unchanged after a three months of consecutive reductions. So there could have also been an expectation effect over the ECB decision: markets might have expected a further decrease in interest rates and the fact that this did not happened could have led to a perception of increased risk that translated into higher government bond yields.

On December 3rd 2009 the ECB published details of refinancing operations up to April 2010 announcing that from then on the MROs would be conducted as fixed rate tender procedure with full allotment for as long as is needed. This tender procedure would also continue to be used in the special-term refinancing operations[6] with a maturity of one maintenance period[7]. Both liquidity measures would be in place at least until April 13th 2010. This announcement is relevant because it was the first time that the ECB used the words "for as long as is needed", which is a quite binding claim and gave to the financial sector the feeling that the provision of extra liquidity would continue for long time. However, this does not appear to have had the desired effect on bond yields as most of them increased significantly. The same is confirmed by the Wald statistic. As before, it is necessary to point out that on this same day there had been the monthly meeting of the Governing Council that left the interest rates unchanged.

On May 10th 2010 the ECB established the Securities Markets Programme and implemented the first government bonds' purchases which led to a strong decrease in yields of Belgium, Greece, Italy, Portugal and Spain with t-statistics much higher than 3 in most of the cases. This is not however a pure announcement effect but the direct effect of national central banks purchases. Yields of the remaining countries display a mixed pattern with significance mostly concentrated on long-term yields increases. Furthermore the ECB decided to implement a supplementary LTRO with 6-months maturity and it reactivated the US dollar liquidity-providing operations. Overall this intervention had the expected effect of easing market tensions on riskier bonds.

In August 2011 the ECB started again to purchase government bonds. The statement of the

[6]Special-term refinancing operations are additional open market operations with the aim to improve the overall liquidity position of the euro area banking system. Neither the schedule nor the maturity of this operations is fixed but they are usually short-term (7 or 28 days).

[7]The maintenance period is the period over which compliance with reserve requirements is calculated, i.e. the time-frame in which banks and other depository institutions must maintain a specified level of funds. The maintenance period begins on the settlement day of the first MRO following the monthly meeting of the Governing Council and usually it is a four-week period that begins on a Wednesday and ends on a Tuesday.

President announcing the action in the late evening of August 7th 2011 was followed by the beginning of purchases on August 8th and this produced a significant decline in many of the considered bond yields. In particular a significant decline is shown for Austrian, Belgian, Finnish, Italian, Portuguese and Spanish bonds, except for very short maturities. In contrast Greek yields increased in the 3-months maturity with a t-statistic greater than 3 and declined on the long-medium term but not significantly. Unfortunately data on intermediate maturities are not available but these movements can be easily explained by an increase in the probability of default in the short term while for longer terms perspectives remained relatively more benign. All these countries report very low p-values in the Wald test for the joint significance of changes.

On October 6th 2011 the ECB launched the second CBPP, whose technical details were published on November 3rd, and announced two supplementary LTROs of 12-month maturity. Moreover there had been the usual monthly meeting of the Governing Council that left interest rates unchanged. The evidence on yields is mixed and overall very few changes are statistically significant. As regards significant changes, Austria, Belgium, France, Greece and The Netherlands recorded an increase in short-term yields while only Portuguese bonds at 6-months maturity declined. The Wald statistics is in line with these findings. Overall it seems that investors exited the bond market and it might be possible that they preferred to buy covered bonds. There is no evidence of positive spillovers from the credit sector to sovereign bonds.

On November 3rd the ECB published the details of the CBPP2 and lowered interest rates of 25 basis points. Again, in this situation the two events might have produced different effects in theory. This can also be seen in data because evidence is mixed and few results are significant, just like as two forces were pulling yields in different directions: in some cases the effect of lower interest rates prevailed and yields decreased, in other cases the flight to quality due to covered bond purchases prevailed and yields increased. In particular, yields of Austria, Belgium, Finland, France, Germany and the Netherlands decreased and yields of Italy and Spain increased while Portugal display a mixed pattern. Few of these changes are significant. Significant movements happened only in Greek yields on medium- and long-term maturities with very low p-values. However this is in line with the high variability of November yields which I argue is due more to political events, namely the change of the Prime Minister and the connected high economic uncertainty, than to the ECB measures.

In the early afternoon of December 2nd some rumors about the future ECB monetary policy stance to be announced on December 8th spread into markets. Goldman Sachs predicted an interest rate cut of 25 basis point, the implementation of new LTROs with maturity of 2 years and the broadening of collateral accepted[8]. New rumors from several different sources came out on December 5th expecting new LTROs with 2- or 3-year maturity[9]. The effect of these rumors was that yields decreased all along the curve for almost all countries except for Finland, Germany and Netherlands. However significant declines apply only to Italy and Belgium in long-term yields and to all Spanish

[8] http://www.businessinsider.com/goldman-sachs-the-ecb-will-cut-rates-next-week-but-there-will-be-no-big-bazooka-2011-12?op=1

[9] Bloomberg ticker of the news: NSN LVQBV86K50XY. See also: http://www.thisislondon.co.uk/business/european-central-bank-expected-to-cut-interest-rates-6375411.html

yields. The yield pattern is similar to the one presented at the implementation of the SMP. This is a relevant finding as it proves that it is not necessary for investors to physically have money in their pockets to invest, but the simple expectation of future liquidity is sufficient to move markets. It is interesting to notice that Finnish yields remained practically unchanged and German and Dutch yields on short maturities increased significantly. This might signal that, thanks to the expected higher liquidity, investors left safer assets for riskier activities. This is the only case in which there had been positive spillovers from the banking sector to government debt.

Once the effects of rumors is taken into account it is not surprising to see that the formal announcement of the 36-months LTROs on December 8th led to significant changes only in long-term Greek yields which displayed a huge rise. Moreover the ECB cut the interest rate of 25 basis points, it extended the range of securities eligible for collateral in credit operations and reduced the reserve ratio to 1%. Evidence about yields of other countries is mixed, most of them increased but there is no significance. This lack of significance is due to the high yields volatility. So the most aggressive ECB liquidity intervention did not produce a big decrease in yields on impact just because the fall had already happened few days earlier.

To evaluate the impact of the supplementary LTROs I investigate also if the call for bids had any effects on yields., i.e. whether the fact that the ECB asked for bids for the subsequent day led to any change in yields.

In general, liquidity injections can affect government bond yields because they reduce the systemic banking risk with positive spillovers on sovereign debt, as it is less likely that governments would intervene to support the financial sector, leading to a decline in long-term rates, but also by increasing monetary aggregates and then inflation. For the bids' call of June 23 2009, September 29 2009, December 15 2009, December 20 2011 and February 28 2012 only very few yields show a significant change but no common pattern is identifiable and the Wald test finds no significant joint changes for any country. Most probably the market did not react to these type of announcements because they were expected. The only exception is the LTRO announced on the 25th of October 2011: yields fell significantly on longer-term bonds for Austria, Belgium, Finland, The Netherlands and especially in France. Some positive and significant changes happened on Italian, Portuguese and Spanish medium-term maturity bonds.

The last three events of this event-study regard the Outright Monetary Transaction program. On the July 26th 2012 the President of the ECB declared that "Within our mandate, the ECB is ready to do whatever it takes to preserve the euro. And believe me, it will be enough.". This statement referred to the ongoing tensions on sovereign debt markets and it had been followed by the official announcement of a new program called OMT on August 2nd 2012. The first declaration of the ECB President had a significant effect mainly on Italian and Spanish yields which decreased at all maturities while German yields increased. On the other hand, the official announcement of the OMT program led to very few significant changes in yields. The details of the program were announced on September 6th and they had been followed by an increase in yields of German and Dutch bond yields and by a decline in Italian, Portuguese and Spanish bond yields mainly at medium- and

long-term maturities. Therefore announcement effects involved not only the government bonds that could be potentially bought by the ECB, i.e. bonds up to 3-year maturity, but also bonds with longer maturities meaning that this program led to positive spillovers all along the yield curve.

This event-study analysis highlights that overall the unconventional monetary policy measures of the ECB have been able to move market yields. However, the effects differ across countries and they are influenced by the general economic condition. Often ECB interventions led to a shift in the composition of investors' portfolios as some yields increased and some other decreased. Effects are almost always different between short- and long-term maturities and between speculative- and investment-grade countries. Moreover, the transmission mechanism is different and it depends on the nature of the ECB intervention. The Security Market Programme led to a decrease in yields for a direct supply effect that pushes up prices. On the other hand, announcements and implementations of the Covered Bond Purchase Programme brought to an increase in yields consistent with a flight to quality effect. Liquidity injections through LTROs overall led to a decrease in yields which was always anticipated at the days of the announcement and so no significant yields' changes is evident at the implementations. Significant announcement effects has been found also for the OMT program as yields of some highly indebted countries declined. These are relevant findings as they show the importance of expectations for markets' behaviour. Finally, interventions aimed at supporting banks' funding conditions, i.e. the CBPPs and the LTROs, had almost no positive spillovers on sovereign debt as they did not brought a decline in long-term yields.

5 Panel Analysis of Liquidity Injections

The previous sections found no relevant effects of actual LTRO implementation on government bond yields as in most cases markets anticipated the liquidity injection and yields moved on the announcement day. These anticipated movements in yields can be due to the action of many different types of investor, also the ones that would not receive directly the liquidity from the ECB. For example, after the announcement of a new LTRO to be implemented somewhere in the future, a private investor could decide to immediately buy government bonds if he thinks that the liquidity will ease market tensions pushing up prices. On the other hand, it is also likely that most of the banks asking for funds from the ECB would invest once they will have actually received the liquidity. As a matter of fact, if markets were efficient there would only be an announcement effects while if banks are liquidity constrained there would be also an implementation effect.

To go deeper into this matter, in this section I will focus on the actual implementation of long-term refinancing operations to assess the impact of liquidity injections by the European Central Bank. This will allow me to see if there have been any supply effect in markets, i.e. if actually banks invested the received liquidity in government bonds or if market participants did that because of an increase in lending from banks or because of a reduction in sovereign risk perception, as explained by Gerlach, Schulz and Wolff (2010) and by Acharya, Drechsel, Schnabl (2011). Therefore, the analysis of implementation effects will produce further evidence on whether positive spillovers from liquidity

injections to sovereign debt exist. For this purpose I will consider a modified measure of yields, namely the cumulative percentage change.

As discussed before, there have been six main LTROs implemented by the ECB, four with a maturity of 12 months and two with a maturity of 36 months. It takes three days for the ECB to complete an LTRO: the first day it calls for bids, the second day bids are collected in the auction and the third day there is the settlement. These LTROs were unconventional not only for the maturity but also because they are conducted at fixed-rate tender and full-allotment procedure, meaning that the auction was not competitive and the ECB accommodated all bids.

For seek of simplicity I numbered the events chronologically so that in the following discussion:

- Event 1 refers to the 12-month maturity LTRO implemented in June 23-25 2009;
- Event 2 refers to the 12-month maturity LTRO implemented in September 29 - October 1 2009;
- Event 3 refers to the 12-month maturity LTRO implemented in December 15-17 2009;
- Event 4 refers to the 12-month maturity LTRO implemented in October 25-27 2011;
- Event 5 refers to the 36-month maturity LTRO implemented in December 20-22 2011;
- Event 6 refers to the 36-month maturity LTRO implemented in February 28 - March 1 2012.

The effects of the last two events have been already evaluated by Darraq-Paries and De Santis (2013) which uses a panel-VAR framework and identify the credit supply shock by means of the Bank Lending Survey and using quarterly data. Their results show that the 3-year LTROs are expansionary over the short to the medium term as they led to an increase in GDP through the compression of lending rate spreads, the decrease of inter-bank risk and the increase of loan volume, therefore producing evidence about the importance of the bank lending channel in the transmission of these shocks.

5.1 Model Specification and Econometric Methodology

Concerning the econometric methodology I keep on applying on an event-study approach but here I shift the focus of the analysis from a single country to the aggregate effect. In order to do so I construct a panel where the dependent variables are bond yields of several different countries and the regressors are time-varying dummies capturing the changes in yields around LTROs implementations. In particular I consider a 21-days window around the auction day so that the LTROs implementation is perfectly centered and for each event I calculate the cumulative percentage change in yields:

$$y_{it} = \frac{Y_{it} - Y_{i0}}{Y_{i0}}.$$

Given that, y_{it} is a series of 21 observations for each event but the first element is always zero. The aggregate vector Y has 126 observations for each country for a total of 1260 elements when

considering the 10 Euro-area countries and 2016 elements when the panel is expanded with 6 extra Euro-area countries.

To reconcile the analysis with the general framework presented in Section 3.1, here I consider as market expectations the change in the very first day of the event-window, i.e. zero. Therefore the test to evaluate whether the percentage yield growth rate is abnormal compares the actual cumulative change in yields with that measure of expectations leading to a t-test similar to the one in the previous section:

$$t = \frac{y_{it}}{sd} \sim T(n-1).$$

I decided to use a medium-size event-window for several reasons. First of all, and as before, I need to assume that the macroeconomic context is fixed. For this assumption to be valid the event-window cannot be too wide otherwise many other events could influence yields. On the other hand, the window cannot be too close to the implementation, otherwise I would not capture investment decisions that are shifted of few days. There is also a statistical reason for the event-window not to be too narrow: if this is the case, as I am considering cumulative changes, variations in data will be too low, reducing the power of significance tests. Moreover the choice of the 21-days window is in line with Dell'Erba (2012), which performs a similar analysis on the effects of rating changes on yield spreads.

The model I estimate is the following:

$$y_{itk} = \alpha_{ik} + \sum_{\tau=-s+1}^{s} \beta_m d_{i\tau k} + \varepsilon_{itk}.$$

Here yields of each country are regressed over 20 time-varying dummies for each event, each one of them has a 1 on a different day along the 21-days window across countries and zero otherwise. In particular, the dummies capture the yield variations from the second day of the sample, which in the output tables presented below is labeled as T-9 and T is the central day of the window. The T-10 day has no dummy as it is taken as the reference day to calculate the significance of the variation and clearly including 21 dummies would lead to a perfect-collinearity problem. The model is estimated separately for each event k and so I run the estimation six times, each time including the 20 dummies of the event of interest and the sample consists of 126 observations.

The model has fixed effects because, as regressors are the same across countries, there should be correlation between individual heterogeneity and residuals. Moreover I used standard errors consistent to both autocorrelation and heteroskedasticity by clustering by individuals. Details about the econometric specification are reported in Appendix A.

5.2 Euro-Area Countries

The first step of the analysis is to consider only the usual 10 European countries as dependent variables, namely Austria, Belgium, Finland, France, Germany, Greece, Italy, Netherlands, Portugal and Spain.

Results are presented in Table 12.

The events that produced more significant results are the LTROs of June 2009 and September 2009, i.e. the first two events.

The very first 12-month maturity LTRO of June 2009 led to a significant and progressive decrease in bond yields across Europe starting from the 8th day preceding the auction meaning that investors anticipated the liquidity injection and that they kept on buying bonds also for several days after: the effect of the LTRO had been persistent.

The second LTRO, implemented in September 2009, led to a similar decline in yields. In the first days of the window, yields increased significantly but, then, from the day T-4 changes becomes negative and highly significant. The highest declines are reached during the five days after the implementation.

The remaining four events do not seems to produce significant changes in yields' growth rates, however some interesting insights can be taken combining the output of the panel analysis with figures representing the evolution of single-country yields along the event windows.

The third event, i.e. the third 12-month LTRO of December 2009, produced an increase in yields which is the opposite of what one should expect if there would have been a supply effect. Significant changes are concentrated at the end of the window. Moreover standard errors are higher than before meaning that this period is characterized by a higher variability of yields.

The fourth event is characterized by aggregate positive changes in yields growth rates with almost no statistical significance. One thing to notice here is that the standard errors increase a lot in the second half of the window. This could be due by the fact that yields of different countries diverged after the liquidity injection. Unfortuntely this model is not telling what it is exactly happening and so this issue will be explored more carefully in the subsequent sections.

Event 5, the first 36-month maturity LTRO of December 20th 2011, did produce declines in bond yields all around the implementation days and after. However these changes are not statistically significant because of the high variability in yields. Moreover it must be recalled that the previous event-study analysis on single-country yields shows that yields already anticipated this liquidity injection in December 2nd when some rumors circulated about the decision of the ECB to implement two LTROs with 3-year maturity. So, this LTRO produced a decrease in yields only at announcements while the actual liquidity injection did not lead to significant supply effects.

The last LTRO displays positive coefficient for the first part of the window and then, 2 days before the implementation, they become negative but not significant as standard errors increase a lot. As before, it is not possible to understand the source of this high variability, i.e. if it is due to a higher variability across countries or in time.

Overall, from this first panel analysis, it is possible to conclude that these six LTROs produced only some of the expected supply effect on yields leading at least to a decline in growth rates and so the ECB had not always been able to mitigate bond market tensions. However, the most important thing to notice is that the effects of the first two LTROs were similar for all countries while for following interventions it is not possible to identify significant changes in yields because their

variability is higher than in the first two events which could be due to an increase in variability across countries or in time. One possible explanation to this is that at the beginning of the crisis there was an actual lack of liquidity in markets and so the LTROs were fully effective but then the nature of the crisis changed leading to different responses in yields. This interpretation is supported by the papers of Arghyrou and Kontonikas (2012) and Afonso, Arghyrou, Bagdatoglou and Kontonikas (2013) which find that the crisis can be divided into two main sub-periods, i.e. August 2007-February 2010 and March 2010 onwards, in which both the determinants of spreads and their relationship were different.

To better understand this last intuition and to evaluate how the monetary policy transmission actually works inside a monetary union, in the following sections I will extend the analysis dividing the European countries into two subsets.

5.3 Greece and Portugal

The analysis of the effects of liquidity injections at the Euro-area level showed that during the last three LTROs yields variability has been high which might be due to differences in the evolution of yields across countries. To evaluate this hypothesis I replicate the analysis distinguishing between Greece and Portugal and the remaining eight Euro-area countries.

Results are presented in Table 13, where, for simplicity, "NGP" stands for no Greece and Portugal, i.e. the other eight Euro-area countries, "GP" stands for Greece and Portugal and "diff" indicates the difference between the effect on the yields of the remaining eight countries and the effect on Greek and Portuguese yields.

The first LTRO, implemented at the end of June 2009, led to a decrease in all Euro-area yields that intensified after the actual settlement. The impact was however weaker on Greek and Portuguese yields as shown by the difference between the two coefficients, which in some days is highly significant. These findings complement the results displayed in Table 12 showing that the decline in yields was actually uniform across countries.

For the second event, the LTRO implemented at the end of September 2009, the results are quite similar. In the very first days of the window, yields growth of the core countries increased significantly, then changes became negative few days before the LTRO and their magnitude increased. On the other hand, Greece and Portugal always report negative and significant changes in yields and the magnitude intensify after the implementation date. The difference between the coefficients is negative but not significant.

This yield decomposition adds some interesting insights regarding the third event, i.e. the LTRO implemented in mid December 2009. In the first half of the window all yields increased significantly. The growth was stronger for Greece and Portugal with coefficients that are more than double those of core countries. Starting from the day of implementation, changes became negative for the other Euro countries but they are not significant.

For the fourth LTRO, implemented in the second half of October 2011, the current analysis does not add much to what obtained when we do not distinguish Greece and Portugal from other

countries. Only few increases in Greece and Portugal yields are significant in the second half of the window. In this period core countries' yields decreased but not significantly.

The results for the two LTROs with 36-month maturity show that, in both cases, Greek and Portuguese yields increased while other countries yields decreased. Coefficients are almost always highly significant and Greece and Portugal experienced the largest movements. So these LTRO produced supply effects only on core countries' yields meaning that investors decided to sell risky bonds and purchased safer ones. Therefore, despite the high amount of liquidity injected, the ECB had not been able to reduce the spreads of debt distressed countries.

Overall, this analysis highlights that liquidity injections had the expected supply effect in most cases and especially during event 1, 2, 5 and 6, in line with what obtained from the aggregate analysis. However the distinction allows to understand that only during event 1 and 2 there had been a supply effect on all Euro-area bond yields while in the last two events supply effects only concerned core countries' yields.

5.4 Sovereign Ratings

As several coefficients do not have the expected sign, to further understand the reasons behind yield changes I replicated the analysis distinguishing countries on the base of their investment category, i.e. investment grade or speculative grade. To obtain this classification I considered the sovereign credit ratings from the agency Standard & Poor's as they are publicly available on the official website.

By dividing the European countries in two subsets I can evaluate the effects of the liquidity injections on the two investment category meaning that I can evaluate whether the monetary policy transmission mechanism is unique inside the monetary union.

Results are presented in Table 14. For seek of simplicity, I used abbreviations: "INVEST" stands for investment grade countries, i.e. Austria, Belgium, Finland, France, Germany and Netherlands, "SPECUL" stands for speculative grade countries, i.e. Greece, Italy, Portugal and Spain, and "diff" indicates the difference between the effect on the yields of investment grade countries and of speculative grade countries.

The first two events, the LTROs implemented in June and September 2009, produced a significant decrease in the growth rate of both investment-grade and speculative-grade countries yields along all the time-window. The impact is higher for investment-grade countries and overall this does not add much to the previous analysis: the first LTRO led to the expected supply effect on bond yields.

The third event is the LTRO of December 2009. This analysis confirms the results reported in Table 12 and 13 as most of the coefficients are positive and significant changes occurred mainly in investment-grade countries yields. Therefore there had been no supply-effect on bond yields.

Concerning the LTRO of October 2011, coefficients of investment-grade countries are almost always negative but not significant while the opposite happens for speculative-grade countries.

A similar evolution of yields characterizes the fifth event, i.e. the implementation of the first LTRO with 36-month maturity. Investment-grade countries display significant and negative changes all along the time-window while speculative-grade countries yields increased but significant changes

apply in the first six days and in the four day after the LTRO implementation. The difference between changes in speculative- and investment-grade countries yields is significant all along the time window.

Also the second LTRO with 36-month maturity had the expected supply-effects only on investment-grade countries. Coefficients of higher-rated bonds are significant in several days both before and after the LTRO implementation. Therefore during all these events there had been a substitution of riskier bonds for safer ones: the LTRO had been effective but not on the desired bonds because it actually increased spreads rather than mitigate market tensions.

To conclude, the LTROs that produced the desired supply-effects were only the first two (for all countries), while other supply effects worked in the wrong direction.

5.5 Italy and Spain

The previous section shows that Greek and Portuguese yields often followed a very different pattern with respect to the other Euro-area countries, especially in the last four events. For this reason, in this section I drop yields of Greece and Portugal from the dataset and I distinguish the movements in Italian and Spanish yields from changes in the remaining six countries.

Results are presented in Table 15, where, for simplicity, "NIS" stands for no Italy and Spain, i.e. the remaining six Euro-area countries, "IS" stands for Italy and Spain and "diff" indicates the difference between the effect on the yields of the remaining six countries and the effect on Italian and Spanish yields.

The first two LTRO led to substantial and highly significant decreases in both categories confirming the previous findings. Coefficients are always greater for the six core countries but the difference with respect to Italy and Spain coefficients is rarely significant.

Interesting results appear analyzing the third event, i.e. the LTRO implemented in December 2009. Yields of Italian and Spanish bonds always increased and most changes are significant. On the other hand, yields of the remaining countries display a mixed pattern: they alternate some days in which they rose with some others in which they decreased. In general, increases are always significant while declines are significant only in two days right after the implementation. In this period bond market tensions were high and the liquidity injection produced only a temporary stop in yield growth trend of the core European countries.

During the fourth event yields of the two groups followed an opposite trend. Italian and Spanish yields increased with high significance while the other countries' yields declined but not significantly. The magnitude of changes is much greater for Italy and Spain meaning that in October 2011 investors exited from this bond market segment. Therefore this LTRO produced a flight to safety effect: investors sold riskier bonds for safer ones.

The fifth event, which refers to the first 36-month maturity LTRO implemented in December 20th 2011, produced significant declines in core countries yields with p-values that are almost always lower that 0.01. As before, Italian and Spanish yields rose but significance is present only in the first five changes because of the high yields' variability. Overall it seems reasonable to interpret these

patterns as consistent with a flight to safety.

The last LTRO shows significant supply effects for all the bonds considered. More precisely, the event-window can be divided into two parts. The first part includes the first seven days and here Italian and Spanish coefficients are negative and significant while the others are positive but not significant. Starting from the day T-2 also coefficients of the six core countries become negative and after the LTRO they become also highly significant. Therefore, in the second half of the window all changes are negative and significant with Italian and Spanish yields experiencing the greatest movements.

Interesting insights can be deduced from this analysis. The first two events are confirmed to be the only cases in which supply effects involved all the considered yields. More relevant are the results of the last three events: during event 4 and 5 there is clear evidence of a flight to quality effect, i.e. only yields of higher-rated countries declined, while the last LTRO had been effective in easing market tensions also on Italian and Spanish bonds.

5.6 Extra Euro-Area Countries

After analyzing the yield dynamics inside the Euro-area, in this last part I want to assess whether the ECB liquidity injections had any effect on bond yields outside the Euro-area, which is the usual area of influence of ECB actions.

For this purpose I expand the panel adding as dependent variables the 10-year government bond yields of Denmark, Japan, Sweden, Switzerland, United Kingdom and United States. The regressors are the usual 20 dummy variables for each event. By using categorical variables I am able to check whether the dummy variables have any significance for yields of extra-Euro countries and if the difference between the effect on Euro and extra-Euro countries yields is statistically significant. Moreover I compare variations in extra-Euro yields also with two subsets of European countries, namely Greece and Portugal and the remaining eight countries[10].

The results are presented in Tables 16, 17 and 18. For seek of simplicity, I used the following abbreviations: "EURO" stands for the usual ten Euro-area countries, "EXEURO" stands for the six extra-Euro countries used as control variables, "NGP" stands for all countries but Greece and Portugal, "GP" stands for Greece and Portugal and "diff" indicates the difference between the previous two coefficients.

The coefficients for Euro-area countries are the same presented in Tables 12 and 13 and so in the following I will focus mainly on the coefficients of control variables, which capture the effects of LTROs on yields on extra-Euro countries, and on their magnitude and significance with respect to the effects on Euro countries. On the other hand, standard errors differ from the ones presented in previous tables as here the dimensionality of the panel has changed. However differences are

[10] In practice, I constructed several dummy variables: the first indicates Euro-area countries and is equal to one for Austria, Belgium, Finland, France, Germany, Greece, Italy, Netherlands, Portugal, Spain and it is zero otherwise; the second selects extra-Euro countries and so it is equal to one for Denmark, Japan, Sweden, Switzerland, UK, US while it is zero otherwise; the last two dummy variables split Euro-area countries into two subsets, i.e. Greece and Portugal and the core European countries.

negligible as almost all p-values remain in the same category of significance.

During the first event, both yields of European and extra-Euro countries declined all along the time window. P-values are always very low but the interesting point is that the magnitude of the decrease is higher for extra-Euro countries and also significant around the implementation date. The same is true with respect to the two subsets of Euro countries.

Also the second event is connected to a decline in yields growth rate outside the Euro-area with high statistical significance. In this case supply effects start from the fourth day before the auction. Here the magnitude of changes is much higher for extra-Euro countries, with coefficients that in most of the days are more than double the change in European yields. As a matter of fact also the difference between coefficients is statistically significant.

So, these two LTROs had highly statistically significant effects both inside and outside the Euro-area meaning that investors actually used the liquidity to buy bonds and most of the purchases involved extra-Euro countries bonds.

The LTRO of December 2009 led to significant increases in yields of both Euro-area and extra-Euro area countries. Here it is important to point out that increases are much higher for Greek and Portuguese bonds signalling rising market tensions connected to debt sustainability issues. On the other hand, extra-Euro countries' yields experienced greater changes with respect to core countries' yields, even though their difference is never significant. For extra-Euro countries applies a reasoning similar to the one used for Euro-area countries. An increase in yields is the opposite of one would have expected after a liquidity injection. However after the call for bids for the LTRO (on the 15th of December) yields growth rates declined for all countries. So it is possible to say that a little liquidity effect appeared just as a temporary stop in the increasing trend of growth rates.

The fourth event is the LTRO implemented in October 2011. From an aggregate point of view, during the first half of the window, there is some significance in both Euro-area yields, which always increased, and in extra-Euro yields, which decreased in most of the cases. The interesting thing here is that extra-Euro yields started to decrease significantly in the second half of the window. In contrast, Euro-area yields increased and so so the difference between the coefficients of the two groups is statistically significant. By considering the breakdown of Euro-area countries it is possible to see that core countries yields have negative coefficients in the second part of the window, while Greek and Portuguese yields always increased. In particular, even though the magnitude of changes is relevant, coefficients of the two groups of Euro-area countries are never statistically significant because of the high variability in yields. Moreover, the difference between non-European countries coefficients and those of Greece and Portugal is much greater than the difference with respect to the core European countries. This seems to indicate that investors moved out from the European bond market (and especially from lower-rated bonds) and purchased non-Euro bonds. So, for this event, the supply effect can be found mainly on extra-Euro yields and once again this is evidence of a flight to safety.

For the fifth event the panel analysis finds no significant liquidity effects for the Euro countries as a whole but Greece and Portugal bond yields rose with very low p-values and the other eight

countries yields declined from the fourth day before the implementation. On the other hand, extra-Euro bond yields declined during all the time span with high statistical significance. Therefore we had a supply effect on both higher-rated Euro and non-Euro bonds meaning that most of the injected liquidity had been used to purchase safe securities.

The analysis of the last LTRO does not provide very interesting information as yields of extra-Euro countries almost always increased in several days at the beginning of the window with high statistical significance. Interesting movements happened in the two Euro-countries subsets as Greek and Portuguese yields always increased while yields of the core countries had been affected by a supply effect. So, in this case, investors preferred to buy higher-rated Euro bonds.

This last analysis has been useful to show some relevant evidence about the transmission of liquidity shocks outside the Euro-area. These channels fully worked during event 1, 2, 4 and 5.

5.7 Overall Effects of the LTROs

The panel analysis produced lots of evidence about the effects of the liquidity injections. Overall most of the considered events produced some decrease in bond yields meaning that banks during the crisis experienced some liquidity constraints and moreover there have been positive spillovers from the banking sector to government debt.

The first LTRO was implemented in June 23rd-25th 2009. All the bond yields considered declined in the event-window with very low p-values. The effect was much more prominent for investment-grade countries than for lower-rated ones. I also presented evidence about the decline in yields of extra-Euro countries meaning that there had been a transmission also outside the area of influence of the ECB. This event is the one showing the strongest and broader supply effects suggesting that banks actually used the available liquidity to buy government bonds.

The second LTRO took place in September 29th-October 1st 2009. Yield growth rates declined for both investment-grade and speculative-grade countries starting from the fourth day before the auction. Concerning extra-Euro countries the decrease in yields started with the same timing as European yields. Overall supply effects are evident as investors anticipated the liquidity injection buying both Euro-area and non-Euro bonds.

It is necessary to notice that these first two LTRO had been conducted in a period of high stress for the banking sector. As a matter of fact, at the beginning of the financial crisis, banks experienced a liquidity crisis due to the lack of confidence which made the interbank market dysfunctional. Therefore banks actually used the received liquidity to invest in the bond market.

The third LTRO was implemented in December 15th-17th. All the analysis reported shows that no supply effects affected any of the bond yields considered. All the considered categories of bonds showed an increase in yields which was more significant for higher-rated European bonds and extra-Euro bonds meaning that investors exited form the government bond market. The graphical analysis of Euro-area yields shows that the LTRO seems to have temporary eased the yield growth rate for some countries but this does not generate any statistically significant result.

The fourth LTRO was implemented in October 25th-27th. Yields of speculative grade countries

increased during all the time-window and the significance is higher in the last days. Greek and Portuguese yields followed this trend but coefficients are not significant while Italian and Spanish yield changes are coupled with very low p-values. Core European countries' yields declined but not significantly. On the other hand, supply effects are evident for extra-Euro countries. This pattern indicates that investors sold risky bonds and purchased safer ones.

The fifth LTRO was the first one with 36-month maturity and it took place in December 20th-22nd 2011. Inside the Euro area investment-grade countries yields reduced significantly during most of the event-window while Greek and Portuguese yields increased with high statistical significance. Italian and Spanish yields increased with low significance. Yields growth of extra-Euro countries declined and the magnitude of changes is higher in the last days. Also in this case the liquidity injected was not used in the expected way and it did not help to ease bond market tensions as spreads of highly indebted countries increased.

The last LTRO was the second one with 36-month maturity and it took place in February 28th-March 1st 2012. The outcome of the empirical analysis is similar to the previous ones as the expected supply effects mostly concentrated on higher-rated Euro bonds after the auction day. Moreover, here there have been a significant increase in yields of Greek and Portuguese bonds exacerbating the yield spreads with respect to Germany. These yields declined only after the decisions taken by the ECB Governing Council to reaccept Greek debt instruments as collateral in European credit operations. On the contrary, Italian and Spanish bond yields decreased with high statistical significance. Finally, yields of extra Euro-area bonds reported some significant positive changes at the beginning of the window and some not-significant negative changes after the LTRO implementation.

Overall these last three LTROs did not produce the expected supply effect as investors only purchased higher-rated bonds and the spreads of Greece and Portugal increased making the ECB intervention detrimental for bond markets. Spreads of Italy and Spain increased during event 4 and 5 while they reduced during event 6. It must however recalled that the event-study analysis of policy announcements found that news about these last two interventions had significant effects on yields of almost all countries. In these cases there have been an announcement effect and a weaker supply effect once banks actually received the liquidity.

It is also important to notice that during event 1, 2, 4 and 5 non-European yields declined more than Euro-area ones. This can be explained using the uncovered interest parity. This relationship predicts that, when foreign interest rates decreases more than national ones, the national currency should depreciate, which is what actually happened to the Euro currency with respect to the Japanese yen, the Swedish krone and the Swiss franc. Figure .1 shows that the Euro exchange rate with respect to the UK sterling and the US dollar alternated periods in which it depreciated with periods in which it appreciated. In particular, it depreciated from mid October 2009 to mid June 2010 and from May 2011 on, while it appreciated from mid June 2010 to April 2011. These periods are consistent with event 1, 2, 4 and 5 and so it is possible to conclude that the uncovered interest parity fully explain the yields' evolution over these events. On the other hand this evidence is not consistent with the Dornbusch (1976) overshooting model which predicts that, after an expansionary monetary policy,

national interest rates should decline more than foreign ones and the exchange rate overshoots, i.e. it depreciates a lot so to generate a subsequent appreciation.

Finally, the evidence supports also the idea that LTROs were effective as long as the crisis was due to a lack of liquidity. Since the autumn 2009 the crisis became debt-oriented and liquidity injections lost their effectiveness. Debt sustainability issues led to a differentiation between European countries which is the cause of the impaired transmission of monetary policy. Positive spillovers from the banking sector to sovereign debt affected only higher-rated countries. Therefore, inside a monetary union there can be situations in which the monetary policy transmission mechanism is not unique making the effects of unconventional interventions ambiguous. Moreover, in the last days of the event-window of the sixth LTRO the ECB announced to reaccept Greek bonds as collateral in European credit operations and this led to an abrupt decline in Greek yields suggesting that direct interventions on bonds are more effective in containing spreads than liquidity injections. What makes the effects of a monetary policy action difficult to forecast seems to be the lack of homogeneity between the single-countries macroeconomic fundamentals and the impaired functioning of financial markets. This finding raises some issues regarding the effectiveness of monetary policy during unconventional times.

6 Conclusion

This work focused on the effects of unconventional monetary policy measures implemented by the ECB on government bond yields. The aim was to evaluate whether banks actually invested the received liquidity and so if there had been positive spillovers from the banking to sovereign debt.

The first empirical analysis concerned the effects of announcements on single-countries bond yields to evaluate whether policy actions affected markets through investors' expectations. The findings, even though they are not all consistent with each-other, supports the effectiveness of the expectational channel in shaping market movements. The announcements that produced the most relevant effect were the ones about the Covered Bond Purchase Programmes, the Securities Markets Programme, the Outright Monetary Transaction programme and the rumors about the lengthening in the maturity of LTROs in early December 2011. On the other hand no significant changes in yields had been found in conjunction with the actual LTRO implementation.

For the second empirical analysis I constructed a panel of both Euro-area and extra Euro-area country yields and I analyzed the direct effects of extraordinary liquidity injections by the ECB, namely six longer-term refinancing operations. The most interesting finding here is that the transmission mechanism of these liquidity injections was not unique and moreover during the time span of the last three LTROs it actually produced an increase in market spreads for lower-rated Euro countries due to a flight to safety effect. This can be justified by the change in the nature of the financial crisis. At the beginning the ECB had been successful in mitigate market tension because the crisis was due to a lack of confidence between banks that led to funding problems. All countries benefited from the liquidity injections because they improved funding conditions for both

banks and firms and so there had been positive spillovers from the banking sector to sovereign debt. However, in 2009 the liquidity-crisis evolved into a debt-crisis and from then on the monetary policy effects differentiated between countries. In a context of increasing sovereign default risk for several European countries the monetary policy transmission started to be influenced by the differences in macroeconomic fundamentals and the impaired functioning of financial markets. Positive spillovers from liquidity to government debt involved only higher-rated countries. This finding raises some issues about the effectiveness of monetary policy during unconventional times especially when market tensions are not due to monetary issues like the lack of liquidity but rather they are caused by fiscal issues like debt sustainability. In this context liquidity injections had the effect of exacerbating rather than mitigating market tensions.

As a matter of fact, the first part of this work showed that the interventions that proved to be more effective in containing bond spreads during the debt crisis were the direct interventions on bonds, like the Securities Market Programme and the acceptance of bonds as collateral as they led to strong declines in yields. Therefore, even though liquidity injections in credit markets proved not to be effective during the debt-crisis to mitigate spreads, the ECB is not powerless: direct bond purchases are effective and it should keep on implementing that kind of actions if it would reduce spreads.

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Appendix A. Econometric Details of the Panel Model

In section 5 I specified the following model:

$$y_{itk} = \alpha_{ik} + \sum_{\tau=-s+1}^{s} \beta_m d_{i\tau k} + \varepsilon_{itk}.$$

Here the subscript k capture the six events over which the model is estimated, while i and t represent, respectively, countries and time.

The regressors are 20 time-varying dummies for each event ($s = 10$), each one of them has a 1 on a different day along the 21-days window across countries and zero otherwise. In particular, the dummies capture the yield variations from the second day of the sample, which in the output tables presented below is labelled as T-9 and T is the central day of the window. The T-10 day has no dummy as it is taken as the reference day to calculate the significance of the variation and clearly including 21 dummies would lead to a perfect-collinearity problem. The model is estimated separately for each event and so I run the estimation six times, each time including the 20 dummies of the event of interest and the sample consists of 126 observations.

As this is not a structural model, it can suffer from different misspecification problems. In the following I analyse these problems and explain how I accounted for them.

Fixed Effects vs. Random Effects

In this context, regressors are the same across individuals and so there should be correlation between individual heterogeneity and residuals. To capture this heterogeneity I added the fixed effect to the model. Fixed effects are actually non-significant as estimation outputs report always a zero correlation between the matrix of regressors and individual heterogeneity meaning that the results from the fixed-effects model are very similar to the ones coming from a random-effects model. Moreover, the model had been estimated also with random effects and standard errors are equal to the ones in the fixed-effects case up to the 5th decimal so that the significance of coefficient does not change between the two specifications.

Overall, for the theoretical reason explained here, I preferred to use the fixed-effect model.

Robust Standard Errors

Following the classical assumptions, errors should be independent and identically distributed but in reality this is often not the case. When this assumption is violated the OLS standard errors are not consistent anymore and to obtain an accurate statistical inference it is necessary to take into account the structure of the variance-covariance matrix.

Here errors are both autocorrelated and heteroskedastic. Autocorrelation comes form the fact that the event-windows are the same for all the bonds considered, while heteroskedasticity is typical of financial data at high frequency.

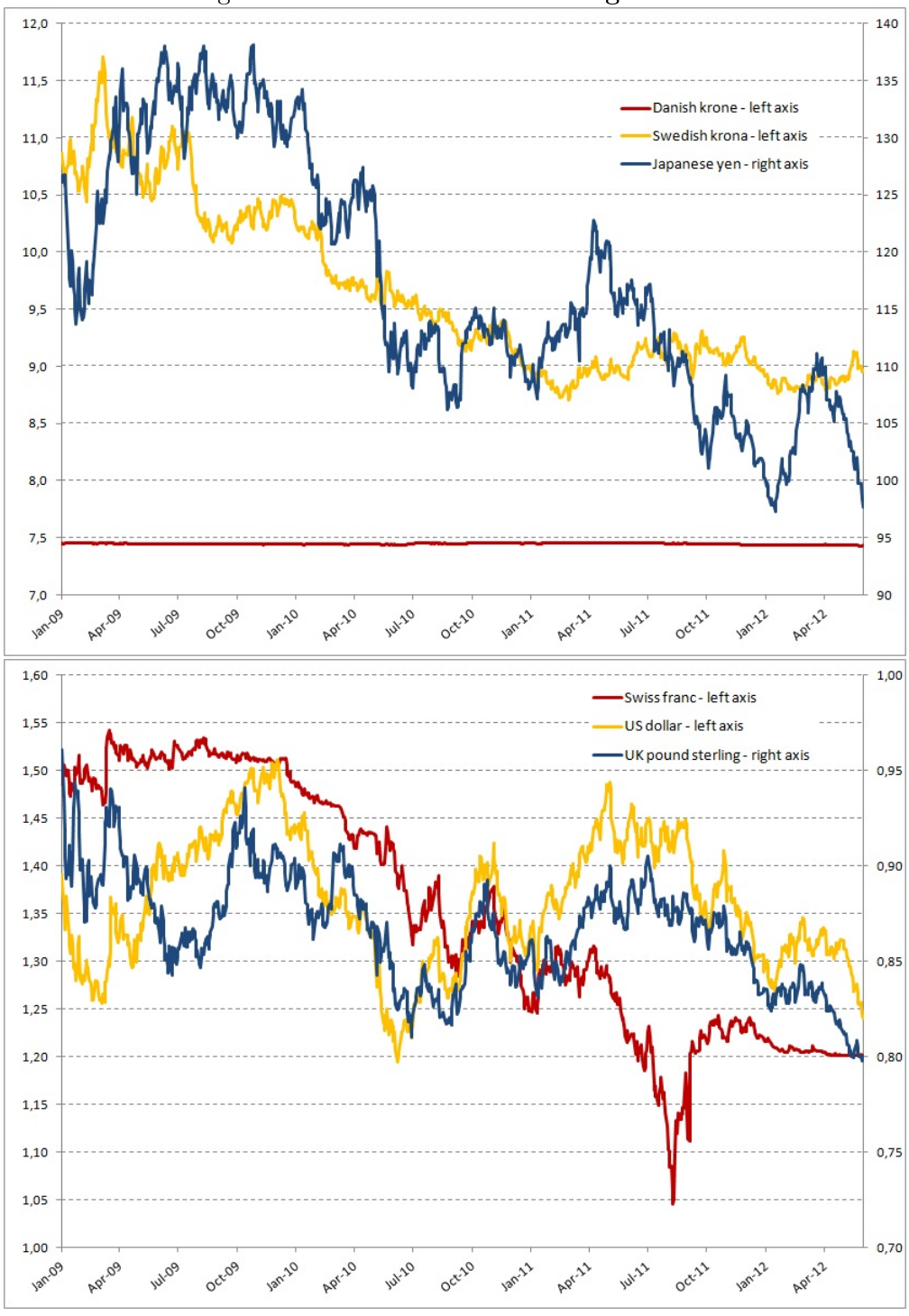
Concerning the correlation structure, in a panel context there can be several levels of correlation which in general are referred to as "clustered errors". "Clustered" refers to the fact that the correlation is grouped along different dimensions. The simplest case is when the clustering is along one dimension: individuals or time. When errors are clustered within individuals it means that there are "individual effects", i.e. errors are correlated across time for each individual ($E(\varepsilon_{it}\varepsilon_{ik} \mid x_{it}, x_{ik}) \neq 0 \; \forall \; t \neq k$). When errors are clustered within time it means that there are "time effects", i.e. errors are correlated across individuals for each moment in time ($E(\varepsilon_{it}\varepsilon_{jt} \mid x_{it}, x_{jt}) \neq 0 \; \forall \; i \neq j$). The extended case is when the clustering involves multiple levels but only one dimension. For example the correlation can be through individuals and cities and in this case clusters are said to be nested. On the other hand, errors can be clustered by the two different dimensions of the panel: individuals and time. In this case clusters are said to be non-nested. If errors are correlated between different individuals in different time we have "persistent common shocks", meaning that shocks are common to all individuals and autocorrelated for L periods ($E(\varepsilon_{it}\varepsilon_{jk} \mid x_{it}, x_{jk}) \neq 0 \; \forall \; i \neq j$ and $|t-k| > L$). Of course errors can be clustered also by more than two dimensions and this would complicate the procedure. For each of this case the corrections needed to obtain robust errors are different.

In the present framework the regressors are independent of each other and of the errors because they are dummy variables. So, even though errors are correlated across individuals in each time because the event-windows are the same, $Cov(x_{it}\varepsilon_{it}, x_{jt}\varepsilon_{jt}) = 0$ and then I don't need to cluster by time. The only correction needed is to cluster by individual which can be easily done with STATA.

Heteroskedasticity implies that the variance of the error term is not constant over time. To account for this kind of misspecification it is necessary to use Huber-White standard errors. Stock and Watson (2008) prove that the heteroskedasticity-consistent estimator in case of fixed-effects and the autocorrelation-consistent estimator are asymptotically equivalent for $T = 3$ while if $T > 3$ the autocorrelation-consistent estimator should be used. For this reason, in STATA the command to cluster by individual produces a variance-covariance matrix which is consistent also to heteroskedasticity.

Appendix B. Figures

Figure .1: **Euro Nominal Exchange Rates**



Source: ECB

*Nominal exchange rate is defined as the ratio between the foreign currency and the Euro currency

Appendix C. Tables

Table 1: **Main ECB announcements of unconventional monetary policy measures**

Date	Time	Description	Event Window
August 22, 2007	15.34	Announcement of the first supplementary LTRO (3-month maturity, standard procedure)	2 days (Aug. 21-23)
October 15, 2008	16.32	Announcement of several LTROs (3/6-month maturity, fixed-rate full allotment procedure) and expansion of the list of eligible collaterals	2 days (Oct. 14-16)
May 7, 2009	14.35	Announcement of the Enhanced Credit Support programme and of the Covered Bonds Purchase Programme 1	2 days (May 6-8)
June 4, 2009	14.30	Publication of the technical details of the Covered Bonds Purchase Programme 1	2 days (June 3-5)
June 23, 2009	15.35	Call for Bids of a LTRO with 12-month maturity	2 days (June 22-24)
September 29, 2009	15.35	Call for Bids of a LTRO with 12-month maturity	2 days (Sep. 28-30)
December 3, 2009	15.40	Announcement of details on refinancing operations (MROs conducted as fixed-rate and full-allotment procedure "for as long a is needed")	2 days (Dec. 2-4)
December 15, 2009	15.35	Call for Bids of a LTRO with 12-month maturity	2 days (Dec. 14-16)
May 10, 2010	3.15	Announcement of the Securities Markets Programme	1 days (May 9-10)
August 7, 2011	23.00	Statement about the active implementation of the Securities Markets Programme	1 day (Aug. 7-8)
October 6, 2011	14.45	Announcement of the Covered Bonds Purchase Programme 2 and of two LTROs with 12-month maturity	2 days (Oct. 5-7)
October 25, 2011	15.35	Call for Bids of a LTRO with 12-month maturity	2 days (Oct. 24-26)
November 3, 2011	15.30	Publication of the technical details of the Covered Bonds Purchase Programme 2	2 days (Nov. 2-4)
December 2, 2011		Rumors about ECB's LTROs with 36-month maturity	2 days (Dec. 1-5)
December 8, 2011	14.30	Announcement of two LTROs with 36-month maturity	2 days (Dec. 7-9)
December 20, 2011	15.35	Call for Bids of a LTRO with 36-month maturity	2 days (Dec. 19-21)
February 28, 2012	15.35	Call for Bids of a LTRO with 36-month maturity	2 days (Feb. 27-29)
July 26 2012	12.00	Statement about the commitment of the ECB to do whatever it takes to preserve the euro	2 days (Jul. 25-27)
August 2 2012	14.30	Announcement of the OMT program	2 days (Aug. 1-3)
September 6 2012	14.30	Publication of the details of the OMT program	2 days (Sep. 5-7)

Table 2: **Austria: analysis of ECB announcements**

EVENTS	RESPONSES TO ANNOUNCEMENTS						Joint
	1y	2y	3y	5y	7y	10y	Significance
Aug. 22, 2007 (2d)	**0.106**	**0.151**	**0.146**	0.1	0.074		**0.577**
p-value	0.0007	0.0547	0.0562	0.1426	0.2047		0.0001
Oct. 15, 2008 (2d)	0.047	-0.029	**-0.263**	-0.161	-0.117	-0.058	-0.581
p-value	0.7747	0.8400	0.0921	0.2589	0.3212	0.5871	0.4454
May 7, 2009 (2d)	**-0.082**	-0.077	-0.088	-0.006	0.034	**0.097**	**-0.122**
p-value	0.0777	0.1246	0.2484	0.9326	0.5617	0.0680	0.0830
Jun. 4, 2009 (2d)	**0.152**	**0.253**	0.286	**0.309**	**0.267**	**0.213**	**1.48**
p-value	0.0914	0.0769	0.2261	0.0050	0.0063	0.0002	0.0000
Jun. 23, 2009 (2d)	-0.051	-0.065	-0.047	-0.033	-0.029	-0.008	-0.233
p-value	0.5804	0.6734	0.8439	0.7878	0.7911	0.9066	0.9947
Sept. 29, 2009 (2d)	0.021	0.041	0.038	0.033	0.018	0.021	0.172
p-value	0.3156	0.3009	0.3402	0.4915	0.7211	0.6634	0.6900
Dec. 3, 2009 (2d)	-0.052	0.042	**0.095**	**0.089**	0.081	0.038	**0.293**
p-value	0.1400	0.2219	0.0445	0.0710	0.1063	0.3888	0.0178
Dec. 15, 2009 (2d)	0.005	-0.024	-0.006	0.017	0.045	0.036	0.073
p-value	0.9347	0.4401	0.9016	0.7085	0.3006	0.3580	0.8382
May 10, 2010 (1d)	**-0.182**	0.064	**0.15**	0.047	**0.107**	**0.114**	**0.3**
p-value	0.0000	0.1194	0.0182	0.5149	0.0254	0.0245	0.0000
Aug. 7, 2011 (1d)	-0.052	**-0.143**	-0.099	**-0.11**	**-0.113**	**-0.087**	**-0.604**
p-value	0.3947	0.0231	0.1172	0.0665	0.0421	0.0592	0.0017
Oct. 6, 2011 (2d)	**0.166**	0.082	0.116	0.109	0.084	0.151	**0.708**
p-value	0.0621	0.3141	0.2111	0.2457	0.4141	0.1345	0.0912
Oct. 25, 2011 (2d)	-0.13	**-0.202**	**-0.168**	**-0.182**	-0.148	-0.161	**-0.991**
p-value	0.2000	0.0103	0.0556	0.0301	0.1060	0.1035	0.0005
Nov. 3, 2011 (2d)	**-0.222**	-0.138	-0.022	-0.048	-0.055	0.001	-0.484
p-value	0.0336	0.1355	0.8066	0.5734	0.5626	0.9927	0.2335
Dec. 2, 2011 (2d)	0.022	-0.012	-0.091	-0.125	-0.168	-0.066	-0.44
p-value	0.8652	0.9575	0.6997	0.6034	0.4680	0.7179	0.9800
Dec. 8, 2011 (2d)	0.094	0.048	0.072	0.045	-0.007	0.039	0.291
p-value	0.4630	0.8334	0.7629	0.8538	0.9762	0.8322	0.9928
Dec. 20, 2011 (2d)	-0.008	-0.044	-0.08	-0.043	0.057	0.064	-0.054
p-value	0.9468	0.8446	0.7482	0.8641	0.8098	0.7309	0.9992
Feb. 28, 2012 (2d)	-0.056	0.048	-0.009	-0.037	0.001	-0.011	-0.064
p-value	0.2431	0.6143	0.8596	0.6074	0.9888	0.8660	0.9188
Jul. 26, 2012 (2d)	0.092	-0.033	-0.096	-0.097	-0.086	-0.064	-0.284
p-value	0.1234	0.6125	0.2472	0.2785	0.3366	0.4358	0.3233
Aug. 2, 2012 (2d)	0.032	0.026	0.032	0.021	0.008	0.004	0.123
p-value	0.6069	0.6972	0.6821	0.8092	0.9245	0.9576	0.9952
Sep. 6, 2012 (2d)	-0.003	0.07	0.053	0.055	0.034	0.047	0.256
p-value	0.9449	0.1606	0.2790	0.2821	0.4670	0.2756	0.3932

Significant changes are in bold font.

Table 3: **Belgium: analysis of ECB announcements**

EVENTS	RESPONSES TO ANNOUNCEMENTS											Joint Significance
	3m	6m	1y	2y	3y	5y	7y	10y	15y	20y	30y	
Aug. 22, 2007 (2d)	**0.062**		**0.123**	**0.148**	**0.13**	**0.107**	0.067	0.037	0.02		0.009	**0.703**
p-value	0.0947		0.0613	0.0412	0.0670	0.0928	0.2416	0.4766	0.6843		0.8454	0.0171
Oct. 15, 2008 (2d)	-0.202		0.101	-0.164	-0.226	-0.193	-0.128	-0.087	-0.006		0.076	-0.829
p-value	0.3066		0.6495	0.2977	0.1269	0.1918	0.2923	0.4299	0.9593		0.5936	0.4597
May 7, 2009 (2d)	-0.042		-0.053	-0.042	-0.027	0.024	0.065	**0.135**	**0.162**		**0.189**	**0.411**
p-value	0.6475		0.3446	0.6082	0.6924	0.6211	0.2005	0.0096	0.0014		0.0009	0.0000
Jun. 4, 2009 (2d)	0.048		**0.149**	**0.283**	**0.296**	**0.291**	**0.204**	**0.142**	**0.12**		0.077	**1.61**
p-value	0.3560		0.0013	0.0000	0.0000	0.0185	0.0001	0.0058	0.0319		0.2086	0.0000
Jun. 23, 2009 (2d)	**-0.197**		0.022	-0.035	-0.066	-0.061	-0.023	0.002	0.01		0.016	-0.332
p-value	0.0343		0.7341	0.7107	0.4498	0.6588	0.7486	0.9737	0.8584		0.7612	0.7188
Sept. 29, 2009 (2d)	0.009	0.027	0.059	0.049	0.003	0.029	0.002	0.004	0.016	-0.014	-0.027	0.157
p-value	0.8808	0.3795	0.1936	0.2185	0.9414	0.5072	0.9660	0.9362	0.7373	0.7930	0.6425	0.9291
Dec. 3, 2009 (2d)	-0.074	-0.033	-0.001	0.036	0.074	**0.089**	0.07	0.043	0.046	0.007	0.028	0.285
p-value	0.1500	0.6775	0.9857	0.3580	0.1205	0.0537	0.1150	0.3080	0.2975	0.8884	0.5666	0.1807
Dec. 15, 2009 (2d)	0.006	**0.124**	-0.028	-0.012	-0.025	-0.011	-0.009	-0.002	-0.035	-0.038	-0.021	-0.051
p-value	0.8833	0.0755	0.6084	0.7681	0.6050	0.8237	0.8490	0.9611	0.4055	0.4273	0.6459	0.8916
May 10, 2010 (1d)	-0.050	**-0.040**	**0.303**	**-0.188**	**-0.177**	**-0.090**	-0.046	**-0.068**	-0.025	**0.108**	**0.110**	**-0.163**
p-value	0.1327	0.0693	0.0001	0.0001	0.0001	0.0247	0.2044	0.0719	0.4642	0.0077	0.0024	0.0000
Aug. 7, 2011 (1d)	**-0.095**	-0.109	**-0.233**	**-0.238**	**-0.217**	**-0.255**	**-0.260**	**-0.199**	**-0.250**	**-0.192**	**-0.165**	**-2.213**
p-value	0.0111	0.3831	0.0012	0.0156	0.0138	0.0001	0.0001	0.0016	0.0000	0.0000	0.0002	0.0000
Oct. 6, 2011 (2d)	**0.153**	0.009	0.008	0.004	0.063	0.011	-0.013	-0.033	0.003	0.005	0.017	0.227
p-value	0.0555	0.8976	0.9322	0.9797	0.7142	0.9438	0.9298	0.8046	0.9789	0.9650	0.8666	0.9621
Oct. 25, 2011 (2d)	**-0.167**	-0.037	-0.134	-0.215	-0.266	-0.265	-0.252	-0.182	-0.216	**-0.242**	**-0.216**	**-2.192**
p-value	0.0812	0.6153	0.2981	0.2690	0.1583	0.1228	0.1106	0.2021	0.1188	0.0558	0.0715	0.0091
Nov. 3, 2011 (2d)	**-0.241**	-0.092	-0.091	-0.069	-0.062	-0.025	-0.016	-0.032	-0.046	-0.023	-0.04	-0.737
p-value	0.0160	0.2278	0.4351	0.7205	0.7305	0.8724	0.9129	0.8130	0.7072	0.8445	0.7147	0.5889
Dec. 2, 2011 (2d)	-0.345	-0.323	-0.554	-0.417	-0.499	-0.463	-0.495	**-0.509**	**-0.44**	**-0.479**	**-0.426**	**-4.950**
p-value	0.1136	0.1470	0.1577	0.3455	0.2386	0.2262	0.1548	0.0875	0.0631	0.0536	0.0632	0.0036
Dec. 8, 2011 (2d)	-0.005	0.132	0.249	-0.066	-0.005	-0.001	0.016	0.106	0.036	0.039	-0.007	0.494
p-value	0.9833	0.5804	0.5565	0.8825	0.9907	0.9980	0.9647	0.7406	0.8902	0.8861	0.9774	1.0000
Dec. 20, 2011 (2d)	-0.211	-0.32	-0.167	-0.15	-0.179	-0.026	-0.117	-0.065	-0.077	-0.081	-0.05	-1.443
p-value	0.4266	0.2836	0.7219	0.7451	0.6906	0.9489	0.7507	0.8413	0.7737	0.7718	0.8439	0.9950
Feb. 28, 2012 (2d)	0.01	0.043	-0.105	-0.075	-0.078	-0.069	-0.055	-0.055	-0.071	-0.053	-0.039	-0.547
p-value	0.9158	0.5856	0.2680	0.3801	0.4588	0.4273	0.4940	0.4754	0.2810	0.4379	0.5042	0.8085
Jul. 26, 2012 (2d)	0.011	0.008	-0.01	-0.08	-0.142	-0.114	-0.092	-0.066	-0.05	-0.059	-0.064	-0.658
p-value	0.8067	0.8840	0.8559	0.4708	0.2741	0.4272	0.4773	0.5740	0.6395	0.5681	0.5104	0.9573
Aug. 2, 2012 (2d)	**-0.078**	0.027	0.021	-0.04	-0.079	-0.102	-0.089	-0.102	-0.039	-0.074	-0.059	-0.614
p-value	0.0883	0.6631	0.7090	0.7206	0.5432	0.4725	0.4807	0.3645	0.7106	0.4495	0.5219	0.7996
Sep. 6, 2012 (2d)	0.005	0.035	0	-0.016	-0.061	-0.067	-0.04	-0.025	-0.039	-0.043	-0.033	-0.284
p-value	0.9278	0.2905	1.0000	0.6862	0.2398	0.2639	0.4579	0.6406	0.4856	0.4205	0.5365	0.8440

Table 4: **Finland: analysis of ECB announcements**

EVENTS	RESPONSES TO ANNOUNCEMENTS							Joint
	2m	2y	3y	5y	8y	10y	15y	Significance
Aug. 22, 2007 (2d)		**0.214**	**0.181**	**0.143**		0.075		**0.613**
p-value		0.0062	0.0182	0.0491		0.1817		0.0003
Oct. 15, 2008 (2d)	-0.06	-0.282	-0.269	-0.172		0.008		-0.775
p-value	0.3974	0.1243	0.1128	0.2587		0.9468		0.2027
May 7, 2009 (2d)	-0.01	-0.036	0.084	0.04	0.107	**0.215**		**0.4**
p-value	0.5395	0.6414	0.2674	0.6611	0.1324	0.0100		0.0602
Jun. 4, 2009 (2d)	0.01	**0.303**	**0.248**	**0.34**	**0.17**	0.149		**1.22**
p-value	0.6085	0.0001	0.0025	0.0005	0.0714	0.1389		0.0000
Jun. 23, 2009 (2d)	-0.03	-0.14	-0.036	-0.104	-0.004	0.007		-0.307
p-value	0.1847	0.1519	0.7146	0.3472	0.9670	0.9490		0.5352
Sept. 29, 2009 (2d)	0	0.044	0.013	0.052	0.032	-0.014		0.127
p-value	1.0000	0.3088	0.8256	0.3698	0.5649	0.7944		0.8837
Dec. 3, 2009 (2d)	**-0.05**	0.014	**0.093**	**0.09**	**0.087**	0.071	0.017	**0.322**
p-value	0.0492	0.7733	0.0347	0.0829	0.0712	0.1635	0.7368	0.0115
Dec. 15, 2009 (2d)	0	-0.02	**-0.088**	-0.028	-0.029	0.004	-0.015	-0.176
p-value	1.0000	0.6765	0.0894	0.6319	0.5986	0.9396	0.7375	0.7907
May 10, 2010 (1d)	0.000	0.018	0.016	0.067	**0.166**	**0.117**	0.063	**0.447**
p-value	1.0000	0.7381	0.7549	0.2883	0.0002	0.0168	0.1425	0.0002
Aug. 7, 2011 (1d)	**-0.051**	**-0.159**	**-0.179**	**-0.187**	**-0.163**	**-0.201**	**-0.143**	**-1.083**
p-value	0.0667	0.0443	0.0052	0.0063	0.0120	0.0011	0.0071	0.0000
Oct. 6, 2011 (2d)	0.083	0.068	0.05	0.098	0.124	0.127	0.097	0.647
p-value	0.2891	0.3473	0.6045	0.3677	0.2541	0.2548	0.3508	0.4507
Oct. 25, 2011 (2d)	-0.015	**-0.142**	**-0.155**	**-0.177**	-0.13	-0.106	-0.159	**-0.884**
p-value	0.8882	0.0676	0.0631	0.0751	0.2201	0.3347	0.1338	0.0282
Nov. 3, 2011 (2d)	0.079	-0.023	-0.046	-0.021	-0.012	0.02	-0.002	-0.005
p-value	0.5098	0.7919	0.6317	0.8613	0.9282	0.8808	0.9877	0.9973
Dec. 2, 2011 (2d)	0.02	0.056	0.034	-0.025	0	0.005	-0.02	0.07
p-value	0.8530	0.6242	0.7776	0.8568	1.0000	0.9731	0.8867	0.9997
Dec. 8, 2011 (2d)	0.017	0.05	0.021	0.047	0.06	0.04	0.084	0.319
p-value	0.8752	0.6532	0.8574	0.7295	0.6897	0.7921	0.5591	0.9953
Dec. 20, 2011 (2d)	-0.016	0.005	0.021	0.033	0.024	0.023	0.047	0.137
p-value	0.8754	0.9616	0.8434	0.7811	0.8529	0.8625	0.7154	0.9998
Feb. 28, 2012 (2d)	0.002	-0.023	-0.015	0.01	-0.02	-0.009	0.002	-0.053
p-value	0.9358	0.7718	0.9037	0.9463	0.8221	0.9048	0.9824	1.0000
Jul. 26, 2012 (2d)	0	0.025	0.005	0.036	0.069	0.057	0.083	0.275
p-value	1.0000	0.6199	0.9309	0.6467	0.4434	0.5292	0.3500	0.9355
Aug. 2, 2012 (2d)	0	0.03	0.047	0.092	0.053	0.045	0.011	0.278
p-value	1.0000	0.4676	0.3127	0.1878	0.5132	0.5719	0.8900	0.7563
Sep. 6, 2012 (2d)	0	0.06	0.07	0.031	0.06	0.056	0.12	0.397
p-value	1.0000	0.0299	0.0851	0.6719	0.4074	0.5192	0.1003	0.0828

Table 5: **France: analysis of ECB announcements**

EVENTS	RESPONSES TO ANNOUNCEMENTS											Joint
	3m	6m	1y	2y	3y	5y	7y	10y	15y	20y	30y	Significance
Aug. 22, 2007 (2d)	-0.011	**0.076**	**0.149**	0.127	0.121	0.079	0.052	0.017	0.001	0.008	-0.004	**0.615**
p-value	0.7724	0.0890	0.0068	0.1344	0.1325	0.2858	0.4185	0.7608	0.9857	0.8761	0.9374	0.0726
Oct. 15, 2008 (2d)	-0.092	**0.482**	-0.194	**-0.35**	-0.241	-0.25	-0.151	-0.069	0.004	0.036	0.031	-0.794
p-value	0.8278	0.0473	0.1542	0.0705	0.2079	0.1417	0.3045	0.5590	0.9757	0.8056	0.8421	0.1611
May 7, 2009 (2d)	-0.016	-0.063	-0.054	-0.064	0.018	0.124	**0.132**	**0.191**	**0.17**	**0.19**	**0.201**	**0.829**
p-value	0.7236	0.3615	0.3490	0.5802	0.8611	0.1406	0.0824	0.0015	0.0036	0.0021	0.0017	0.0000
Jun. 4, 2009 (2d)	**0.087**	0.082	**0.162**	**0.277**	**0.37**	**0.284**	**0.202**	**0.157**	**0.121**	0.073	0.057	**1.872**
p-value	0.0774	0.1724	0.0014	0.0535	0.0000	0.0009	0.0055	0.0242	0.0523	0.2578	0.3675	0.0000
Jun. 23, 2009 (2d)	**-0.11**	-0.089	-0.074	-0.095	-0.049	-0.04	0.006	0.021	0.031	0.006	0.009	-0.384
p-value	0.0392	0.1535	0.2664	0.5309	0.7024	0.6908	0.9401	0.7619	0.6051	0.9100	0.8631	0.6012
Sept. 29, 2009 (2d)	0.01	**0.039**	-0.006	0.036	-0.012	0.007	0.017	0.005	-0.007	-0.029	-0.045	0.015
p-value	0.6190	0.0692	0.8442	0.4277	0.8473	0.8954	0.7414	0.9273	0.9016	0.6315	0.4589	0.9052
Dec. 3, 2009 (2d)	**-0.048**	-0.049	-0.008	**0.089**	**0.088**	0.078	**0.092**	0.063	0.035	0.026	0.033	**0.399**
p-value	0.0176	0.1804	0.7898	0.0437	0.0877	0.1567	0.0722	0.2177	0.4388	0.6034	0.5316	0.0113
Dec. 15, 2009 (2d)	**0.04**	-0.029	-0.028	-0.042	-0.035	-0.016	-0.025	-0.01	-0.04	-0.036	-0.006	-0.227
p-value	0.0676	0.4044	0.3885	0.4220	0.6082	0.7715	0.6403	0.8349	0.3621	0.4633	0.9097	0.7316
May 10, 2010 (1d)	-0.002	-0.020	0.002	0.049	-0.009	0.077	0.066	0.059	**0.076**	**0.122**	**0.125**	**0.545**
p-value	0.8691	0.5449	0.9304	0.2805	0.8606	0.1423	0.1430	0.1344	0.0461	0.0063	0.0048	0.0011
Aug. 7, 2011 (1d)	-0.009	0.003	**-0.138**	-0.043	0.061	0.059	-0.044	-0.029	-0.021	-0.013	-0.032	-0.206
p-value	0.8168	0.9492	0.0518	0.4931	0.3525	0.3654	0.3676	0.4866	0.6395	0.7925	0.5532	0.6789
Oct. 6, 2011 (2d)	**0.113**	0.082	0.103	0.045	0.102	0.092	0.111	0.105	0.102	0.112	0.115	1.082
p-value	0.0812	0.2027	0.1580	0.5854	0.1914	0.2928	0.2653	0.2455	0.3133	0.2550	0.2209	0.1088
Oct. 25, 2011 (2d)	-0.109	-0.008	-0.049	**-0.271**	**-0.299**	**-0.357**	**-0.303**	**-0.255**	**-0.277**	**-0.287**	**-0.276**	**-2.491**
p-value	0.1048	0.8754	0.5354	0.0006	0.0002	0.0001	0.0017	0.0087	0.0086	0.0071	0.0094	0.0000
Nov. 3, 2011 (2d)	**-0.155**	-0.07	-0.071	-0.028	-0.067	-0.074	-0.06	-0.029	-0.041	0.011	0.048	-0.536
p-value	0.0554	0.1947	0.3724	0.7451	0.4935	0.5123	0.5854	0.7851	0.7220	0.9242	0.6722	0.6864
Dec. 2, 2011 (2d)	-0.073	0.054	0.011	-0.082	-0.031	-0.021	-0.013	-0.017	-0.054	-0.034	-0.056	-0.316
p-value	0.4184	0.5834	0.9226	0.6582	0.8760	0.9191	0.9428	0.9169	0.7549	0.8323	0.7085	0.9996
Dec. 8, 2011 (2d)	-0.006	0.048	0.003	-0.085	0	0	0.038	0.002	-0.042	-0.04	-0.042	-0.124
p-value	0.9407	0.6200	0.9770	0.6356	1.0000	1.0000	0.8244	0.9898	0.7956	0.7860	0.7573	1.0000
Dec. 20, 2011 (2d)	0.015	-0.04	-0.035	0.04	0.039	0.005	-0.005	0.02	0.048	0.065	0.067	0.219
p-value	0.9031	0.6853	0.7639	0.8288	0.8404	0.9799	0.9777	0.9027	0.7723	0.6773	0.6451	1.0000
Feb. 28, 2012 (2d)	**-0.048**	-0.04	-0.035	-0.12	-0.064	-0.059	-0.041	-0.06	-0.045	-0.025	-0.027	-0.564
p-value	0.0785	0.2152	0.3060	0.2014	0.5879	0.5202	0.6142	0.3989	0.4283	0.6431	0.6229	0.4813
Jul. 26, 2012 (2d)	-0.008	0.006	**0.118**	**-0.141**	-0.138	-0.115	-0.086	-0.072	-0.073	-0.079	-0.056	**-0.644**
p-value	0.8747	0.8868	0.0048	0.0641	0.1202	0.2267	0.3661	0.4240	0.4054	0.3345	0.4899	0.0353
Aug. 2, 2012 (2d)	-0.011	-0.019	**-0.105**	-0.006	-0.009	-0.019	-0.006	-0.006	-0.026	-0.026	-0.011	-0.244
p-value	0.8282	0.6533	0.0607	0.9371	0.9179	0.8345	0.9468	0.9440	0.7549	0.7335	0.8824	0.9577
Sep. 6, 2012 (2d)	0.001	0.008	0.011	0.054	0.009	-0.011	-0.031	-0.029	-0.023	-0.012	-0.024	-0.047
p-value	0.9223	0.5937	0.8047	0.1793	0.8424	0.8361	0.5524	0.5670	0.6776	0.8283	0.6760	0.9835

Table 6: **Germany: analysis of ECB announcements**

EVENTS	RESPONSES TO ANNOUNCEMENTS										Joint
	3m	6m	1y	2y	3y	5y	7y	10y	20y	30y	Significance
Aug. 22, 2007 (2d)	-0.005	0.074	**0.166**	**0.155**	**0.142**	**0.118**	0.077	0.052	0.028	0.017	**0.824**
p-value	0.9481	0.1407	0.0046	0.0447	0.0482	0.0787	0.1965	0.3200	0.5645	0.7238	0.0027
Oct. 15, 2008 (2d)	**-0.530**	-0.27	0.054	**-0.288**	-0.258	-0.164	-0.089	-0.011	0.055	0.055	-1.446
p-value	0.0924	0.1954	0.7812	0.0928	0.1282	0.3003	0.5312	0.9250	0.7156	0.7123	0.2762
May 7, 2009 (2d)	-0.044	**-0.131**	-0.068	-0.016	0.029	0.143	**0.181**	**0.206**	**0.182**	**0.216**	**0.698**
p-value	0.3146	0.0558	0.2274	0.8642	0.7733	0.1363	0.0601	0.0076	0.0171	0.0027	0.0000
Jun. 4, 2009 (2d)	0.062	0.082	**0.154**	**0.317**	**0.297**	**0.262**	**0.213**	0.103	0.113	0.085	**1.688**
p-value	0.1749	0.1482	0.0049	0.0002	0.0002	0.0019	0.0093	0.1376	0.1182	0.2543	0.0000
Jun. 23, 2009 (2d)	0.000	0.031	-0.015	-0.063	-0.04	-0.038	-0.014	-0.014	0.045	0.046	-0.062
p-value	1.0000	0.5543	0.8211	0.5794	0.6849	0.6979	0.8696	0.8420	0.4820	0.4652	0.9949
Sept. 29, 2009 (2d)	0.000	0.036	**0.049**	0.047	0.01	-0.012	-0.032	-0.026	-0.019	-0.052	0.001
p-value	1.0000	0.1140	0.0817	0.4905	0.8833	0.8331	0.5691	0.6192	0.7578	0.4090	0.6439
Dec. 3, 2009 (2d)	-0.044	**-0.05**	0.005	**0.113**	**0.105**	**0.119**	**0.1**	0.038	0.029	0.038	**0.453**
p-value	0.1332	0.0399	0.8839	0.0425	0.0225	0.0394	0.0819	0.4795	0.5848	0.4920	0.0031
Dec. 15, 2009 (2d)	-0.013	-0.021	-0.03	-0.026	-0.035	0.006	0.008	0.034	-0.016	-0.011	-0.104
p-value	0.6802	0.5255	0.2966	0.6744	0.5238	0.9248	0.8937	0.5023	0.7440	0.8382	0.9825
May 10, 2010 (1d)	-0.005	-0.017	-0.027	0.052	**0.083**	0.092	**0.119**	**0.186**	**0.149**	**0.185**	**0.817**
p-value	0.8708	0.6555	0.5453	0.3047	0.0949	0.1316	0.0298	0.0000	0.0032	0.0004	0.0000
Aug. 7, 2011 (1d)	-0.048	-0.055	-0.027	-0.072	-0.080	-0.087	-0.085	-0.088	-0.047	-0.065	-0.654
p-value	0.7162	0.4906	0.6641	0.3319	0.2586	0.2641	0.2422	0.1952	0.4790	0.3299	0.5232
Oct. 6, 2011 (2d)	0.131	0.087	0.102	0.122	0.120	0.146	0.161	0.165	0.160	0.143	**1.337**
p-value	0.2246	0.3846	0.1302	0.1982	0.2300	0.2375	0.1807	0.1798	0.1745	0.1979	0.0770
Oct. 25, 2011 (2d)	-0.007	-0.023	-0.064	-0.132	-0.140	-0.149	-0.107	-0.080	-0.090	-0.099	-0.891
p-value	0.9115	0.6617	0.2477	0.1178	0.1239	0.1864	0.3580	0.4948	0.4373	0.3989	0.3388
Nov. 3, 2011 (2d)	**-0.262**	-0.087	-0.074	-0.050	-0.050	-0.059	-0.046	-0.023	-0.033	-0.031	**-0.715**
p-value	0.0001	0.1190	0.2012	0.6002	0.6438	0.6763	0.7589	0.8808	0.8177	0.8274	0.0038
Dec. 2, 2011 (2d)	**0.298**	0.022	**0.112**	-0.002	-0.005	-0.030	-0.039	-0.034	-0.113	-0.117	**0.092**
p-value	0.0000	0.6575	0.0693	0.9801	0.9590	0.8243	0.7843	0.8206	0.4262	0.3871	0.0012
Dec. 8, 2011 (2d)	0.040	0.076	0.060	0.003	0.026	-0.001	0.015	0.046	0.061	0.051	0.377
p-value	0.6841	0.1414	0.3700	0.9685	0.7792	0.9939	0.9142	0.7625	0.6809	0.7149	0.9568
Dec. 20, 2011 (2d)	-0.027	-0.022	-0.010	0.009	0.021	0.039	0.035	0.053	0.067	0.068	0.233
p-value	0.7459	0.6438	0.8702	0.8752	0.7537	0.6961	0.7284	0.6413	0.5690	0.5297	0.9981
Feb. 28, 2012 (2d)	**-0.147**	0.007	-0.017	0.005	-0.004	0.027	0.011	0.006	0.024	0.023	-0.065
p-value	0.0459	0.7940	0.7408	0.8641	0.9398	0.6722	0.8744	0.9355	0.7368	0.7509	0.8912
Jul. 26, 2012 (2d)	**0.143**	0.011	**0.095**	0.034	0.055	0.091	0.110	**0.131**	0.107	0.107	**0.884**
p-value	0.0025	0.7846	0.0029	0.3697	0.2538	0.2058	0.1484	0.0882	0.2042	0.2010	0.0002
Aug. 2, 2012 (2d)	0.006	0.041	0.010	0.034	0.038	0.052	0.032	0.017	0.001	0.006	0.237
p-value	0.9275	0.4288	0.7986	0.2549	0.3132	0.3809	0.6255	0.8022	0.9889	0.9287	0.9364
Sep. 6, 2012 (2d)	-0.084	**0.083**	0.019	**0.070**	**0.075**	**0.097**	0.096	0.115	**0.124**	**0.142**	**0.737**
p-value	0.3871	0.0547	0.6480	0.0035	0.0339	0.0939	0.1497	0.1278	0.0934	0.0714	0.0002

Table 7: **Greece: analysis of ECB announcements**

EVENTS	RESPONSES TO ANNOUNCEMENTS				Joint
	3m	10y	15y	30y	Significance
Aug. 22, 2007 (2d)		0.006	-0.018	-0.014	-0.026
p-value		0.9576	0.8764	0.9228	0.9981
Oct. 15, 2008 (2d)		-0.032	0.007	-0.003	-0.028
p-value		0.7763	0.9517	0.9835	0.9934
May 7, 2009 (2d)		**-0.13**	**-0.135**	**-0.145**	**-0.41**
p-value		0.0185	0.0617	0.0106	0.0006
Jun. 4, 2009 (2d)		0.147	0.144	**0.191**	**0.482**
p-value		0.1219	0.1183	0.0417	0.0216
Jun. 23, 2009 (2d)		-0.016	0.064	0.07	0.118
p-value		0.8763	0.4473	0.4027	0.7198
Sept. 29, 2009 (2d)		0.029	0.02	-0.024	0.025
p-value		0.6375	0.7060	0.7238	0.9191
Dec. 3, 2009 (2d)		**0.205**	0.147	0.146	**0.498**
p-value		0.0877	0.2349	0.1101	0.0626
Dec. 15, 2009 (2d)		0.089	0.188	-0.01	0.267
p-value		0.6270	0.2354	0.9386	0.6335
May 10, 2010 (1d)		**-4.009**	**-1.979**	**-0.665**	**-6.653**
p-value		0.0000	0.0000	0.0003	0.0000
Aug. 7, 2011 (1d)	**5.543**	-0.412	-0.163	-0.198	**4.770**
p-value	0.0002	0.3786	0.5715	0.4109	0.0005
Oct. 6, 2011 (2d)	**4.925**	0.946	0.144	-0.108	**5.907**
p-value	0.0002	0.5583	0.9194	0.8883	0.0009
Oct. 25, 2011 (2d)	0.103	-0.235	-0.207	0.802	0.463
p-value	0.9725	0.8772	0.8722	0.1738	0.7365
Nov. 3, 2011 (2d)	-0.187	**3.948**	**4.86**	**1.359**	**9.980**
p-value	0.9468	0.0019	0.0000	0.0257	0.0000
Dec. 2, 2011 (2d)	-0.004	-0.679	0.739	-0.608	-0.552
p-value	0.9991	0.7965	0.7173	0.4379	0.9357
Dec. 8, 2011 (2d)	0.014	1.283	1.314	**2.001**	4.612
p-value	0.9969	0.6279	0.5230	0.0240	0.1758
Dec. 20, 2011 (2d)	-1.683	0.203	0.21	-0.551	-1.821
p-value	0.7244	0.9317	0.9074	0.4161	0.9346
Feb. 28, 2012 (2d)	0.019	0.589	0.185	-0.122	0.671
p-value	0.9924	0.6614	0.8949	0.9060	0.9940
Jul. 26, 2012 (2d)	-0.02	-0.938	-0.996	-1.535	-3.489
p-value	0.9675	0.3107	0.3500	0.1089	0.3189
Aug. 2, 2012 (2d)	-0.25	-0.88	-1.247	-1.376	-3.753
p-value	0.6098	0.3245	0.2162	0.1513	0.2831
Sep. 6, 2012 (2d)	0.13	-0.188	-0.257	-0.184	-0.499
p-value	0.5436	0.7616	0.6660	0.7646	0.9446

Table 8: **Italy: analysis of ECB announcements**

EVENTS	RESPONSES TO ANNOUNCEMENTS										Joint Significance
	3m	6m	1y	2y	3y	5y	7y	10y	15y	30y	
Aug. 22, 2007 (2d)				**0.133**	**0.126**	0.071	0.018	0.012		-0.033	0.312
p-value				0.0794	0.0933	0.2694	0.7336	0.7966		0.4771	0.2102
Oct. 15, 2008 (2d)				**-0.275**	**-0.328**	**-0.299**	-0.215	-0.057		-0.01	**-1.237**
p-value				0.0802	0.0492	0.0511	0.1118	0.5658		0.9378	0.0208
May 7, 2009 (2d)				**-0.165**	-0.038	0.051	0.073	0.039		0.049	0.043
p-value				0.0915	0.6604	0.5547	0.1650	0.4095		0.2791	0.2324
Jun. 4, 2009 (2d)				**0.294**	**0.287**	**0.254**	**0.178**	**0.14**		**0.144**	**1.47**
p-value				0.0009	0.0020	0.0031	0.0009	0.0168		0.0127	0.0000
Jun. 23, 2009 (2d)				-0.083	-0.106	-0.079	-0.048	-0.005		0.058	-0.234
p-value				0.3746	0.3170	0.3367	0.4587	0.9394		0.3136	0.5917
Sept. 29, 2009 (2d)	0.006	0.016	0.029	-0.075	0.024	0.078	0.019	0.008	0	-0.041	0.064
p-value	0.9448	0.2291	0.4534	0.5253	0.5841	0.1414	0.6826	0.8681	1.0000	0.4414	0.8231
Dec. 3, 2009 (2d)	-0.032	**-0.073**	-0.027	0.056	0.084	0.059	0.013	0.006	-0.014	-0.025	0.047
p-value	0.7641	0.0038	0.5925	0.3727	0.2631	0.3222	0.8209	0.9293	0.7539	0.5525	0.1751
Dec. 15, 2009 (2d)	-0.001	-0.036	-0.035	-0.061	**-0.096**	-0.05	-0.051	-0.018	-0.035	-0.039	-0.422
p-value	0.9925	0.2723	0.5126	0.4120	0.0967	0.3615	0.3283	0.7665	0.4347	0.3209	0.5399
May 10, 2010 (1d)	0.004	**-0.296**	**-0.349**	**-0.554**	**-0.718**	**-0.507**	**-0.441**	**-0.280**	**-0.237**	**-0.169**	**-3.547**
p-value	0.9631	0.0008	0.0053	0.0000	0.0000	0.0000	0.0000	0.0000	0.0003	0.0001	0.0000
Aug. 7, 2011 (1d)	-0.093	-0.250	**-0.544**	**-0.946**	**-0.969**	**-0.929**	**-0.869**	**-0.811**	**-0.528**	**-0.405**	**-6.344**
p-value	0.6998	0.2730	0.0217	0.0001	0.0002	0.0000	0.0000	0.0000	0.0001	0.0010	0.0000
Oct. 6, 2011 (2d)	0.144	-0.159	-0.04	-0.135	-0.089	-0.109	-0.054	-0.002	0.025	-0.033	-0.452
p-value	0.6792	0.5294	0.8736	0.5958	0.7179	0.6136	0.7610	0.9898	0.8750	0.8440	0.9991
Oct. 25, 2011 (2d)	**0.37**	**0.573**	**0.619**	0.082	-0.005	-0.025	0.001	-0.027	-0.099	-0.065	**1.424**
p-value	0.0471	0.0055	0.0167	0.6011	0.9746	0.8827	0.9939	0.7957	0.2799	0.4839	0.0160
Nov. 3, 2011 (2d)	**0.713**	0.105	0.307	**0.398**	**0.362**	0.26	**0.218**	**0.18**	**0.151**	0.053	**2.747**
p-value	0.0002	0.6606	0.3687	0.0427	0.0492	0.1256	0.0903	0.0827	0.0867	0.5304	0.0000
Dec. 2, 2011 (2d)	0.247	**-1.062**	-0.698	-0.857	-0.838	**-0.956**	**-0.888**	-0.284	**-0.507**	-0.38	**-6.223**
p-value	0.8150	0.0441	0.5240	0.1184	0.1514	0.0530	0.0329	0.3767	0.0883	0.1065	0.0046
Dec. 8, 2011 (2d)	0.095	0.345	0.742	0.404	0.293	0.531	0.432	0.35	0.345	0.148	3.685
p-value	0.9305	0.5650	0.4998	0.5056	0.6487	0.3492	0.3737	0.3151	0.2995	0.5567	0.8385
Dec. 20, 2011 (2d)	0.005	-0.295	0.251	-0.083	0.02	-0.042	-0.064	-0.055	-0.065	-0.058	-0.386
p-value	0.9965	0.6484	0.8185	0.8875	0.9749	0.9414	0.8941	0.8773	0.8487	0.8152	1.0000
Feb. 28, 2012 (2d)	-0.246	-0.253	**-0.334**	**-0.55**	**-0.389**	**-0.371**	**-0.307**	**-0.269**	-0.203	-0.191	**-3.113**
p-value	0.1096	0.1292	0.0470	0.0065	0.0336	0.0651	0.0872	0.0755	0.1291	0.1040	0.0000
Jul. 26, 2012 (2d)	-0.041	**-0.706**	**-0.738**	**-1.135**	**-0.965**	**-0.765**	**-0.637**	**-0.495**	**-0.426**	**-0.354**	**-6.262**
p-value	0.9206	0.0008	0.0296	0.0028	0.0028	0.0047	0.0038	0.0060	0.0067	0.0179	0.0000
Aug. 2, 2012 (2d)	0.224	-0.301	**-0.752**	-0.577	-0.496	-0.267	-0.093	0.144	0.104	0.159	-1.855
p-value	0.5460	0.4696	0.0926	0.2826	0.3144	0.5145	0.7819	0.5768	0.6298	0.3952	0.6292
Sep. 6, 2012 (2d)	0.028	-0.145	-0.065	-0.213	-0.274	-0.391	**-0.406**	**-0.43**	**-0.326**	**-0.29**	**-2.512**
p-value	0.8810	0.4506	0.8416	0.5449	0.3621	0.1283	0.0540	0.0153	0.0334	0.0489	0.0070

Table 9: **Netherlands: analysis of ECB announcements**

EVENTS	RESPONSES TO ANNOUNCEMENTS										Joint Significance
	3m	6m	1y	2y	3y	5y	7y	10y	20y	30y	
Aug. 22, 2007 (2d)			0.07	0.126	0.107	0.064	0.044	0.02	-0.014	-0.016	0.401
p-value			0.7806	0.2244	0.1863	0.3667	0.4671	0.7203	0.7898	0.7541	0.7426
Oct. 15, 2008 (2d)			0.33	0	**-0.342**	-0.226	-0.12	-0.057	0.049	0.041	-0.325
p-value			0.1052	1.0000	0.0859	0.1680	0.4078	0.6396	0.7132	0.7912	0.3343
May 7, 2009 (2d)			-0.044	-0.073	-0.02	0.044	0.105	**0.193**	**0.177**	**0.149**	**0.531**
p-value			0.4648	0.4835	0.8219	0.5608	0.1065	0.0013	0.0142	0.0300	0.0003
Jun. 4, 2009 (2d)			**0.157**	**0.276**	**0.275**	**0.304**	**0.231**	**0.161**	0.095	0.078	**1.577**
p-value			0.0201	0.0006	0.0002	0.0002	0.0023	0.0262	0.1575	0.2384	0.0000
Jun. 23, 2009 (2d)			-0.104	-0.084	-0.047	-0.045	-0.024	0.015	0.03	0.026	-0.233
p-value			0.1424	0.4056	0.6039	0.6323	0.7668	0.8318	0.5979	0.6465	0.8452
Sept. 29, 2009 (2d)			0.012	0.025	0.035	-0.004	0.034	-0.004	-0.024	-0.056	0.018
p-value			0.7030	0.6635	0.4812	0.9409	0.5213	0.9423	0.6855	0.3779	0.9723
Dec. 3, 2009 (2d)			**-0.043**	0.038	**0.093**	0.087	0.058	0.044	0.043	0.037	**0.357**
p-value			0.0734	0.3229	0.0250	0.1148	0.2568	0.3536	0.3967	0.5077	0.0409
Dec. 15, 2009 (2d)			-0.031	-0.025	**-0.123**	-0.028	-0.034	-0.03	-0.029	-0.032	-0.332
p-value			0.1708	0.5360	0.0252	0.6323	0.4906	0.5052	0.5512	0.5632	0.2782
May 10, 2010 (1d)			0.015	0.000	0.019	0.104	0.086	0.083	**0.149**	**0.145**	**0.601**
p-value			0.7345	1.0000	0.7725	0.1690	0.1938	0.1464	0.0136	0.0188	0.0134
Aug. 7, 2011 (1d)	**-0.087**	-0.101	**-0.134**	-0.084	-0.068	-0.082	**-0.102**	-0.084	-0.125	-0.066	**-0.933**
p-value	0.0457	0.4371	0.0078	0.1918	0.2446	0.1791	0.0809	0.1106	0.0467	0.3124	0.0010
Oct. 6, 2011 (2d)	**0.151**	**0.113**	**0.112**	0.098	0.088	0.117	0.147	0.158	0.169	0.14	**1.293**
p-value	0.0130	0.0702	0.0955	0.2275	0.3156	0.2235	0.1476	0.1221	0.1406	0.1836	0.0031
Oct. 25, 2011 (2d)	-0.053	-0.051	-0.065	**-0.138**	**-0.146**	**-0.177**	-0.162	-0.13	-0.111	-0.093	**-1.126**
p-value	0.4278	0.4591	0.3327	0.0873	0.0778	0.0660	0.1247	0.2320	0.3303	0.4202	0.0559
Nov. 3, 2011 (2d)	-0.045	-0.049	-0.058	-0.089	-0.083	-0.091	-0.067	-0.043	-0.072	-0.041	-0.638
p-value	0.4763	0.4507	0.3850	0.3256	0.3927	0.4619	0.6156	0.7556	0.6063	0.7635	0.8970
Dec. 2, 2011 (2d)	**0.077**	**0.11**	0.056	0.001	-0.031	-0.067	-0.027	-0.013	-0.077	-0.112	-0.083
p-value	0.0872	0.0697	0.4190	0.9932	0.8135	0.6538	0.8440	0.9199	0.5761	0.3822	0.5538
Dec. 8, 2011 (2d)	-0.008	-0.001	-0.032	-0.018	0.003	-0.001	0.02	0.018	0.049	0.04	0.070
p-value	0.8846	0.9885	0.6713	0.8756	0.9812	0.9945	0.8818	0.8886	0.7308	0.7638	1.0000
Dec. 20, 2011 (2d)	-0.043	-0.025	-0.005	0.032	0.047	0.061	0.077	0.072	0.073	0.079	0.368
p-value	0.3865	0.7006	0.9412	0.7588	0.6908	0.6255	0.4905	0.4762	0.5239	0.4424	0.9684
Feb. 28, 2012 (2d)	0.001	0.006	0.009	-0.008	0.003	0.033	0.015	0.005	0.003	0.017	0.084
p-value	0.9493	0.6609	0.5442	0.8746	0.9730	0.6912	0.8374	0.9406	0.9657	0.8091	0.9999
Jul. 26, 2012 (2d)	0.029	-0.006	0	-0.015	-0.038	-0.004	0.016	0.031	0.033	0.046	0.092
p-value	0.1213	0.6234	1.0000	0.6866	0.4915	0.9591	0.8467	0.7129	0.7129	0.5892	0.9445
Aug. 2, 2012 (2d)	0.013	**0.028**	0.01	0.028	0.03	0.036	0.029	0.017	0.018	-0.018	0.191
p-value	0.4757	0.0340	0.6435	0.4247	0.5309	0.6155	0.6882	0.8191	0.8221	0.8136	0.6938
Sep. 6, 2012 (2d)	0	0.011	0.021	**0.042**	**0.07**	0.083	0.078	0.07	0.055	0.112	**0.542**
p-value	1.0000	0.3240	0.1096	0.0821	0.0533	0.1288	0.2166	0.3018	0.4519	0.1129	0.0351

Table 10: **Portugal: analysis of ECB announcements**

EVENTS	RESPONSES TO ANNOUNCEMENTS								Joint
	6m	2y	3y	5y	7y	10y	15y	30y	Significance
Aug. 22, 2007 (2d)		**0.152**	0.117	0.094	0.053	0.009	-0.004		0.421
p-value		0.0392	0.1539	0.1337	0.3647	0.8510	0.9365		0.1214
Oct. 15, 2008 (2d)		**-0.239**	**-0.378**	**-0.261**	-0.133	-0.109	-0.03		**-1.15**
p-value		0.0930	0.0207	0.0733	0.3208	0.3234	0.8087		0.0241
May 7, 2009 (2d)		-0.104	-0.031	0.037	0.04	0.077	**0.112**		0.131
p-value		0.1537	0.7425	0.5850	0.5611	0.2108	0.0307		0.1375
Jun. 4, 2009 (2d)		**0.328**	**0.388**	**0.253**	**0.226**	**0.196**	**0.162**		**1.553**
p-value		0.0000	0.0001	0.0036	0.0006	0.0083	0.0091		0.0000
Jun. 23, 2009 (2d)		-0.059	-0.1	-0.05	-0.045	0.019	0.043		-0.192
p-value		0.5428	0.4165	0.5774	0.5495	0.8019	0.5033		0.8936
Sept. 29, 2009 (2d)		0.006	0.043	0.069	0.054	0.021	0.007	-0.007	0.193
p-value		0.8695	0.4824	0.1491	0.3120	0.6940	0.9041	0.9107	0.7827
Dec. 3, 2009 (2d)		0.036	**0.102**	0.055	0.053	0.042	-0.024	-0.008	0.256
p-value		0.3604	0.0741	0.2593	0.2294	0.4042	0.6222	0.8702	0.3222
Dec. 15, 2009 (2d)		-0.031	-0.046	0.027	-0.019	0.003	-0.013	-0.028	-0.107
p-value		0.4665	0.4471	0.6406	0.7639	0.9582	0.8043	0.6049	0.9704
May 10, 2010 (1d)		**-3.218**	**-2.710**	**-1.381**	**-1.784**	**-1.739**	**-1.356**	**-0.236**	**-12.424**
p-value		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0202	0.0000
Aug. 7, 2011 (1d)	0.321	**-1.798**	**-2.001**	**-1.417**	**-1.500**	-0.415	-0.438	-0.050	**-7.298**
p-value	0.7042	0.1000	0.0933	0.0633	0.0353	0.3976	0.3179	0.8314	0.0362
Oct. 6, 2011 (2d)	**-1.423**	-0.163	0.067	-0.053	0.026	-0.056	0.138	-0.025	-1.489
p-value	0.0022	0.8571	0.9248	0.9287	0.9540	0.8774	0.4793	0.8997	0.1577
Oct. 25, 2011 (2d)	-0.017	0.924	**0.959**	0.458	0.259	-0.16	-0.159	0.143	2.407
p-value	0.9822	0.1401	0.0439	0.1714	0.3908	0.5964	0.4825	0.4896	0.2162
Nov. 3, 2011 (2d)	-0.22	-0.733	0.356	0.155	0.143	-0.02	-0.087	-0.007	-0.413
p-value	0.8225	0.2560	0.5443	0.7663	0.7255	0.9486	0.7604	0.9754	0.9783
Dec. 2, 2011 (2d)	-0.434	-0.434	**-2.186**	-0.837	-0.707	-0.406	-0.171	-0.211	-5.386
p-value	0.7211	0.7069	0.0477	0.3268	0.3366	0.4228	0.6932	0.3804	0.4226
Dec. 8, 2011 (2d)	0.02	0.647	0.72	-0.212	0.69	0.366	0.061	-0.018	2.274
p-value	0.9864	0.6080	0.5568	0.8076	0.3825	0.5071	0.8882	0.9359	0.9826
Dec. 20, 2011 (2d)	-0.12	-0.353	-0.302	-0.015	-0.072	-0.122	-0.008	-0.016	-1.008
p-value	0.9012	0.7608	0.7959	0.9847	0.9239	0.8212	0.9840	0.9362	1.0000
Feb. 28, 2012 (2d)	0.103	-0.616	0.896	0.315	0.937	0.775	0.565	0.182	3.157
p-value	0.8670	0.7486	0.6002	0.8266	0.4502	0.4225	0.5121	0.7021	0.9704
Jul. 26, 2012 (2d)	0.121	-0.417	**1.092**	0.243	0.184	-0.13	-0.149	-0.304	0.64
p-value	0.4619	0.4967	0.0276	0.6307	0.6675	0.6776	0.5987	0.0597	0.1939
Aug. 2, 2012 (2d)	-0.093	-0.235	-0.128	-0.406	-0.279	-0.217	0	-0.146	-1.504
p-value	0.6719	0.6798	0.7919	0.4064	0.5287	0.5022	1.0000	0.3829	0.9468
Sep. 6, 2012 (2d)	-0.186	**-0.971**	-0.993	**-1.124**	**-0.877**	**-1.025**	0	**-0.509**	**-5.685**
p-value	0.3814	0.0629	0.1325	0.0259	0.0163	0.0007	1.0000	0.0037	0.0000

Table 11: **Spain: analysis of ECB announcements**

EVENTS	RESPONSES TO ANNOUNCEMENTS											Joint
	3m	6m	1y	2y	3y	5y	7y	10y	15y	20y	30y	Significance
Aug. 22, 2007 (2d)				0.14	**0.186**	0.073	0.048	0.024	0.02		0.009	**0.5**
p-value				0.1341	0.0000	0.1036	0.2792	0.5284	0.5536		0.8066	0.0000
Oct. 15, 2008 (2d)				**-0.405**	-0.238	**-0.277**	**-0.241**	-0.132	-0.026	0.041	-0.002	**-1.28**
p-value				0.0406	0.1086	0.0771	0.0867	0.2491	0.9054	0.7846	0.9897	0.0533
May 7, 2009 (2d)				-0.048	-0.039	0.014	0.09	**0.124**	**0.169**	**0.196**	**0.175**	**0.681**
p-value				0.5946	0.5233	0.8188	0.1515	0.0198	0.0036	0.0070	0.0141	0.0000
Jun. 4, 2009 (2d)				**0.293**	**0.29**	**0.271**	**0.219**	**0.136**	**0.119**	0.123	0.077	**1.528**
p-value				0.0004	0.0000	0.0007	0.0026	0.0517	0.0944	0.1256	0.3113	0.0000
Jun. 23, 2009 (2d)				-0.002	-0.071	-0.106	-0.084	-0.022	0.03	0.03	0.033	-0.192
p-value				0.9842	0.4215	0.2554	0.2954	0.7672	0.6215	0.6230	0.5982	0.8557
Sept. 29, 2009 (2d)				0.012	-0.009	0.036	0.047	0.017	0.021	0.018	0	0.142
p-value				0.9010	0.8471	0.5174	0.3794	0.7782	0.7248	0.7838	1.0000	0.9916
Dec. 3, 2009 (2d)				0.068	0.046	0.026	0.077	0.023	0.023	0.035	0.021	0.319
p-value				0.3495	0.3028	0.6644	0.1567	0.6473	0.6104	0.5280	0.6844	0.7178
Dec. 15, 2009 (2d)				**-0.139**	0.013	0.046	-0.01	-0.006	-0.024	-0.032	-0.025	-0.177
p-value				0.0442	0.7799	0.4217	0.8573	0.9127	0.6315	0.5717	0.6608	0.6503
May 10, 2010 (1d)				**-1.035**	**-0.797**	**-0.919**	**-0.681**	**-0.507**	**-0.349**	**-0.261**	**-0.174**	**-4.723**
p-value				0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Aug. 7, 2011 (1d)	**-0.429**	**-0.458**	**-0.654**	**-1.194**	**-1.202**	**-1.129**	**-1.157**	**-1.056**	**-0.863**	**-0.732**	**-0.696**	**-9.57**
p-value	0.0053	0.0242	0.0129	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Oct. 6, 2011 (2d)	-0.194	-0.123	-0.17	-0.055	-0.072	-0.024	-0.068	-0.086	-0.063	-0.054	-0.036	-0.945
p-value	0.1208	0.3565	0.3559	0.7519	0.6327	0.8724	0.5915	0.4914	0.6320	0.6614	0.7826	0.8759
Oct. 25, 2011 (2d)	0.127	**0.232**	-0.153	-0.166	-0.165	-0.108	-0.074	-0.057	-0.056	-0.058	-0.07	-0.548
p-value	0.3297	0.0715	0.3102	0.2285	0.2248	0.3401	0.5180	0.5856	0.5664	0.5079	0.4387	0.3884
Nov. 3, 2011 (2d)	0.267	0.102	0.127	**0.354**	**0.319**	**0.214**	0.15	0.131	0.112	0.107	0.082	**1.965**
p-value	0.1218	0.3920	0.4036	0.0246	0.0330	0.0677	0.2163	0.2577	0.3081	0.2918	0.4092	0.0123
Dec. 2, 2011 (2d)	-0.7	**-0.981**	**-0.856**	**-0.981**	**-0.863**	**-0.758**	**-0.741**	**-0.607**	**-0.651**	**-0.522**	**-0.456**	**-8.116**
p-value	0.2740	0.0283	0.0093	0.0019	0.0060	0.0046	0.0022	0.0092	0.0070	0.0168	0.0347	0.0000
Dec. 8, 2011 (2d)	0.178	0.682	0.125	0.389	0.297	0.345	0.319	0.322	0.364	0.379	0.284	3.684
p-value	0.7955	0.1743	0.7433	0.3462	0.4602	0.3247	0.3330	0.2890	0.2330	0.1616	0.2767	0.4016
Dec. 20, 2011 (2d)	-0.091	-0.171	0.131	0.324	0.223	0.076	0.097	0.088	0.06	0.053	0.038	0.828
p-value	0.8981	0.7590	0.7548	0.4893	0.6223	0.8431	0.7859	0.7909	0.8588	0.8602	0.8964	0.9999
Feb. 28, 2012 (2d)	-0.048	-0.058	-0.193	-0.202	-0.182	-0.075	-0.063	-0.056	-0.075	-0.057	-0.059	-1.068
p-value	0.7331	0.6937	0.1455	0.2407	0.2602	0.5906	0.6320	0.7295	0.5728	0.6759	0.6554	0.8285
Jul. 26, 2012 (2d)	-0.819	**-1.008**	**-1.562**	**-1.133**	**-1.104**	**-0.915**	**-0.762**	**-0.671**	**-0.536**	**-0.465**	**-0.494**	**-9.469**
p-value	0.2056	0.0893	0.0034	0.0576	0.0450	0.0398	0.0459	0.0444	0.0400	0.0462	0.0226	0.0000
Aug. 2, 2012 (2d)	-0.218	-0.283	-0.224	-1.002	-0.742	-0.247	0.02	0.192	0.252	0.218	0.235	-1.799
p-value	0.7393	0.6529	0.6893	0.1389	0.2346	0.6198	0.9618	0.5947	0.3813	0.3980	0.3297	0.7723
Sep. 6, 2012 (2d)	-0.032	-0.201	-0.092	-0.262	-0.459	**-0.61**	**-0.695**	**-0.707**	**-0.582**	**-0.574**	**-0.554**	**-4.768**
p-value	0.9035	0.4779	0.7861	0.5714	0.2772	0.0816	0.0194	0.0088	0.0142	0.0066	0.0082	0.0000

Table 12: **Effects of LTROs on Euro-Area 10-Year Government Bond Yields**

	Event 1	**Event 2**	**Event 3**	**Event 4**	**Event 5**	**Event 6**
T-9	-0.0004	0.0033*	0.0036**	-0.0076	0.0226**	0.0057
	[0.00176]	[0.00178]	[0.00134]	[0.00746]	[0.00974]	[0.00405]
T-8	-0.0133***	0.0040*	0.0148***	0.0190***	0.0263***	0.0131
	[0.00121]	[0.00185]	[0.00369]	[0.00587]	[0.00649]	[0.00802]
T-7	-0.0345***	0.0079***	0.0092	0.0029	0.0198	0.0084
	[0.00175]	[0.0017]	[0.00568]	[0.01072]	[0.0126]	[0.01047]
T-6	-0.0311***	0.0103***	0.0092	-0.0001	0.0149	0.0115
	[0.00358]	[0.00236]	[0.01082]	[0.01664]	[0.01286]	[0.01227]
T-5	-0.0406***	0.0061**	0.0228	0.0161	-0.0033	0.0080
	[0.00229]	[0.00244]	[0.01727]	[0.01501]	[0.0206]	[0.01123]
T-4	-0.0286***	-0.0109***	0.0313*	0.0091	-0.0214	0.0007
	[0.00227]	[0.00207]	[0.01579]	[0.01743]	[0.02025]	[0.01169]
T-3	-0.0368***	-0.0220***	0.0264**	0.0249	-0.0362	0.0051
	[0.00135]	[0.00223]	[0.00825]	[0.01414]	[0.02352]	[0.016]
T-2	-0.0474***	-0.0194***	0.0217	0.0343*	-0.0320	-0.0045
	[0.0026]	[0.00193]	[0.0136]	[0.016]	[0.02144]	[0.01491]
T-1	-0.0419***	-0.0236***	0.0377*	0.0149	-0.0270	-0.0115
	[0.00348]	[0.00205]	[0.01792]	[0.01652]	[0.01623]	[0.01692]
T	-0.0474***	-0.0180***	0.0240	-0.0004	-0.0241	-0.0057
	[0.00266]	[0.00284]	[0.01553]	[0.01705]	[0.0182]	[0.02256]
T+1	-0.0538***	-0.0195***	0.0210	0.0138	-0.0239	-0.0197
	[0.00293]	[0.0041]	[0.02107]	[0.00967]	[0.01976]	[0.02643]
T+2	-0.0619***	-0.0333***	0.0223	0.0203	-0.0255	-0.0265
	[0.0029]	[0.00379]	[0.02301]	[0.01118]	[0.02207]	[0.02604]
T+3	-0.0719***	-0.0357***	0.0414*	0.0042	-0.0244	-0.0196
	[0.00289]	[0.0033]	[0.02362]	[0.01905]	[0.02328]	[0.02629]
T+4	-0.0687***	-0.0306***	0.0466**	-0.0147	-0.0228	-0.0094
	[0.003]	[0.0031]	[0.01846]	[0.04113]	[0.02738]	[0.02746]
T+5	-0.0641***	-0.0388***	0.0474**	-0.0024	-0.0400	-0.0141
	[0.00331]	[0.00355]	[0.01728]	[0.034]	[0.0254]	[0.02861]
T+6	-0.0820***	-0.0406***	0.0493**	0.0148	-0.0377	-0.0163
	[0.00328]	[0.003]	[0.01705]	[0.03746]	[0.02727]	[0.03296]
T+7	-0.0804***	-0.0227***	0.0502**	0.0155	-0.0326	-0.0181
	[0.00354]	[0.00249]	[0.01695]	[0.04708]	[0.03072]	[0.03111]
T+8	-0.0877***	-0.0264***	0.0635***	0.0196	-0.0185	-0.0798
	[0.00481]	[0.00263]	[0.01658]	[0.04781]	[0.02257]	[0.04894]
T+9	-0.0846***	-0.0254***	0.0649***	0.0139	-0.0109	-0.0704
	[0.00434]	[0.00309]	[0.01568]	[0.05113]	[0.02178]	[0.05023]
T+10	-0.0839***	-0.0125***	0.0756***	0.0311	0.0016	-0.0551
	[0.00444]	[0.00305]	[0.01717]	[0.06009]	[0.02291]	[0.05388]

Significance levels: * for 10%, ** for 5%, *** for 1%.

Standard errors in brackets.

Table 13: **Effects of LTROs on 10-Year Government Bond Yields of Greece-Portugal and of other Euro-Area Countries**

Time	Subject	Event 1	Event 2	Event 3	Event 4	Event 5	Event6
	NGP	0.0003	0.0038	0.0030*	-0.0084	0.0183	0.0012
T-9	GP	-0.0031***	0.0014	0.0064**	-0.0046***	0.0397	0.0237***
	diff	0.0034	0.0023	-0.0034	-0.0038	-0.0215	-0.0226***
	NGP	-0.0122***	0.0048**	0.0118***	0.0209**	0.0242**	0.0077
T-8	GP	-0.0177***	0.0008	0.0268*	0.0115	0.0347***	0.0346***
	diff	0.0055	0.0040	-0.0150	0.0094	-0.0105	-0.0269**
	NGP	-0.0332***	0.0084***	0.0030	0.0013	0.0175	0.0063
T-7	GP	-0.0396***	0.0058***	0.0336	0.0094	0.0289***	0.0166***
	diff	0.0064	0.0025	-0.0306	-0.0081	-0.0114	-0.0103
	NGP	-0.0292***	0.0110***	-0.0031*	-0.0028	0.0087	0.0071
T-6	GP	-0.0384***	0.0073***	0.0585	0.0108	0.0398***	0.0293***
	diff	0.0092	0.0037	-0.0617	-0.0136	-0.0311	-0.0222
	NGP	-0.0410***	0.0074**	0.0020	0.0146	-0.0147	-0.0007
T-5	GP	-0.0388***	0.0011	0.1062**	0.0225	0.0424***	0.0429***
	diff	-0.0022	0.0063	-0.1042**	-0.0079	-0.0572*	-0.0437**
	NGP	-0.0287***	-0.0110***	0.0124**	0.0067	-0.0381	-0.0105
T-4	GP	-0.0281***	-0.0105**	0.1070**	0.0188	0.0456***	0.0454***
	diff	-0.0006	-0.0006	-0.0946*	-0.0121	-0.0838***	-0.0559***
	NGP	-0.0376***	-0.0227***	0.0158***	0.0225	-0.0570	-0.0127
T-3	GP	-0.0339***	-0.0191***	0.0688***	0.0342	0.0471***	0.0764***
	diff	-0.0037	-0.0036	-0.0530**	-0.0117	-0.1041***	-0.0891***
	NGP	-0.0500***	-0.0201***	0.0057***	0.0324	-0.0530**	-0.0210
T-2	GP	-0.0371***	-0.0167***	0.0861*	0.0423	0.0519***	0.0617***
	diff	-0.0129***	-0.0033	-0.0805*	-0.0100	-0.1049***	-0.0827***
	NGP	-0.0452***	-0.0248***	0.0177***	0.0101	-0.0466***	-0.0309**
T-1	GP	-0.0287***	-0.0190***	0.1178*	0.0341	0.0512**	0.0659**
	diff	-0.0165***	-0.0058	-0.1001	-0.0241	-0.0978***	-0.0967***
	NGP	-0.0501***	-0.0198***	0.0061*	-0.0082	-0.0427**	-0.0328**
T	GP	-0.0365***	-0.0109**	0.0957*	0.0307	0.0504**	0.1024**
	diff	-0.0136***	-0.0090*	-0.0896*	-0.0389	-0.0931***	-0.1351***
	NGP	-0.0559***	-0.0232***	-0.0033	0.0143	-0.0444**	-0.0492**
T+1	GP	-0.0451***	-0.0048	0.1180*	0.0117	0.0581***	0.0983**
	diff	-0.0108	-0.0184*	-0.1213*	0.0026	-0.1025***	-0.1474**
	NGP	-0.0648***	-0.0357***	-0.0048	0.0252*	-0.0468*	-0.0574***
T+2	GP	-0.0504***	-0.0240***	0.1307*	0.0007	0.0595***	0.0971*
	diff	-0.0144**	-0.0117	-0.1355*	0.0245	-0.1063***	-0.1545**
	NGP	-0.0737***	-0.0377***	0.0131*	0.0046	-0.0469*	-0.0517***
T+3	GP	-0.0643***	-0.0278***	0.1550**	0.0022	0.0655**	0.1089**
	diff	-0.0094	-0.0100*	-0.1419*	0.0024	-0.1124***	-0.1605***
	NGP	-0.0700***	-0.0319***	0.0244***	-0.0398	-0.0519**	-0.0455***
T+4	GP	-0.0635***	-0.0256***	0.1353**	0.0857*	0.0933**	0.1348***
	diff	-0.0065	-0.0063	-0.1110**	-0.1256*	-0.1452**	-0.1803***
	NGP	-0.0641***	-0.0412***	0.0270***	-0.0262	-0.0666**	-0.0519***
T+5	GP	-0.0638***	-0.0293***	0.1291**	0.0926*	0.0665***	0.1369***
	diff	-0.0003	-0.0119	-0.1021*	-0.1188*	-0.1331***	-0.1887***
	NGP	-0.0822***	-0.0420***	0.0292***	-0.0167	-0.0656**	-0.0604***
T+6	GP	-0.0814***	-0.0347***	0.1295**	0.1408	0.0739***	0.1598***
	diff	-0.0008	-0.0073	-0.1003*	-0.1575	-0.1395***	-0.2202***
	NGP	-0.0813***	-0.0236***	0.0303***	-0.0236	-0.0644**	-0.0591***
T+7	GP	-0.0771***	-0.0195***	0.1295**	0.1718	0.0947**	0.1460***
	diff	-0.0041	-0.0040	-0.0992*	-0.1954	-0.1590***	-0.2052***
	NGP	-0.0880***	-0.0278***	0.0453***	-0.0181	-0.0411	-0.0640***
T+8	GP	-0.0864***	-0.0206***	0.1362***	0.1700	0.0719	-0.1426
	diff	-0.0016	-0.0072	-0.0909*	-0.1881	-0.1130	0.0785
	NGP	-0.0844***	-0.0263***	0.0482***	-0.0231	-0.0304	-0.0525***
T+9	GP	-0.0852***	-0.0219***	0.1316**	0.1618	0.0670	-0.1422
	diff	0.0008	-0.0044	-0.0834*	-0.1849	-0.0974	0.0897
	NGP	-0.0871***	-0.0135***	0.0567***	-0.0025	-0.0158	-0.0316
T+10	GP	-0.0711***	-0.0084*	0.1514***	0.1655	0.0711	-0.1491
	diff	-0.0160	-0.0051	-0.0947*	-0.1680	-0.0869	0.1175

Table 14: **Effects of LTROs on Investment-Grade and Speculative-Grade 10-Year Government Bond Yields**

Time	Subject	Event 1	Event 2	Event 3	Event 4	Event 5	Event6
	INVEST	0.0015	0.0040	0.0044**	-0.0164	0.0079	0.0036
T-9	SPECUL	-0.0033***	0.0023	0.0026	0.0055	0.0445***	0.0089
	diff	0.0048	0.0016	0.0018	-0.0219	-0.0365*	-0.0053
	INVEST	-0.0126***	0.0049*	0.0145***	0.0221**	0.0135***	0.0191**
T-8	SPECUL	-0.0143***	0.0026	0.0153	0.0144**	0.0456***	0.0040
	diff	0.0018	0.0022	-0.0008	0.0077	-0.0321***	0.0150
	INVEST	-0.0341***	0.0096***	0.0051***	-0.0067	-0.0034	0.0227**
T-7	SPECUL	-0.0350***	0.0053***	0.0152	0.0173*	0.0546***	-0.0132
	diff	0.0009	0.0043	-0.0101	-0.0240	-0.0580***	0.0359
	INVEST	-0.0302***	0.0131***	-0.0038*	-0.0155	-0.0096	0.0265**
T-6	SPECUL	-0.0323***	0.0061***	0.0287	0.0231*	0.0517***	-0.0110
	diff	0.0021	0.0070*	-0.0324	-0.0386	-0.0613***	0.0375
	INVEST	-0.0444***	0.0087*	-0.0027	0.0052	-0.0444**	0.0139
T-5	SPECUL	-0.0349***	0.0022	0.0612	0.0326**	0.0584***	-0.0008
	diff	-0.0095**	0.0065	-0.0639	-0.0274	-0.1028***	0.0147
	INVEST	-0.0310***	-0.0099***	0.0082**	-0.0117	-0.0642***	0.0018
T-4	SPECUL	-0.0250***	-0.0124***	0.0660*	0.0404**	0.0429**	-0.0010
	diff	-0.0060	0.0025	-0.0578	-0.0521	-0.1072***	0.0027
	INVEST	-0.0380***	-0.0219***	0.0144***	0.0140	-0.0829***	0.0020
T-3	SPECUL	-0.0352***	-0.0221***	0.0443**	0.0411**	0.0340	0.0098
	diff	-0.0028	0.0002	-0.0299	-0.0271	-0.1170***	-0.0078
	INVEST	-0.0528***	-0.0213***	0.0037***	0.0230	-0.0717***	-0.0092
T-2	SPECUL	-0.0395***	-0.0166***	0.0488	0.0514**	0.0275	0.0026
	diff	-0.0133***	-0.0047	-0.0450	-0.0283	-0.0992***	-0.0118
	INVEST	-0.0486***	-0.0257***	0.0179***	-0.0063	-0.0535***	-0.0194
T-1	SPECUL	-0.0317***	-0.0204***	0.0674	0.0466**	0.0127	0.0004
	diff	-0.0169***	-0.0054	-0.0494	-0.0529	-0.0662*	-0.0198
	INVEST	-0.0518***	-0.0221***	0.0054	-0.0284	-0.0593***	-0.0153*
T	SPECUL	-0.0407***	-0.0120***	0.0520	0.0416**	0.0287	0.0085
	diff	-0.0112**	-0.0100*	-0.0466	-0.0700**	-0.0879***	-0.0238
	INVEST	-0.0581***	-0.0239***	-0.0067**	0.0084	-0.0656***	-0.0258*
T+1	SPECUL	-0.0473***	-0.0129*	0.0626	0.0219	0.0386*	-0.0106
	diff	-0.0108*	-0.0110	-0.0693	-0.0135	-0.1042***	-0.0152
	INVEST	-0.0665***	-0.0370***	-0.0104*	0.0129	-0.0728***	-0.0383***
T+2	SPECUL	-0.0552***	-0.0277***	0.0714	0.0314	0.0454*	-0.0088
	diff	-0.0113*	-0.0093	-0.0818	-0.0185	-0.1182***	-0.0295
	INVEST	-0.0749***	-0.0396***	0.0073	-0.0198	-0.0751***	-0.0333***
T+3	SPECUL	-0.0672***	-0.0300***	0.0926*	0.0400	0.0516**	0.0011
	diff	-0.0077	-0.0096	-0.0853	-0.0598	-0.1267***	-0.0344
	INVEST	-0.0715***	-0.0329***	0.0217***	-0.0839	-0.0793***	-0.0334**
T+4	SPECUL	-0.0645***	-0.0272***	0.0839*	0.0891***	0.0618*	0.0265
	diff	-0.0071	-0.0057	-0.0622	-0.1730***	-0.1411***	-0.0599
	INVEST	-0.0642***	-0.0420***	0.0266***	-0.0587	-0.0921***	-0.0396**
T+5	SPECUL	-0.0638***	-0.0341***	0.0787*	0.0820***	0.0382	0.0241
	diff	-0.0005	-0.0079	-0.0521	-0.1407**	-0.1302***	-0.0637
	INVEST	-0.0827***	-0.0426***	0.0282***	-0.0461	-0.0928***	-0.0450***
T+6	SPECUL	-0.0810***	-0.0375***	0.0809*	0.1063*	0.0451	0.0267
	diff	-0.0016	-0.0051	-0.0527	-0.1524**	-0.1379***	-0.0717
	INVEST	-0.0820***	-0.0232***	0.0292***	-0.0647	-0.0882***	-0.0412***
T+7	SPECUL	-0.0782***	-0.0220***	0.0816*	0.1358*	0.0509	0.0166
	diff	-0.0038	-0.0012	-0.0524	-0.2006**	-0.1390**	-0.0578
	INVEST	-0.0901***	-0.0269***	0.0483***	-0.0629	-0.0560**	-0.0508***
T+8	SPECUL	-0.0841***	-0.0256***	0.0862**	0.1433**	0.0378	-0.1233
	diff	-0.0059	-0.0013	-0.0379	-0.2062**	-0.0938**	0.0725
	INVEST	-0.0870***	-0.0277***	0.0506***	-0.0745*	-0.0465*	-0.0373***
T+9	SPECUL	-0.0809***	-0.0220***	0.0864**	0.1465*	0.0425	-0.1202
	diff	-0.0061	-0.0057	-0.0358	-0.2210**	-0.0890**	0.0829
	INVEST	-0.0912***	-0.0146**	0.0588***	-0.0718	-0.0313	-0.0093
T+10	SPECUL	-0.0731***	-0.0092***	0.1008**	0.1855**	0.0510**	-0.1238
	diff	-0.0181**	-0.0054	-0.0420	-0.2573**	-0.0823**	0.1145

Table 15: **Effects of LTROs on 10-Year Government Bond Yields of Italy and Spain and of other Euro-Area Countries (ex Greece and Portugal)**

Time	Subject	Event 1	Event 2	Event 3	Event 4	Event 5	Event6
	NIS	0.0015	0.0040	0.0044**	-0.0164	0.0079	0.0036
T-9	IS	-0.0035**	0.0032	-0.0012	0.0155***	0.0492***	-0.0060
	diff	0.0051	0.0008	0.0056**	-0.0319**	-0.0413***	0.0096
	NIS	-0.0126***	0.0049*	0.0145***	0.0221*	0.0135**	0.0191**
T-8	IS	-0.0110***	0.0045***	0.0038*	0.0173**	0.0564***	-0.0265***
	diff	-0.0016	0.0003	0.0107***	0.0048	-0.0429***	0.0456***
	NIS	-0.0341***	0.0096***	0.0051***	-0.0067	-0.0034	0.0227**
T-7	IS	-0.0304***	0.0047***	-0.0032*	0.0252*	0.0803***	-0.0431***
	diff	-0.0037*	0.0049	0.0083***	-0.0319	-0.0837***	0.0658***
	NIS	-0.0302***	0.0131***	-0.0038	-0.0155	-0.0096	0.0265**
T-6	IS	-0.0262***	0.0049*	-0.0012*	0.0353***	0.0635***	-0.0513***
	diff	-0.0040	0.0082*	-0.0026	-0.0509	-0.0731***	0.0778***
	NIS	-0.0444***	0.0087**	-0.0027	0.0052	-0.0444**	0.0139
T-5	IS	-0.0309***	0.0034	0.0161*	0.0427***	0.0744**	-0.0446***
	diff	-0.0135***	0.0053	-0.0189**	-0.0375	-0.1188***	0.0585***
	NIS	-0.0310***	-0.0099***	0.0082**	-0.0117	-0.0642***	0.0018
T-4	IS	-0.0220***	-0.0144**	0.0250**	0.0621***	0.0402	-0.0473**
	diff	-0.0090**	0.0045	-0.0168*	-0.0738**	-0.1044**	0.0491**
	NIS	-0.0380***	-0.0219***	0.0144***	0.0140	-0.0829***	0.0020
T-3	IS	-0.0364***	-0.0251***	0.0199***	0.0481**	0.0209	-0.0568***
	diff	-0.0015	0.0032	-0.0054*	-0.0341	-0.1039*	0.0588**
	NIS	-0.0528***	-0.0213***	0.0037***	0.0230	-0.0717***	-0.0092
T-2	IS	-0.0418***	-0.0164**	0.0114***	0.0604**	0.0031	-0.0565***
	diff	-0.0110**	-0.0049	-0.0077***	-0.0374	-0.0748	0.0473**
	NIS	-0.0486***	-0.0257***	0.0179***	-0.0063	-0.0535***	-0.0194
T-1	IS	-0.0347***	-0.0218***	0.0170***	0.0591**	-0.0258	-0.0651***
	diff	-0.0139*	-0.0040	0.0010	-0.0654*	-0.0277	0.0457**
	NIS	-0.0518***	-0.0221***	0.0054	-0.0284	-0.0593***	-0.0153
T	IS	-0.0448***	-0.0132**	0.0083***	0.0525**	0.0069	-0.0853***
	diff	-0.0070	-0.0088	-0.0030	-0.0809**	-0.0662*	0.0700***
	NIS	-0.0581***	-0.0239***	-0.0067*	0.0084	-0.0656***	-0.0258*
T+1	IS	-0.0495***	-0.0210***	0.0071	0.0320***	0.0191	-0.1194***
	diff	-0.0086	-0.0029	-0.0139	-0.0236*	-0.0847**	0.0937***
	NIS	-0.0665***	-0.0370***	-0.0104*	0.0129	-0.0728***	-0.0383***
T+2	IS	-0.0599***	-0.0315***	0.0122	0.0621***	0.0313	-0.1146***
	diff	-0.0066	-0.0055	-0.0226	-0.0493**	-0.1041**	0.0764***
	NIS	-0.0749***	-0.0396***	0.0073	-0.0198	-0.0751***	-0.0333***
T+3	IS	-0.0701***	-0.0322***	0.0303*	0.0779***	0.0376	-0.1067***
	diff	-0.0049	-0.0073	-0.0230	-0.0976***	-0.1127**	0.0734**
	NIS	-0.0715***	-0.0329***	0.0217***	-0.0839	-0.0793***	-0.0334**
T+4	IS	-0.0654***	-0.0288***	0.0324	0.0924***	0.0303	-0.0818**
	diff	-0.0062	-0.0041	-0.0107	-0.1764***	-0.1096**	0.0484
	NIS	-0.0642***	-0.0420***	0.0266***	-0.0587	-0.0921***	-0.0396***
T+5	IS	-0.0637***	-0.0388***	0.0283	0.0713***	0.0098	-0.0887**
	diff	-0.0006	-0.0032	-0.0017	-0.1300**	-0.1019*	0.0491
	NIS	-0.0827***	-0.0426***	0.0282***	-0.0461	-0.0928***	-0.0450***
T+6	IS	-0.0807***	-0.0403***	0.0323*	0.0717***	0.0162	-0.1064**
	diff	-0.0020	-0.0023	-0.0041	-0.1179**	-0.1091*	0.0614
	NIS	-0.0820***	-0.0232***	0.0292***	-0.0647	-0.0882***	-0.0412***
T+7	IS	-0.0792***	-0.0245***	0.0337*	0.0998***	0.0071	-0.1129***
	diff	-0.0028	0.0012	-0.0045	-0.1645***	-0.0952	0.0716*
	NIS	-0.0901***	-0.0269***	0.0483***	-0.0629	-0.0560**	-0.0508***
T+8	IS	-0.0818***	-0.0306***	0.0363**	0.1165***	0.0037	-0.1039**
	diff	-0.0082	0.0037	0.0121	-0.1795***	-0.0597	0.0532
	NIS	-0.0870***	-0.0277***	0.0506***	-0.0745	-0.0465*	-0.0373***
T+9	IS	-0.0766***	-0.0220***	0.0412**	0.1312***	0.0179	-0.0982**
	diff	-0.0104	-0.0057	0.0095	-0.2056***	-0.0644	0.0610
	NIS	-0.0912***	-0.0146***	0.0588***	-0.0718	-0.0313	-0.0093
T+10	IS	-0.0750***	-0.0100***	0.0502***	0.2054***	0.0308	-0.0985*
	diff	-0.0162	-0.0046	0.0086	-0.2772***	-0.0621	0.0892*

Table 16: **Effects of LTROs on Euro-Area and Non Euro-Area 10-Year Government Bond Yields**

Time	Subject	Event 1	Event 2	Event 3	Event 4	Event 5	Event6
	EURO	-0.0004	0.0033*	0.0036**	-0.0076	0.0226**	0.0057
T-9	EXEURO	0.0043	0.0008	0.0109***	-0.0178*	-0.0257***	0.0089
	diff	-0.0047	0.0025	-0.0073**	0.0101	0.0483***	-0.0032
	EURO	-0.0133***	0.0040**	0.0148***	0.0190***	0.0263***	0.0131
T-8	EXEURO	-0.0175**	0.0043	0.0286***	0.0082	-0.0169	0.0275**
	diff	0.0042	-0.0003	-0.0138*	0.0108	0.0432***	-0.0144
	EURO	-0.0345***	0.0079***	0.0092	0.0029	0.0198	0.0084
T-7	EXEURO	-0.0406***	0.0037	0.0196***	-0.0212*	-0.0290**	0.0394***
	diff	0.0062	0.0042	-0.0104	0.0241	0.0487***	-0.0310*
	EURO	-0.0311***	0.0103***	0.0092	-0.0001	0.0149	0.0115
T-6	EXEURO	-0.0453***	0.0043	0.0113	-0.0383**	-0.0377**	0.0465***
	diff	0.0142	0.0060	-0.0021	0.0382	0.0526**	-0.0350**
	EURO	-0.0406***	0.0061**	0.0228	0.0161	-0.0033	0.0080
T-5	EXEURO	-0.0517***	-0.0015	0.0041	-0.0293*	-0.0626***	0.0272***
	diff	0.0111	0.0076	0.0187	0.0455**	0.0594**	-0.0192
	EURO	-0.0286***	-0.0109***	0.0313*	0.0091	-0.0214	0.0007
T-4	EXEURO	-0.0398***	-0.0137	0.0205	-0.0312**	-0.0578***	0.0204***
	diff	0.0112	0.0028	0.0108	0.0404*	0.0364*	-0.0198
	EURO	-0.0368***	-0.0220***	0.0264***	0.0249*	-0.0362	0.0051
T-3	EXEURO	-0.0462***	-0.0249***	0.0395***	-0.0097	-0.0804***	0.0138**
	diff	0.0094*	0.0029	-0.0131	0.0345*	0.0442*	-0.0086
	EURO	-0.0474***	-0.0194***	0.0217	0.0343**	-0.0320	-0.0045
T-2	EXEURO	-0.0541***	-0.0342***	0.0386***	-0.0111	-0.0845***	-0.0123
	diff	0.0066	0.0148*	-0.0169	0.0454**	0.0525**	0.0078
	EURO	-0.0419***	-0.0236***	0.0377*	0.0149	-0.0270	-0.0115
T-1	EXEURO	-0.0634***	-0.0373***	0.0465***	-0.0271**	-0.0503***	-0.0134
	diff	0.0216**	0.0137*	-0.0088	0.0419*	0.0232	0.0019
	EURO	-0.0474***	-0.0180***	0.0240	-0.0004	-0.0241	-0.0057
T	EXEURO	-0.0666***	-0.0391***	0.0378**	-0.0365***	-0.0579***	0.0032
	diff	0.0192**	0.0211**	-0.0138	0.0361*	0.0338	-0.0090
	EURO	-0.0538***	-0.0195***	0.0210	0.0138	-0.0239	-0.0197
T+1	EXEURO	-0.0774***	-0.0545***	0.0202	0.0197	-0.0641***	0.0125
	diff	0.0237**	0.0350***	0.0008	-0.0059	0.0403	-0.0322
	EURO	-0.0619***	-0.0333***	0.0223	0.0203*	-0.0255	-0.0265
T+2	EXEURO	-0.0803***	-0.0655***	0.0207	0.0290***	-0.0539***	-0.0069
	diff	0.0183**	0.0322***	0.0016	-0.0087	0.0283	-0.0196
	EURO	-0.0719***	-0.0357***	0.0414*	0.0042	-0.0244	-0.0196
T+3	EXEURO	-0.0889***	-0.0672***	0.0320	-0.0324*	-0.0535***	-0.0015
	diff	0.0171**	0.0315***	0.0094	0.0365	0.0290	-0.0181
	EURO	-0.0687***	-0.0306***	0.0466**	-0.0147	-0.0228	-0.0094
T+4	EXEURO	-0.0821***	-0.0655***	0.0490**	-0.1129***	-0.0655***	-0.0175
	diff	0.0134	0.0349***	-0.0025	0.0982*	0.0427	0.0081
	EURO	-0.0641***	-0.0388***	0.0474**	-0.0024	-0.0400	-0.0141
T+5	EXEURO	-0.0667***	-0.0716***	0.0542**	-0.0933***	-0.0731***	-0.0185
	diff	0.0026	0.0327***	-0.0067	0.0909**	0.0331	0.0044
	EURO	-0.0820***	-0.0406***	0.0493**	0.0148	-0.0377	-0.0163
T+6	EXEURO	-0.0838***	-0.0726***	0.0584**	-0.0799***	-0.0923***	-0.0048
	diff	0.0018	0.0320***	-0.0091	0.0948**	0.0546	-0.0116
	EURO	-0.0804***	-0.0227***	0.0502***	0.0155	-0.0326	-0.0181
T+7	EXEURO	-0.0882***	-0.0469***	0.0594**	-0.1016***	-0.1019***	0.0018
	diff	0.0077	0.0242***	-0.0093	0.1171**	0.0693*	-0.0199
	EURO	-0.0877***	-0.0264***	0.0635***	0.0196	-0.0185	-0.0798
T+8	EXEURO	-0.0953***	-0.0517***	0.0728***	-0.1133***	-0.0908***	-0.0160
	diff	0.0076	0.0253***	-0.0093	0.1329**	0.0724**	-0.0637
	EURO	-0.0846***	-0.0254***	0.0649***	0.0139	-0.0109	-0.0704
T+9	EXEURO	-0.0966***	-0.0525***	0.0807***	-0.1103***	-0.0804***	0.0230
	diff	0.0120	0.0271***	-0.0158	0.1242**	0.0694**	-0.0934*
	EURO	-0.0839***	-0.0125***	0.0756***	0.0311	0.0016	-0.0551
T+10	EXEURO	-0.1112***	-0.0378***	0.0802***	-0.1491***	-0.0852**	0.0882***
	diff	0.0272	0.0254***	-0.0045	0.1802**	0.0868**	-0.1432**

Table 17: **Effects of LTROs on Euro-Area (ex Greece and Portugal) and Non Euro-Area 10-Year Government Bond Yields**

Time	Subject	Event 1	Event 2	Event 3	Event 4	Event 5	Event6
	EURO (NGP)	0.0003	0.0038*	0.0030*	-0.0084	0.0183*	0.0012
T-9	EXEURO	0.0043	0.0008	0.0109***	-0.0178*	-0.0257***	0.0089
	diff	-0.0040	0.0030	-0.0079**	0.0094	0.0440***	-0.0077
	EURO (NGP)	-0.0122***	0.0048**	0.0118***	0.0209***	0.0242***	0.0077
T-8	EXEURO	-0.0175**	0.0043	0.0286***	0.0082	-0.0169	0.0275**
	diff	0.0053	0.0005	-0.0168***	0.0127	0.0411**	-0.0198
	EURO (NGP)	-0.0332***	0.0084***	0.0030*	0.0013	0.0175	0.0063
T-7	EXEURO	-0.0406***	0.0037	0.0196***	-0.0212*	-0.0290**	0.0394**
	diff	0.0075	0.0047	-0.0165***	0.0225	0.0464**	-0.0331*
	EURO (NGP)	-0.0292***	0.0110***	-0.0031*	-0.0028	0.0087	0.0071
T-6	EXEURO	-0.0453***	0.0043	0.0113	-0.0383*	-0.0377**	0.0465***
	diff	0.0160	0.0067	-0.0144*	0.0355	0.0464**	-0.0395*
	EURO (NGP)	-0.0410***	0.0074**	0.0020	0.0146	-0.0147	-0.0007
T-5	EXEURO	-0.0517***	-0.0015	0.0041	-0.0293*	-0.0626***	0.0272***
	diff	0.0107	0.0089	-0.0022	0.0439*	0.0479*	-0.0279**
	EURO (NGP)	-0.0287***	-0.0110***	0.0124***	0.0067	-0.0381*	-0.0105
T-4	EXEURO	-0.0398***	-0.0137	0.0205	-0.0312**	-0.0578***	0.0204***
	diff	0.0111	0.0027	-0.0081	0.0380	0.0197	-0.0309**
	EURO (NGP)	-0.0376***	-0.0227***	0.0158***	0.0225	-0.0570**	-0.0127
T-3	EXEURO	-0.0462***	-0.0249***	0.0395***	-0.0097	-0.0804***	0.0138**
	diff	0.0087	0.0022	-0.0237*	0.0322	0.0234	-0.0265*
	EURO (NGP)	-0.0500***	-0.0201***	0.0057***	0.0324	-0.0530**	-0.0210*
T-2	EXEURO	-0.0541***	-0.0342***	0.0386***	-0.0111	-0.0845***	-0.0123
	diff	0.0040	0.0141	-0.0330**	0.0435*	0.0315	-0.0087
	EURO (NGP)	-0.0452***	-0.0248***	0.0177***	0.0101	-0.0466***	-0.0309**
T-1	EXEURO	-0.0634***	-0.0373***	0.0465***	-0.0271**	-0.0503***	-0.0134
	diff	0.0183**	0.0125	-0.0288**	0.0371	0.0037	-0.0175
	EURO (NGP)	-0.0501***	-0.0198***	0.0061**	-0.0082	-0.0427**	-0.0328**
T	EXEURO	-0.0666***	-0.0391***	0.0378**	-0.0365***	-0.0579***	0.0032
	diff	0.0165*	0.0193*	-0.0317*	0.0283	0.0152	-0.0360
	EURO (NGP)	-0.0559***	-0.0232***	-0.0033	0.0143	-0.0444**	-0.0492**
T+1	EXEURO	-0.0774***	-0.0545***	0.0202	0.0197	-0.0641***	0.0125
	diff	0.0215**	0.0313***	-0.0234	-0.0054	0.0197	-0.0617**
	EURO (NGP)	-0.0648***	-0.0357***	-0.0048	0.0252*	-0.0468**	-0.0574***
T+2	EXEURO	-0.0803***	-0.0655***	0.0207	0.0290***	-0.0539***	-0.0069
	diff	0.0155*	0.0299***	-0.0255	-0.0038	0.0071	-0.0505*
	EURO (NGP)	-0.0737***	-0.0377***	0.0131*	0.0046	-0.0469**	-0.0517***
T+3	EXEURO	-0.0889***	-0.0672***	0.0320	-0.0324*	-0.0535***	-0.0015
	diff	0.0152*	0.0295***	-0.0189	0.0370	0.0066	-0.0502*
	EURO (NGP)	-0.0700***	-0.0319***	0.0244***	-0.0398	-0.0519**	-0.0455***
T+4	EXEURO	-0.0821***	-0.0655***	0.0490**	-0.1129***	-0.0655***	-0.0175
	diff	0.0121	0.0336***	-0.0247	0.0730	0.0136	-0.0280
	EURO (NGP)	-0.0641***	-0.0412***	0.0270***	-0.0262	-0.0666***	-0.0519***
T+5	EXEURO	-0.0667***	-0.0716***	0.0542**	-0.0933***	-0.0731***	-0.0185
	diff	0.0026	0.0304***	-0.0271	0.0671	0.0065	-0.0333
	EURO (NGP)	-0.0822***	-0.0420***	0.0292***	-0.0167	-0.0656**	-0.0604***
T+6	EXEURO	-0.0838***	-0.0726***	0.0584**	-0.0799***	-0.0923***	-0.0048
	diff	0.0016	0.0306***	-0.0292	0.0633	0.0267	-0.0556**
	EURO (NGP)	-0.0813***	-0.0236***	0.0303***	-0.0236	-0.0644**	-0.0591***
T+7	EXEURO	-0.0882***	-0.0469***	0.0594**	-0.1016***	-0.1019***	0.0018
	diff	0.0069	0.0234**	-0.0291	0.0780	0.0375	-0.0610**
	EURO (NGP)	-0.0880***	-0.0278***	0.0453***	-0.0181	-0.0411*	-0.0640***
T+8	EXEURO	-0.0953***	-0.0517***	0.0728**	-0.1133***	-0.0908***	-0.0160
	diff	0.0073	0.0239**	-0.0274	0.0953*	0.0498	-0.0480*
	EURO (NGP)	-0.0844***	-0.0263***	0.0482***	-0.0231	-0.0304	-0.0525***
T+9	EXEURO	-0.0966***	-0.0525***	0.0807***	-0.1103***	-0.0804***	0.0230
	diff	0.0122	0.0262**	-0.0325	0.0872	0.0500	-0.0755***
	EURO (NGP)	-0.0871***	-0.0135***	0.0567***	-0.0025	-0.0158	-0.0316
T+10	EXEURO	-0.1112***	-0.0378***	0.0802***	-0.1491***	-0.0852**	0.0882***
	diff	0.0240	0.0244***	-0.0235	0.1466*	0.0694*	-0.1198***

Table 18: **Effects of LTROs on Euro-Area (Greece and Portugal) and Non Euro-Area 10-Year Government Bond Yields**

Time	Subject	Event 1	Event 2	Event 3	Event 4	Event 5	Event6
	EURO (GP)	-0.0031***	0.0014	0.0064*	-0.0046***	0.0397	0.0237***
T-9	EXEURO	0.0043	0.0008	0.0109***	-0.0178	-0.0257***	0.0089
	diff	-0.0074	0.0006	-0.0045	0.0132	0.0655**	0.0149
	EURO (GP)	-0.0177***	0.0008	0.0268*	0.0115	0.0347***	0.0346***
T-8	EXEURO	-0.0175*	0.0043	0.0286***	0.0082	-0.0169	0.0275
	diff	-0.0002	-0.0035	-0.0018	0.0033	0.0516**	0.0071
	EURO (GP)	-0.0396***	0.0058**	0.0336	0.0094	0.0289**	0.0166***
T-7	EXEURO	-0.0406***	0.0037	0.0196**	-0.0212	-0.0290**	0.0394**
	diff	0.0010	0.0021	0.0140	0.0306	0.0579***	-0.0228
	EURO (GP)	-0.0384***	0.0073**	0.0585	0.0108	0.0398***	0.0293**
T-6	EXEURO	-0.0453***	0.0043	0.0113	-0.0383*	-0.0377*	0.0465***
	diff	0.0069	0.0030	0.0473	0.0491*	0.0775***	-0.0173
	EURO (GP)	-0.0388***	0.0011	0.1062*	0.0225	0.0424***	0.0429***
T-5	EXEURO	-0.0517***	-0.0015	0.0041	-0.0293	-0.0626***	0.0272***
	diff	0.0129	0.0026	0.1020*	0.0518*	0.1051***	0.0158*
	EURO (GP)	-0.0281***	-0.0105**	0.1070**	0.0188	0.0456***	0.0454***
T-4	EXEURO	-0.0398***	-0.0137	0.0205	-0.0312*	-0.0578***	0.0204**
	diff	0.0117	0.0033	0.0865	0.0500*	0.1034***	0.0250***
	EURO (GP)	-0.0339***	-0.0191**	0.0688***	0.0342	0.0471**	0.0764***
T-3	EXEURO	-0.0462***	-0.0249**	0.0395**	-0.0097	-0.0804***	0.0138*
	diff	0.0124*	0.0058	0.0293	0.0439	0.1275***	0.0627***
	EURO (GP)	-0.0371***	-0.0167***	0.0861*	0.0423	0.0519***	0.0617***
T-2	EXEURO	-0.0541***	-0.0342***	0.0386**	-0.0111	-0.0845***	-0.0123
	diff	0.0169***	0.0174	0.0475	0.0534	0.1364***	0.0740***
	EURO (GP)	-0.0287***	-0.0190***	0.1178*	0.0341	0.0512**	0.0659**
T-1	EXEURO	-0.0634***	-0.0373***	0.0465**	-0.0271*	-0.0503***	-0.0134
	diff	0.0348***	0.0183*	0.0713	0.0612	0.1015***	0.0793**
	EURO (GP)	-0.0365***	-0.0109**	0.0957*	0.0307	0.0504*	0.1024**
T	EXEURO	-0.0666***	-0.0391***	0.0378*	-0.0365**	-0.0579***	0.0032
	diff	0.0301**	0.0283**	0.0579	0.0672*	0.1083***	0.0991**
	EURO (GP)	-0.0451***	-0.0048	0.1180	0.0117	0.0581**	0.0983*
T+1	EXEURO	-0.0774***	-0.0545***	0.0202	0.0197	-0.0641***	0.0125
	diff	0.0323**	0.0497***	0.0979	-0.0079	0.1223***	0.0857
	EURO (GP)	-0.0504***	-0.0240***	0.1307*	0.0007	0.0595***	0.0971*
T+2	EXEURO	-0.0803***	-0.0655***	0.0207	0.0290**	-0.0539**	-0.0069
	diff	0.0299**	0.0416***	0.1100	-0.0283	0.1134***	0.1040*
	EURO (GP)	-0.0643***	-0.0278***	0.1550**	0.0022	0.0655**	0.1089**
T+3	EXEURO	-0.0889***	-0.0672***	0.0320	-0.0324	-0.0535**	-0.0015
	diff	0.0246	0.0394***	0.1229	0.0346	0.1190***	0.1104**
	EURO (GP)	-0.0635***	-0.0256***	0.1353**	0.0857	0.0933*	0.1348***
T+4	EXEURO	-0.0821***	-0.0655***	0.0490*	-0.1129**	-0.0655***	-0.0175
	diff	0.0186	0.0399***	0.0863	0.1986**	0.1588**	0.1523***
	EURO (GP)	-0.0638***	-0.0293***	0.1291**	0.0926	0.0665***	0.1369***
T+5	EXEURO	-0.0667***	-0.0716***	0.0542*	-0.0933***	-0.0731***	-0.0185
	diff	0.0029	0.0423***	0.0750	0.1859**	0.1396***	0.1554***
	EURO (GP)	-0.0814***	-0.0347***	0.1295**	0.1408	0.0739***	0.1598***
T+6	EXEURO	-0.0838***	-0.0726***	0.0584*	-0.0799***	-0.0923***	-0.0048
	diff	0.0024	0.0379***	0.0712	0.2208*	0.1662***	0.1646***
	EURO (GP)	-0.0771***	-0.0195***	0.1295**	0.1718	0.0947**	0.1460***
T+7	EXEURO	-0.0882***	-0.0469***	0.0594*	-0.1016***	-0.1019***	0.0018
	diff	0.0110	0.0274**	0.0701	0.2735*	0.1965***	0.1442***
	EURO (GP)	-0.0864***	-0.0206**	0.1362**	0.1700	0.0719***	-0.1426
T+8	EXEURO	-0.0953***	-0.0517***	0.0728**	-0.1133***	-0.0908***	-0.0160
	diff	0.0089	0.0310**	0.0635	0.2833**	0.1628***	-0.1265
	EURO (GP)	-0.0852***	-0.0219***	0.1316**	0.1618	0.0670***	-0.1422
T+9	EXEURO	-0.0966***	-0.0525***	0.0807***	-0.1103***	-0.0804**	0.0230
	diff	0.0114	0.0305**	0.0509	0.2720*	0.1474***	-0.1652
	EURO (GP)	-0.0711***	-0.0084*	0.1514**	0.1655	0.0711***	-0.1491
T+10	EXEURO	-0.1112***	-0.0378***	0.0802***	-0.1491***	-0.0852**	0.0882***
	diff	0.0400	0.0294***	0.0712	0.3146*	0.1563***	-0.2372